Effectiveness of *E-Wallet* Scheme in Fertilizer Distribution to Yam Farmers in Agricultural Zone II of Niger State, Nigeria

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Abstract

Accessibility and affordability of fertilizer for agricultural production has been a challenge for small holder farmers in Nigeria. It is on this basis the study assessed the level of effectiveness of fertilizer distribution to yam farmers via E-wallet scheme in agricultural zone II of Niger State, Nigeria. Interview schedule complimented with questionnaire were used to obtain information from a total of 163 respondents. Data were analyzed using frequency distribution, percentages, mean and ordinary least square (OLS). Farmers mean age was 36 years, majority (97.55%) were male, with an average farming experience of 21 years. There was low level of fertilizer accessibility E-wallet scheme in the area. Although farmers perceived the platform as effective in the procurement of fertilizer, they noted that it was ineffective, as distribution was untimely. OLS regression revealed that years of education, farm size, access to extension service, distance to redemption centre, cooperative society membership, years of registration, major occupation and fertilizer affordability had significant effect on the quantity of fertilizer received by farmers. The major constraints were inadequate quantity of fertilizer allocation, late supply of fertilizer and high transaction cost. The success of mobile phone use for accessing fertilizers was achieved to some extent through the subsidy scheme. It was recommended that more redemption centres should be established to reduce cost of procurement and transport of fertilizer; and that agro-dealers should make proper arrangement with fertilizer companies before the cropping season to guard against late supply of fertilizers.

Keywords: Fertilizer distribution, farmers' perception, mobile phone, E-wallet Scheme

Introduction

Agriculture is the basis for human survival; for without it, there is no food for the populace and raw materials for industry. Nigeria is often described as predominantly agricultural, with about 70% of her population engage in agriculture and this sector contributes over 40% to the gross domestic product (Sokoya et al., 2012). Hence, investing more in this sector would enable the country to sufficiently feed its growing population, generate employment, earn foreign exchange, and make raw materials available for industries. This sector has a multiplier effects on the nation's socioeconomic and industrial fabrics because of the multifunctional nature of agriculture (Ogen, 2007).

Root and tuber crops, such as yam, cassava and potato are among the most vital food crops for direct human consumption in Africa. The aggregate value of these crops exceeds all other African staple crops, and is much higher than the value of cereal crops (Nteranya et al., 2015). Nigeria is by far the world's largest producer of yam. According to the International Institute of Tropical Agriculture (IITA), Nigeria accounts for about 70% of the world yam production, which amounts to 17 million tonnes from an area of 2,837,000 hectares. Inputs such as improved seeds, fertilizers, agro-chemicals, machineries, irrigation and extension education play important roles in achieving success in the growth and

development of the agricultural sector (Saleh, 2014). Improved seeds increase the success rate of crop production which eventually results in high crop productivity and profitability. Fertilizer plays an important role in supplying the required nutrients to the soil which helps in boosting plant growth and increasing yield. An increase in the use of these inputs will eminently boost agricultural productivity. However, the average fertilizer usage in Nigeria is 13kg/hectare, compared to the world average of 100kg /hectare and in addition only less than 10% of Nigerian farmers could access improved seeds (International Fertilizer Development Centre, 2013).

Several attempts have been made by the Federal Government of Nigeria (FGN) to improve the agricultural sector through the development of schemes and programmes among which the fertilizer subsidy scheme has been the most persistent of all. The fertilizer subsidy scheme aims at making fertilizer affordable to smallholder farmers in order to increase agricultural productivity and efficiency (World Bank, 2014). However, only 11% of subsidized fertilizer actually gets to the farmers for which it is intended (FMARD, 2012). Adebo (2014) also argued that for many years, the FGN have been procuring and distributing subsidized fertilizer, but no significant increase has been seen in crop production due to inconsistencies in government policy and corruption. The inputs that were meant for the farmers were diverted by political elites to other countries for personal gains (Adesina, 2013). Farmers complain of not getting fertilizers at the required quantity and time. This resulted in a decrease in production and increase in the poverty level of farmers, since land fertility keeps diminishing yearly due to continuous farming activities. Fertilizers meant for farmers are often diverted and sold to middlemen who then sell at higher market prices. This makes them less affordable to small-scale farmers. This has been the trend for several years since the introduction of the subsidy scheme, and therefore affected the growth of agricultural sector and the nation at large.

