Original Research Article

Determinants of Perceived Effectiveness of Organic Fertilizer Used by Farmers in Oyo State, Nigeria

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Abstract

The study examined the determinants of the perceived effectiveness of an organic fertilizer used by farmers in Oyo state, Nigeria. A stratified and purposive sampling technique was used to select 110 respondents from three major vegetation zones of the study area. Descriptive statistics were used to present the findings of the study while the Chi-square analysis was used to test the study hypotheses. Data revealed that 77.3% were aware of the organic fertilizer while only 60.0% of those aware made use of the fertilizer. Among the users, 37.3% applied 25 g of the organic fertilizer per crop stand which was largely on maize (92.16%). Average rate of application was 0.40 tons per hectare. Application method was mainly through side dressing (58.82%) and 'dig and cover' (29.41%). Time of application varied from the time of sowing to 4 weeks after planting with the majority of farmers (64.71%) applying at 2 weeks after planting. Interest in the continuous use of the fertilizer was high (62.75%) and the majority of users (52.95%) perceived that the organic fertilizer was effective. Chi-square analysis revealed that the rate and method of application were significantly related to the effectiveness of the fertilizer ($\chi^2 = 15.66, P < 0.05$ and $\chi^2 = 8.79, P < 0.05$, respectively). Rate and method of application are thus significant determinants to fertilizer effectiveness. Extension activity should therefore focus on farmer education to ensure proper use of the organic fertilizer for maximum productivity.

Keywords: Organic fertilizer; utilization; awareness; applications; farmer education.

INTRODUCTION

All over the world, there is a clamour for environment-friendly technique and practice for production activities and more developed countries are also taking bold steps in recycling their waste (Cabinet Office, 2002; Felipo et al., 2004; Mittelstrass, 2005; Grant Conservation District, 2006). With respect to agriculture, inorganic fertilizers which were once thought by agronomists to be the saviour of diminishing fertility of soils have been found to have dangerous effects on the soil, living organisms as well as the environment (United Nations, 1986; Aktar et al., 2009; EPA, 1999).

Many agricultural chemicals have therefore been discouraged and phased out through legislation and other consumer-induced means in the more developed countries (Eldridge, 1995; Alison, 1999; EPA, 1999; Department of Environmental Conservation, 2013). This has led to the phenomenon called organic farming and products, though such products cost more but are in high demand by health-conscious consumers (Fradkin, 1996; Walaga et al., 2005; International Food Policy Research Institute, 2006; Chianu et al., 2012).

In Nigeria, the use of inorganic fertilizers still constitutes about 80% of the input cost of the average farmer, and this has been proven to be unable to sustain continuous cropping at profitable levels in the tropics (NSSP/IFPRI, 2013). The

intense and continuous use of inorganic fertilizer in Nigeria has also contributed to the destruction of the soil structure, leading to depressed yields as a result of soil acidification, potassium deficiency and aluminium toxicity (IFPRI, 2006 NSSP/IFPRI, 2013).

Furthermore, the use of inorganic fertilizer in Nigeria has also been beleaguered with a myriad of problems: distribution (irregularity of supplies, non-uniformity of prices, politicization and diversion of consignment), utilization (improper rate and time of application as well as the use of the inappropriate types), poor quality of end products of some major root crop for which organic fertilizer were applied (yam turning black in storage and not pounding well, low quality of fufu or gari from cassava) and high cost of the fertilizer, which has made it go beyond the financial capacity of most farmers (IFPRI, 2010 NSSP/IFPRI, 2013).

In response to these problems, the Oyo State government of Nigeria, produced the Pacesetter organic fertilizer from market waste, cow dung and abattoir waste. The final product was a dry black substance, a 50kg bag of which cost ₦300 (\$1 = ₦130). With the understanding that farmers have been familiar with inorganic fertilizers and are just being introduced to organic fertilizer, this study was conducted to investigate farmers' usage of the organic fertilizer. This will enable extension package the necessary information on the proper use of organic fertilizers for Nigerian farmers. Specifically, the study examined:

1. The application rate of the organic fertilizer per crop stand,
2. The method of application of the organic fertilizer;
3. The time of application of the organic fertilizer;
4. The types of crops grown with the organic fertilizer and
5. The user-farmers assessment of the organic fertilizer's effectiveness.

Three hypotheses set in a null form were tested in this study at the 0.05 level of significance. They are as follows:

1. There is no significant relationship between the rate of application and assessment of the fertilizer's effectiveness;
2. There is no significant relationship between the method of application and assessment of the fertilizer's effectiveness and
3. There is no significant relationship between the time of application and assessment of the fertilizer's effectiveness.

