GENDER ANALYSIS OF THE INVOLVEMENT OF SMALLHOLDER ARABLE CROP FARMERS IN SOIL FERTILITY MANAGEMENT PRACTICES IN KWARA STATE, NIGERIA

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Abstract

The declining of soil fertility is a fundamental problem to agricultural growth and food production in Nigeria. In this regard, farmers have been involved in different soil fertility management practices to boost their productivity. The study therefore, investigated the involvement of the Male and female genders in soil management practices of arable crops in Kwara state. A structured interview schedule was used to elicit information from 622 arable crop farmers. The data collected were analysed using both descriptive and inferential statistics. The findings of the study revealed that mean age of male farmers was 49 years while that of female farmers was 45 years. 49.8% male and 42.7% female respectively had one form of formal education or the other. Mixed cropping (95.3%) was the most common soil fertility management practices among male farmers while fertilizer application (89.2%) was the most common among the female farmers. Also, a significant difference existed between male and female farmers' level of involvement in soil fertility management practices ($t=0.016$, $p\leq0.05$). The study concluded that male were more involved in soil fertility management practices than their female counterparts. Extension agents should intensify more efforts in soil fertility management delivery services to female farmers to enhance their production capacity.

Keywords: Gender, Involvement, Soil Fertility Management, Farmers

Introduction

Agricultural production is characterized by small farm holdings in the sub-Saharan Africa. They are the major producers of food and their productivity significantly affects food security in many developing countries (FAO, 2004; IFAD, 2011). More than two thirds of the rural populace are smallholder farmers (Dixon *et al*., 2004). They have diverse sources of livelihood such as herding livestock and off-farm activities (Ellis, 2000; FAO, 2011).

The term 'smallholder' refers to limited resource endowments in terms of land, agricultural inputs, and access to markets and institutions. Hence, they are often restricted in their capacity to cope during times of stress, extreme climatic conditions, and food price volatility (Awoke and Okorji, 2004). Despite the availability of arable land mass, Nigeria is still struggling with fundamental issues of food security (Koledoye, *et al*., 2013). The main reason for the land use intensification was and is still the increase in food production required to feed the rapidly growing population. For example, the Nigerian population has increased from 115 million in 1991 to 140 million in 2006 (NPC, 2006). According to World Bank (2015) Nigeria population is estimated at 170 million and due to rapid population growth, soil fertility management in Nigeria is germane to the improvement and conservation of ecological environment, as well as the sustainable development of the agricultural sector and the economy at large. The growing population requires a better agricultural production performance to ensure food security.

Globally, the depletion of natural resources is among the major problems facing human beings. Degraded landscapes, loss of soil fertility, extreme climate, unsustainable agricultural practices and high costs of inputs and lack of support for diversified income sources are all critical problems widely recognized as major factors responsible for declining agricultural productivity and increasing rural poverty (UNEP, 2009). Conventional management practices such as intensive tillage, slash and burn or removal of crop residue often worsened these problems (Shetto *et al*., 2007). Attaining food security and development goals at the household and national levels requires a shift from conventional to more efficient, sustainable and climate resilient food production practices (FAO, 2010).

The declining soil fertility is an obstacle to sustainable productivity improvement of crops and consequently livestock. Studies have shown that land degradation is a serious problem in Sub Saharan Africa; with more than 14% of its total land area

suffering from severe to highly severe degradation (FAO, 2005). The average annual rate of erosion on cropland is estimated to be 42 tons per hectare per year which exceeds the natural soil formation rate of 3-7 tons (Behailu, 2009). Thus, productivity of land is declining because of inappropriate soil fertility management practices and this is causing great challenge in attaining food security in Nigeria. According to Barry and Ejigu (2005), soil is a critically important resource, the efficient management of which is vital for economic growth and development for the production of food, fiber and other necessities. To accommodate the increasing demand for food, its either production per unit area is intensified, or more land must is cultivated. The possible option is intensification of the available cultivable land using appropriate soil fertility management practices and improving agricultural productivity. The practice of continuous cultivation of the same land without appropriate and sufficient management to replenish or maintain nutrients, will further lead to soil degradation and its consequences.

Soil productivity hinges on good soil conditions, energy flow, post-harvest management, fertility and water management and integrated plant nutrition systems (Magen, 2007). Improving soil fertility management among smallholder arable crop farmers is widely recognized as a critical aspect in addressing food security and poverty (Tchale *et al.*, 2004).