The foregoing necessitated the introduction of the E- wallet scheme. Moreover, this research was conceived to know the level of the effectiveness of E-wallet scheme on fertilizer distribution to yam farmers in agricultural zone II of Niger State, Nigeria. The specific objectives are to assess the level of accessibility of fertilizer via mobile phone; determine the factors influencing the quantity of fertilizer received by farmers via mobile phone; determine the perception of farmers on the level of effectiveness of fertilizer distribution via mobile phone in the study area and identify the constraints faced by the yam farmers.

Methodology

This study was conducted in Agricultural Zone II of Niger State, Nigeria. The State is located on Latitude 8°22′ to 11°30′ North and Longitude 3°30′ to 7°20′ East. It has a total land area of about 76,481km^2 which represent 8% of the total land area of Nigeria. The mean annual rainfall in the state is 1,350mm with an average temperature of 27^{0}C (Salihu et al., 2017). As at 2006, it has a population of 3.9 million in 2006 and the projected figure of 5.4 million persons in 2016 using growth rate of 3.2 percent (NPC, 2006). The state is divided into three agricultural zones namely; zone I, Zone II and Zone III with Bida, Kuta and Kontagora as their respective headquarters. The major occupation of the people is agriculture with about 85% of the population engaged in farming.

In order to obtain a sample frame for this study, a list of registered yam farmers that participated in the E-wallet scheme was obtained from Niger State Agricultural Mechanization and Development Agency (NAMDA). Multi-stage sampling technique was used in selecting respondents for this study. The first stage involved a purposive selection of three Local Government Areas (LGA) of the state that are prominently known for

yam production. The second involved a purposive selection of one extension block from each local government noted for yam production. The third stage involved a random selection of three extension cells from each extension blocks which gives a total of nine extension cells. The last stage was proportionate selection of 10% from the list of registered yam farmers from each selected cell which gave a total of 163 respondents. Data were collected with a structured questionnaire and interview schedule and were analysed in percentages, frequency distribution, mean and ordinary least square. The level of accessibility of fertilizer via mobile phone was determined by categorizing the number of bags of fertilizer received by the farmers in this order: 0 bag of fertilizer = non; 1–2 bags of fertilizer = low level of accessibility; 3– 4 bags of fertilizer = moderate level of accessibility and 5–6 bags =high level of accessibility.

A 5-point Likert rating scale of Strongly Agree (SA) = 5, Agree (A) = 4, Undecided (U) = 3, Disagree (D) = 2 and Strongly Disagree (SD) = 1 was used to determine the perception of farmers on the level of effectiveness of fertilizer distribution via mobile phone. Perception with mean ($\overline{X}$) scores ≥ 3.0 indicates favourable perception, while scores < 3.0 indicates unfavourable perception. Also a 3-point Likert rating scale of Very Serious (VS) = 3, Serious (S) = 2 and Not Serious (NS) = 1 was employed to identify the level of constraints faced by yam farmers in accessing fertilizer via mobile phone in the study area. The constraints with mean ($\overline{X}$) scores ≥ 2.0 indicate serious problem, while those below the mean scores were considered not serious.

OLS was used to determine the factors influencing the quantity of fertilizer received by farmers via mobile phone. The implicit form of the model used was stated as:

$$Y_i^* = X_i\beta + \varepsilon_i$$

The explicit form of the model was expressed as:

$$Y_i^* = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \ldots + \beta_9 X_9 + \varepsilon_i \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where Y_i^*= quantity of fertilizer (kg), X_1 = years of education (years), X_2 = farm size (in hectares), X_3 = access to extension service (dummy), X_4 = farming experience (years), X_5 = distance to redemption centre (in kilometres), X_6 = cooperative member (dummy), X_7 = years of registration (years), X_8 = major occupation (in number) and X_9 =fertilizer affordability (dummy).

Results and Discussion

Socioeconomic characteristics of respondents

The findings in Table 1 show that majority (97.55%) of the respondents were male, while 2.45% were females. This implies that males are the dominant farmers in the study area perhaps due to the strenuous nature of farm work especially yam farming which demands much physical energy. Similarly, the dominance of male in the area with regard to E-wallet fertilizer distribution implies that the usage of ICT such as mobile phone is low among the female fork. This may be as a result of low knowledge on the technicalities associated with the use of mobile phone among rural women. This finding agree with the work of Yusuf et al. (2015) and Fadairo et al. (2015) in a research carried out in Kano state and Oke-Ogun area of Oyo state respectively, who reported that male participation in agricultural production is more pronounced than that of female. This may be as a result of high energy demanding of farm works and the influence of cultures and religion.