MATERIALS AND METHODS

The study was carried out in Oyo State of Nigeria. A stratified sampling technique based on the 3 vegetation regions (rainforest, derived savannah and savannah) of the state was used to select 110 farmers with personal farmlands, purposively chosen from areas to which the organic fertilizer was introduced to by the Oyo state agricultural input supply company (OYSAISCO). The farm settlement in Akufo village in Iddo local government area and Ijaiye village in Akinyele local government area were chosen in the rainforest region. The Ogbomoso farm settlement in Ogbomoso south local government area was chosen in the derived savannah region and farmers who purchased the fertilizer from the agricultural development programme in Saki and Igbeti towns were sampled in the savannah region. Thirty users and thirty non users' farmers served by the agricultural development programme of the state were targeted in each region using the snow ball technique since it was an investigative study. However, a response rate of 61% for users of the organic fertilizer was achieved with 8, 23 and 20 respondents from the rainforest, derived savannah and savannah regions respectively. A well-structured interview schedule was used to collect primary data for the study.

Fertilizer application rate was measured by handfuls which were later converted to grams (an average handful of a farmer weighs 100 g). Farmer's perception of fertilizer effectiveness was measured using a five point scale (very effective -5, effective -4, undecided -3, fairly effective -2, and not effective -1). This measure of Farmer's perception of effectiveness was also used by Llewellyn et al. (2004) in their study on farmer's decision to use new technology. The

chi-square analysis was used to test the three hypotheses stated for the study at 0.05 level of significance.

RESULTS AND DISCUSSION

Data in Table 1 revealed that among the farmers interviewed, the majority (77.30%) of them were aware of the organic fertilizer, while 22.70% were not aware. Those who became aware in the first year were the most numerous (47.10%) followed by those who used in the second year (42.40%), third (9.40%) and fourth (1.10%) year. This finding shows that despite the larger percentage of those aware there were still those who had not heard of the fertilizers. Awareness was mainly through the extension agent (48.24%), followed by social groups (24.70%), friends (23.53%) and the radio (3.53%). Among those who heard, sixty percent used the fertilizer. Majority of those who used organic fertilizers (43.14%) did so in the second year of production, with a decline in use in the third year (25.49%) and none in the fourth year. Usage first increased and then dropped sharply after the second year which can be traced to the reduction in number of farmers who were aware of the technology. This might have been as a result of reduced awareness as shown in Table 1 over the years. Therefore, as awareness declined, the number of adopters also dropped. Awareness can thus be implied to play a crucial role in the usage of this technology. The early stabilization of usage may therefore be due to reduction of extension drive in the dissemination of the technology. The majority (84.30%) used the organic fertilizer due to curiosity whereas 15.70% used it because it was cheaper than the inorganic one. Reasons for not using it ranged from unfavourable reports about the organic fertilizer (50.00%) through non-availability (29.14%), preference for inorganic fertilizer (11.76%), bias against fertilizer raw material (5.89%) to little knowledge about the organic fertilizer (2.94%). Most respondents (62.75%) used 1 or 2 bags of the fertilizer followed by 3-4 bags (23.53%). Those who used between 5 and 10 bags were 7.84% whereas only 3.92 percent used above 10 bags.

Application Practices

Table 2 reveals that the most frequently used method is side dressing (58.82%) followed by dig and cover method (29.41%) and broadcasting (11.77%). The time of fertilizer application varied with majority (64.71%) applying 2 weeks after planting followed by 3 weeks after planting (25.49%) and at planting (3.92%) mainly on maize (92.16%) and vegetables (7.84%). The application rate by most of the farmers was a quarter (1/4) handful which is equivalent to 25g (37.25%) followed by a handful equivalent to 100g (33.34%) and half handful (29.41%).

Table 1: Awareness and Use of the Organic Fertilizer

	Variable	Frequency	Cumulative frequency	Percentage
A	Awareness of the Fertilizer			
	Not aware	25		22.70
	Aware	85		77.30
	Total	110		100
B	Year of Awareness			
	Year 1	40	40	47.10
	Year 2	36	76	42.40
	Year 3	8	84	9.40
	Year 4	1	85	1.10
	Total	85		100
C	Usage of Fertilizer			
	Year 1	16	16	31.37
	Year 2	22	38	43.14
	Year 3	13	51	25.49
	Year 4	-	51	-
	Total	51		100
D	Users			
	Heard but not used	34		40.00
	Heard and used	51		60.00
	Total	85		100
E	Sources of Awareness**			
	Friend	20		23.53
	Extension Agent	41		48.24
	Social group	21		24.70
	T.V.	-		-
	Newspaper	-		-
F	Reasons of non-users who heard			
	Unfavourable report	17		50
	Not available	10		29.41
	Satisfied with inorganic fertilizer	4		11.76
	Bias as to its raw materials	2		5.89
	Just heard of it	1		2.94
	Total	34		100
G	Reasons for use			
	Inquisitiveness	43		84.3
	Cheap	8		15.7
	Total	51		100
H	Number of bags (50kg/bag) used	(Mean = 0.40 tons)		
	< 1	1		1.96
	1 – 2	32		62.75
	3 – 4	12		23.53
	5 – 6	2		3.92
	7 – 8	-		-
	9 – 10	2		3.92
	> 10	2		3.92
	Total	51		100

** Multiple responses

Majority (64.71%) used the organic fertilizer on less than one hectare of land followed by those between 1 and 10 hectares (33.33%). Only 1.96 percent used it on over 10 hectares. These facts reveal that the technology was still at

the trial stage of the adoption process as there was a cautious use of the organic fertilizer on their farmlands. More so the characteristics of the technology in that it is bulky may have hindered its use over large farmlands.