Across the globe gender issues have taken a centre stage most especially in the 20th and 21st centuries, where gender participation in agriculture, processing and power and right to agricultural production input has increased significantly in Nigeria. Gender refers to the social construction of what is expected of, allowed, and valued in a man or woman in a given culture, context, time, and/or location. Gender has often been misunderstood as being about the promotion of women only, but it focuses on the relationship between men and women, their roles, access to and control over resources, division of labour and needs. Men and Women are affected differently in their operation in factors like markets and socioeconomic environments. Women are more constrained than their men counterparts in terms of access to credits, agricultural inputs, and information technology and so on. Dimelu *et al.* (2009) reported that women are involved in crop production generally and arable crop production in particular. Gender differences in rural farming households vary widely across cultures but certain features are common since no tasks were gender specific except child bearing (Ekong, 2003). The gender involvement in agriculture and other farming activities in Nigeria have attracted greater attention in recent years. In some states rural women have virtually taken over the production and processing of arable crops (Afolabi, 2008), and are responsible for as much as 80 % of the staple food items. Gender involvement in soil fertility management practices is expected to be different. Though both men and women are playing very important roles within and outside the home, disparities still exists between them in agricultural activities, education, health, employment, income opportunities, control over assets, personal security and participation in the political process (FAO, 2002). There is also a dearth of quantitative and qualitative data on gender involvement in soil fertility management practices in terms of participation and decision making in Kwara state. Hence, *the study investigated the involvement of the Male and female genders in soil management practices of arable crops in Kwara state, Nigeria.*

The specific objectives were to:

(i) ascertain the socioeconomic characteristics of male and female smallholder arable crop farmers;
(ii) identify common soil fertility management practices carried out by the male and female genders =
(iii) Assess their level of involvement of the male and female genders in soil fertility management practices in the study area.

Hypothesis

H_{01}: There is no significant difference between male and female farmers' level of involvement in soil fertility management practices.

Methodology

The study was carried out in Kwara State, Nigeria. Geographically, Kwara State lies between latitude 8^{o} 5^{l} – 10^{o} 4^{l} N and longitude 4^{o} 55^{l} – 6^{o} 5^{l} E. It covers an estimated land area of 32,500 km (KWADP, 2012) and has a population of about 2.5 million inhabitants. The state is made up of sixteen (16) Local Government Areas. It shares boundary with Niger, Oyo, Kogi and Osun States and the Republic of Benin. Also, it's described as a tropical climate characterized by double rainfall maxima and has tropical wet and dry climate (Olanrewaju, 2009). The rainy season in the State begins towards the end of March and lasts until early September, while the dry season begins in early October and ends in early March. The temperature of the region is uniformly high and ranges between 25^{0}C and 30^{0}C in the wet season while in the dry season it ranges between 33^{0}C to 34^{0}C. The daytimes are sunny and the sun shines brightly for about 6.5 to 7.7 hours daily from November to May (NBS, 2010). The geology of the

study area consists of Precambrian basement complex rock. The elevation on the western side varies from 273m to 333m above sea level while on the Eastern side; it varies from 273m to 364m. The state has an estimated figure of 260,528 farm families with majority of the farm families living in the rural areas (KWADP, 2012). The state is grouped by Kwara State Agricultural Development Project (KWADP) into four Zones; Zone A has its headquarters in Kaiama while the Zonal headquarters of Zone B is at Patigi. Zone C and D have their headquarters at Malete and Igbaja respectively.

Data for the study were obtained using a three stage random sampling technique. The First stage involves purposive selection of all the four (4) ADP Zones in the state. The second stage involves a purposive selection of t 8 communities from each ADP Zone. The third stage involves a proportionate random selection of 0.35% of male and female farmers from each community from the list of contact farmers of Kwara ADP. Thus, a total of 650 respondents (329 male and 321) were selected for the study. However, the responses from six hundred and twenty two (622 = 317 male and 305 female) farmers were found useful for the study.

Data were collected on the socio-economic characteristics of smallholder arable crop farmers, the common soil fertility management practices carried out by the farmers and their level of involvement in soil fertility management practices. These variables were measured as follows:

Level of involvement of male and female farmers in soil fertility management practices: Respondents were presented with a list of soil fertility management practices and were asked to rate them on the basis of a 4-point likert scale of fully involved (4), moderately involved (3), Less involved (2) and Not involved (1).