The results in Table 1 also reveal that majority (86.50%) of the respondents were between the age range of 21 and 50 years. The mean age among the respondents was 36 years. This implies that majority of the yam farmers in the study area were within the youthful age group regarded as active workforce age. People in that age grade are often productive, economically active and innovative in agricultural production (Akinbile et al., 2014).

Educational status refers to the level individuals have attained in acquiring knowledge through training, teaching and learning processes. The results in Table 1 show the educational level of the respondents. Close to half (47.23%) had formal education while 19.63% had no formal education. This implies that considerable number of the respondents had formal education which could enhance adoption of new agricultural technologies and the more educated they are the easier their ability to handle registration processes and use of mobile phones in assessing information from agro-dealers and redemption centres. The AED (2003) opined that Low literacy rates in many rural areas in the developing world present challenges to the effective use of ICTs in the rural areas. The low level of literacy may have negative effect on the level of understanding the technicalities of mobile phones operation to enhance farmer's efficiency in communication and information exchange that will improve social and economic activities the their area.

Farming experience is the number of years spent in farming. The result presented in Table 1 shows that the average years of farming experience of the respondents was 21 years. It is expected that the more the years spent in farming (yam production), the higher the level of experience and by implication, the greater the ability to handle production problems and effectively utilize farm inputs to enhance output (Yekinni et al., 2008; Augustine and Emmanuel, 2011 and Godson-Ibeji et al., 2016) High farming experience equipped the farmers to learn by mistake thereby, taking account of the benefits or otherwise of utilizing mobile phones as a means of sourcing fertilizer for their yam production enterprise.

Level of access to fertilizer via E-wallet

Figure 1 shows the level of accessibility of fertilizer via mobile phone in the study area. From the result, 36.2% of the respondents who registered for the scheme could not accessed any fertilizer at all. The result also reveals that only 7.98% of the respondents got at least 5-6 bags of fertilizer throughout the period of the subsidy scheme. This implies that the level of accessibility is very low, considering that each farmer is entitled to at least two bags of 50kg fertilizer per cropping season and since the scheme lasted for three years it is expected that each farmer should get at least six bags of fertilizer. The low level of accessibility to fertilizer by the yam farmers in the study is likely to have a negative impact on their farm output. The ability of farmers to use inputs and adopt improved technologies is partly determined by the level of accessibility and affordability of production resources that can be combined to improve their output (Asfaw et al., 2012).

Factors influencing the quantity of fertilizer received by respondents

From the OLS results of the multiple regression in Table 2, the double-log function was the lead and chosen equation based on the number of significant of explanatory variables, R-square (R^2) and F-value. The F-value of 16.04 was found to be significant at 1% level of probability indicating the goodness of fit of the model. The R^2 value was 0.4855 which implies that about 49% variation in the dependent variable (quantity of fertilizer accessed) was explained by the independent variables included in the model, while unaccounted 51% could be due to non-inclusion of some explanatory variables and errors in estimation. The regression results reveal that level of education, farm size, access to extension services, cooperative membership, years of registration, major occupation and fertilizer affordability all had positive coefficient and were significant at 1%, 5%, and 10% probability level respectively. This implies that an increase in any of these independent variables will lead to a corresponding increase in quantity of fertilizer received by the yam farmers. Association to cooperative organisation reduces the bottle neck faced by the farmers in accessing fertilizer as

members share information, cost, risk and registration burden. Thereby, enhancing their chances of commanding greater quantity of fertilizer with relative ease due to combined effort. Likewise, respondents whose major occupation is farming are likely to be commanding larger plots of land which requires higher quantity of fertilizer to sustain production. On the other hand, the coefficient of distance to redemption centre was negative and significant at 5% probability level. This implies that farmers residing closer to the redemption centres are likely to receive sufficient quantity of fertilizer for yam production before farmers leaving far away whom may be restricted by higher cost of transportation or mobilization logistics. In essence, years of education, farm size, access to extension service, cooperative membership, years of registration, major occupation (as farmer) and fertilizer affordability and distance to redemption centre were the significant factors influencing the quantity of fertilizer received by farmers via mobile phone in the study area.