Table 2: Distribution of respondents according to use of the pacesetter organic fertilizer

Variable	Frequency	Percentage
A Crops grown with the fertilizer		
Maize	47	92.16
Vegetable	4	7.84
Total	51	100
B Area of land cultivated (ha)		
< 1	33	64.71
1 – 10	17	33.33
>10	1	1.96
Total	51	100
C Application rate/crop stand		
25g	19	37.25
50g	15	29.41
100g	17	33.34
Total	51	100
D Application method		
Side dressing	30	58.82
Dig and cover	15	29.41
Broadcasting	6	11.77
Total	51	100
E Application time		
At planting	2	3.92
A week after planting	1	1.96
A week and half (1 ½) after planting	1	1.96
2 weeks after planting	33	64.71
3 weeks after planting	13	25.49
4 weeks after planting	1	1.96
Total	51	100

Assessment of the fertilizer

The effectiveness of the organic fertilizer was rated high by most of the farmers (52.95%) whereas 29.40 percent rated it as fairly effective and 11.76 percent as not effective (see Table 3). Majority (62.75%) of the current users were willing to continue the use of the fertilizer because it was perceived to be productive (75.00%). Those who were to discontinue use based this on the unproductiveness of the technology.

Test of hypotheses

The first hypothesis tested the relationship between the rate of application and the assessment of the fertilizer's effectiveness. A significant relationship as shown on Table 4 was found to exist between the rate of application and the assessment of the fertilizers effectiveness because the calculated χ^2 value (15.66) was greater than the tabulated χ^2 value (7.88). The null hypothesis is thus rejected and the alternate accepted, indicating a significant relationship between rate of application of organic fertilizer and

Table 3: General assessment of the fertilizer

Variable	Frequency	Percentage
A General assessment of the fertilizer		
Not effective	6	11.76
Fairly effective	15	29.41
Undecided	3	5.88
Effective	19	37.26
Very effective	8	15.69
Total	51	100
B Willingness to continue use		
No	19	37.25
Yes	32	62.75
Total	51	100
C Reasons for wanting to continue the use		
Productive	28	75.00
Cheap	4	25.00
Total	32	100
D Reasons for decision to discontinue the use		
Not productive	19	100
Total	19	100

assessment of fertilizers' effectiveness Government of Alberta (2013).

The second hypothesis also revealed a significant relationship between the method of application and the assessment of the fertilizer's effectiveness as the calculated χ^2 value (8.79) was greater than the tabulated χ^2 value (7.88). The null hypothesis is thus rejected and the alternate accepted, indicating a significant relationship between the method of application and the assessment of the fertilizer's effectiveness. This finding is further corroborated by studies conducted by other researchers (University of Minnesota, 2012; Penn State Extension, 2013) who found that the nature of the fertilizer has implication on the method of application required to make it effective. The third hypothesis tested revealed no significant relationship between the time of application and the assessment of the fertilizers effectiveness as the calculated χ^2 value (7.69) was lesser than the tabulated χ^2 value (7.88). The null hypothesis is therefore accepted. The rates of application of the fertilizer and method of its application have thus been shown to have significant relationship with the effectiveness of the fertilizer Government of Alberta (2013). The contingency coefficient values also showed strong relationships.

In conclusion, the analysis of the data gathered from this survey revealed that this commercially produced organic fertilizer had a favourable assessment from the perception of user farmers and thus it is perceived to be effective. Awareness of the fertilizer had a direct proportional relationship with the use of the fertilizer (IFPRI, 2010). The findings of the study are also consistent with those

Table 4: Chi-square analysis showing the relationship between rate, method and time of application of fertilizer and fertilizer effectiveness

	Calculated χ^2 value	Tabulated df χ^2 value	df	Contingency Coefficient	Decision
Rate of application	15.66	7.88	4	0.48	Reject H_0
Method application	8.79	7.88	4	0.38	Reject H_0
Time of application	7.69	7.88	4	0.36	Accept H_0

of Nzuma and Murwiwa (2000), in a similar study which reported the influence of the rate and method of organic fertilization application on the effectiveness of organic fertilizer. Having found that the rate and method of application had very significant effect on the effectiveness of the fertilizer, more attention should be given to educating farmers on the preferred rate and method of application to ensure effective utilization by plants. This will ensure wider usage when results are evident and greater acceptability of organic fertilizers, leading to regeneration of Nigerian soils, greater productivity and better standard of living for farmers. Agricultural extension agents should also be encouraged to zealously do their work of technology dissemination as awareness was shown to influence usage.

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