Perception on the effectiveness of fertilizer distribution via E–wallet

Farmers' perception on mobile phone technology is an expression of their feelings on the important attributes of it to serve as a medium for accessing input (fertilizer) and this may influence the level of effectiveness. The results in Table 3 reveal that among the favourable perception with the higher mean scores on motivating attributes influencing the level of effectiveness of fertilizer distribution via mobile phone includes fertilizers are delivered by agro-dealers at half cost to farmers without any demand for hidden charges ($\bar{X} = 4.20$), diversion of fertilizer by political elites have been reduced through the *e-wallet* scheme ($\bar{X} = 4.10$) and the use of e-voucher to redeem fertilizer form agro-dealers enhances efficient and transparent distribution of fertilizer to farmers ($\bar{X} = 4.05$). Other motivating attributes are the introduction of *e-wallet* scheme has greatly enhanced transparency in the purchase and distribution of fertilizers ($\bar{X} = 3.87$), the use of e-voucher to redeem fertilizer from agro-dealers guarantees reduction of corrupt practices faced in the old system ($\bar{X} = 3.81$), more farmers will be involved in *e-wallet* if properly trained in the technicalities ($\bar{X} = 3.80$), *E-wallet* platform has greatly reduce the diversion of fertilizer by different dealers ($\bar{X} = 3.75$), inclusion and registration of farmers at the onset of the scheme was transparent ($\bar{X} = 3.75$). This finding validates the results of Ogunjimi et al. (2015) and Fadairo et al. (2015) who reported that farmers highly perceived the program as being effective because of their good attitudinal disposition towards the scheme, and that e-wallet has been able to address the problems of corruption in the supply of agricultural inputs, thereby achieving one of the main aim why the scheme was launched.

Constraints to fertilizer access via mobile phone

Despite the success recorded, this platform is however not free from of challenges. Table 4 shows the constraints faced by the farmers in using the scheme. These constrains were determine using a 3-point Likert scale to categorize the level of seriousness, and a mean score of 2 was used as the decision rule. The major constraints with weighted mean ≥2.0 includes less quantity of fertilizer allocation (WM=2.68), late supply of fertilizer through the scheme (WM = 2.58), high transaction cost incurred by the farmers (WM=2.39) and difficulty in redeeming fertilizer (WM=2.38). However, inability to operate mobile phone (WM=1.85) and high cost of procurement of mobile phone (WM=1.64) had a weighted mean <2 indicating that the constraints are not serious. The less quantity of fertilizer allocation and late supply of fertilizer through the scheme, might be as a result of the inability on the part of the agro-dealers not been able to supply enough fertilizer at the various redemption centres. Their failure has contributed to the shortage of fertilizer

since they have been vested with the responsibility of making fertilizer available (Adebo, 2014). The high transaction cost incurred by the farmers could be as a result of transportation cost, as some of the redemption centres are not located close to the farmers, and most farmers have to go to the redemption centre several times before getting fertilizer while some end up not getting it. This has discouraged them from going to redeem the fertilizer even after receiving alert to do so. Difficulty in redeeming fertilizer is caused by the long queues and large population seen at various redemption centres. These finding is in consonance with the work of Nwalieji et al. (2015) who reported that the bottleneck in the scheme brings about difficulty in redeeming input.

Conclusion and Recommendations

Despite the limitations, it is evident that mobile phone tend to act as a good conduit for accessing fertilizer with relative ease among smallholder farmers in the study area. And with consistent mobile network and prompt alert to the farmers by the organizers of the scheme mobile phones will have even better benefit on the social and economic status of the rural dwellers. Therefore, there is need for continuity and sustainability of the scheme so that more farmers will be able to benefit from it. However, for effective service delivery, there is need to establish more redemption centres close to the farmers to reduce transportation cost which tend to increase total production cost thereby, limiting the total farm income generated by the farmers. While agro-dealers should make proper arrangement with fertilizer companies before production season to guard against late supply of fertilizer at the redemption centres. This will convince and motivate the farmers to accept the scheme as a reliable means of fertilizer acquisition for their farming enterprise.

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Table 1. Socioeconomic characteristics of the respondents

Variable	*Frequency (n = 163)*	*Percentage*	*Mean*
Sex			
Female	4	2.45	
Male	159	97.55	
Age (Years)			
<21	6	3.68	36.00
21-30	52	31.90	
31-40	50	30.67	
41-50	39	23.93	
Above 50	16	9.82	
Educational level			
Quranic	54	33.13	8.00
Primary education	18	11.04	
Secondary education	30	18.40	
Tertiary education	29	17.76	
No formal education	32	19.63	
Farming experience (Years)			
<11	26	15.95	21.00
11-20	62	38.04	
21-30	36	22.09	
31-40	24	14.72	
41-50	15	9.20	

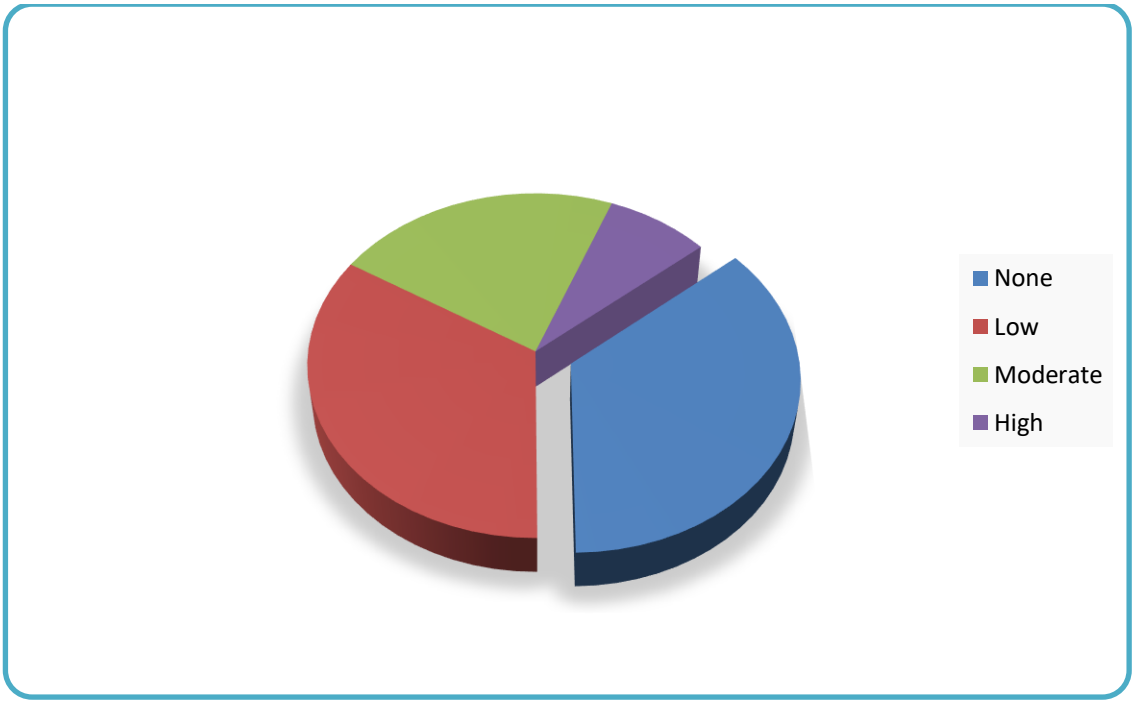

Figure 1: Distribution of respondents according to level of accessibility

Table 2: Result of regression analysis on factors influencing the quantity of fertilizer received by respondents via E – wallet scheme

Variables	*Linear*	*Semi-log*	*Exponential*	*Double-log*
Constant (b_o)	-155.758	-75.85559	-9.959303	-2.271247
	(-4.88)***	(-1.35)	(-6.34)***	(-0.83)
Years of education (X_1)	5.226297	34.63122	0.2641408	1.632533
	(3.50)***	(3.53)***	(3.60)***	(3.42)***
Farm size (X_2)	19.72184	46.48541	1.217959	2.85797
	(3.02)***	(3.63)***	(3.79)***	(4.58)***
Access to extension agent (X_3)	7.766874	7.015652	0.6886627	0.5119481
	(1.70)*	(2.02)**	(3.07)***	(3.03)**
Farming experience (X_4)	1.075747	13.84231	-0.0160612	-0.733655
	(1.82)*	(-1.22)	(-0.55)	(-1.33)
Distance to redemption centre (X_5)	-3.470887	-35.25174	-0.1319115	-1.349715
	(-2.98)***	(-2.68)***	(-2.30)**	(-2.11)**
Cooperative membership (X_6)	23.61137	5.257531	1.564655	0.3565941
	(1.95)*	(2.05)**	(2.63)***	(2.86)***
Years of registration in the participation e – wallet scheme (X_7)	41.69434 (4.55)***	118.446 (4.62)***	1.402824 (3.11)	4.099842 (3.29)***
Major occupation (X_8)	0.0816022	7.41814	0.4548873	1.567621
	(0.01)	(0.62)	(1.60)	(2.69)***
Fertilizer affordability (X_9)	32.239 (2.32)**	6.705554	1.540379	0.2977531
		(2.24)**	(2.25)**	(2.05)**
R-squared	0.3916	0.4129	0.4544	0.4855
Adj.-R-squared	0.3558	0.3784	0.4223	0.4552
F-value	10.94	11.96	14.16	16.04

*** = Significant at 1%, ** = Significant at 5, * = Significant at 10%

Note: Numbers in parenthesis are the respective t – values

Table 3: Farmers perception on the level of effectiveness of *e-wallet* scheme in the procurement of fertilizer

S/N	PERCEPTION STATEMENTS	SA	A	U	D	SD	WS	WM	Remark
1	The introduction of *e-wallet* scheme has greatly enhanced transparency in the purchase and distribution of fertilizers	76(46.63)	39(23.93)	9(5.52)	28(17.18)	11(6.75)	630	3.87 *	Effective
2	*E-wallet* has been very suitable to access fertilizer by farmers	38(23.31)	78(47.85)	7(4.29)	31(19.02)	9(5.52)	594	3.64	Effective
3	*E-wallet* has reduce corruption in the distribution of fertilizers	48(29.45)	68(41.72)	4(2.45)	26(15.95)	17(10.43)	593	3.64	Effective
4	Diversion of fertilizer by political elites have been reduced through the *e-wallet* scheme	59(36.2)	83(50.92)	6(3.68)	9(5.52)	6(7.98)	669	4.10 *	Effective
5	More farmers will be involved in *e-wallet* if properly trained on the technicalities	45(27.61)	72(44.17)	18(11.04)	24(14.72)	4(2.45)	619	3.80 *	Effective
6	*E-wallet* platform has provided a timely access to fertilizers	27(16.56)	38(23.31)	8(4.91)	58(35.58)	32(19.63)	459	2.82	Not effective
7	Fraudulent practices under the old system of fertilizer distribution has been greatly reduced by *e-wallet* scheme	36(22.09)	69(42.33)	8(4.91)	41(25.15)	9(5.52)	571	3.50	Effective
8	Fertilizers are delivered by agro-dealers at half cost to farmers without any demand for hidden charges	71(43.56)	71(43.56)	7(4.29)	10(6.13)	4(2.45)	684	4.20 *	Effective
9	*E-wallet* platform has greatly reduce the diversion of fertilizer by different dealers	47(28.83)	68(41.72)	14(8.59)	29(17.79)	5(3.07)	612	3.75 *	Effective
10	Helpline personnel and redemption supervisors discharge their duty diligently without demand for 'tip-off'	43(26.38)	56(34.36)	20(12.27)	28(17.18)	16(9.82)	571	3.50	Effective
11	Helpline personnel and redemption supervisors sluggishly delay their responsibility when not 'tipped off'	36(22.09)	41(25.15)	17(10.43)	43(26.38)	26(15.95)	507	3.11	Effective
12	The use of e-voucher to redeem fertilizer from agro-dealers guarantees reduction of corrupt practices faced in the old system	60(36.81)	62(38.04)	5(3.07)	22(13.5)	14(8.59)	621	3.81 *	Effective
13	The use of e-voucher to redeem fertilizer form agro-dealers enhances efficient and transparent distribution of fertilizer to farmers	64(39.26)	71(43.56)	6(3.68)	16(9.82)	6(3.68)	660	4.05 *	Effective
14	Farmers gets required quantity of fertilizers sent through e-voucher	40(24.69)	53(32.72)	10(6.17)	30(18.52)	29(17.9)	531	3.26	Effective
15	Fertilizers are distributed to all farmers without preferential treatment	53(32.52)	48(29.45)	13(7.98)	30(18.4)	19(11.66)	575	3.53	Effective
16	The *e-wallet* scheme has led to an increase in production	33(20.25)	44(26.99)	4(2.45)	56(34.36)	26(15.95)	491	3.01	Effective
17	Inclusion and registration of farmers at the onset of the scheme was transparent	45(27.61)	72(33.17)	15(9.2)	22(13.5)	9(5.52)	611	3.75 *	Effective

WM ≥ 3.0 = Motivating attributes (Effective); *Perceived attributes with higher mean scores.
Note: SA-Strongly Agreed; A-Agreed; U-Undecided; D- Disagree; SD-Strongly Disagree; WS: Weighted Sum; WM=Weighted Mean