These soil fertility management practices are as follows:

Mulching	Bush fallowing
Mixed cropping	Cover cropping
Organic manuring	Use of inorganic fertilizer
Shifting cultivation	Conservative tillage
Crop rotation	Tree planting
Ridging across the slope	

In calculating the level of involvement of male and female farmers in soil fertility management practices the mid-point values of the scale (1+2+3+4) was added up to get 10. The total was later divided by 4 to obtain 2.5 which is the mean value. The mean for each level of involvement in soil fertility management practices were obtained by multiplying the point scale by the number of respondents in each scale. Any response with a mean score of above 2.5 is considered as full involvement, any mean score equal to 2.5 is considered medium involvement while any mean score lower than 2.5 is considered as low involvement. i.e. Analysis of the 4-point Likert scale rating was computed using the following formula:

i. $X_{lsp} = \frac{\sum(LSP)}{Nlsp}$

ii. $X_{ws} = \frac{\sum(F_x LSP)}{n}$

Where: X_{lsp} = Mean of likert scale points
X_{ws} = Mean of weighted score
LSP = Likert scale points (1,2,3 and 4)
N*lsp* = Number of likert scale points (4)

For this study the following benchmark was set
If $X_{ws} < X_{lsp}$: Low involvement
If $X_{ws} = X_{lsp}$: Medium involvement
If $X_{ws} > X_{lsp}$: Full involvement

Soil fertility management practices used by gender: A series of soil fertility management practices were presented to the respondents and they were asked to rate these practices on a scale of Used (1), Not used (0).

The data were analysed using descriptive statistics such as frequency counts, percentages, mean scores, and standard deviation, while independent sample t-test was used to test the hypothesis.

Analytical Techniques
Student's t-test:
An independent sample t-test was used to compare the mean of male and female farmers based on their involvement in soil fertility management practices. The model is expressed as follows:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{S_1^2}{N_1} + \frac{S_2^2}{N_2}}}$$

Where $\bar{X}_1$ = the mean of group 1 (male)
$\bar{X}_2$ = the mean of group 2 (female)
N_1 = Number of subjects in group 1 (male)
N_2 = Number of subjects in group 2 (female)
S_1^2 = Variance of group 1(male) = $\frac{\sum(X_1 - \bar{X}_1)}{n_1}$
S_2^2 = Variance of group 2 (female) = $\frac{\sum(X_2 - \bar{X}_2)}{n_2}$

Results and Discussion

Socioeconomic Characteristics of the Respondents

Table 1 revealed that the mean age of the male respondents was 49.5±9.38 years while that of the female respondents was 45.4±8.17 years. The majority (97.8% and 76.7%) of male and female respondents were married, while a very few percentages (1.3%) (1.6%), (0.9% and 21.6%) of the male and female genders respectively were single and divorced. It indicates that most of the smallholder arable crop farmers in Kwara State were married. This is because marriage commits individuals to directly engage in productive farming to raise enough crop produce for domestic use and for sale to meet other cash needs. This finding is similar to findings of Odusina and George, (2008) and Daudu, *et al.* (2015) who reported that married household heads tended to be more involved in agriculture. About 50.2% and 57.3% of male and female respondents had no formal education. Over half (50.2% and 57.3%) of the male and female genders did not receive any formal education. Though, the male farmers were older than their female counterparts, both of them were still within their active age and are expected to be strong and energetic and thus, make positive contribution to agricultural production. Also, the percentage of the male respondents with higher education was higher than the females, there is a slight difference between the educational status of the male and female genders.

The low educational status of the respondents might have a negative effect on the adoption of improved soil management practices.

Also, the majority (52.4%) of male and (64.6%) female respondents fall between 6 and 10 household sizes, an indication of large family. This suggests that, male headed household will have comparative advantage of family labour than their female headed household when carrying out farming operation. The mean farm size for male respondents was 6.2±4.22 while that of their female counterpart was 3.4±1.82 (Table 1). It shows that that the farm size of the male smallholder arable crop farmers was greater than that of their female counterparts. Also, 73.2% and 75.8% of the male and female respondents had above ten years of farming experiences, the higher farming experiences of both the male and female genders is expected to translate to a better knowledge of effective soil management practices. Also, results in Table 1 the average annual income N416,356 for male respondents and N340,393 for female respondents in the study area. The finding shows that male respondents had higher annual income than their female counterpart in terms of farming business in the study area. The implication is that male farmers would have more income to exploit different soil fertility management in order to improve their agricultural productivity.

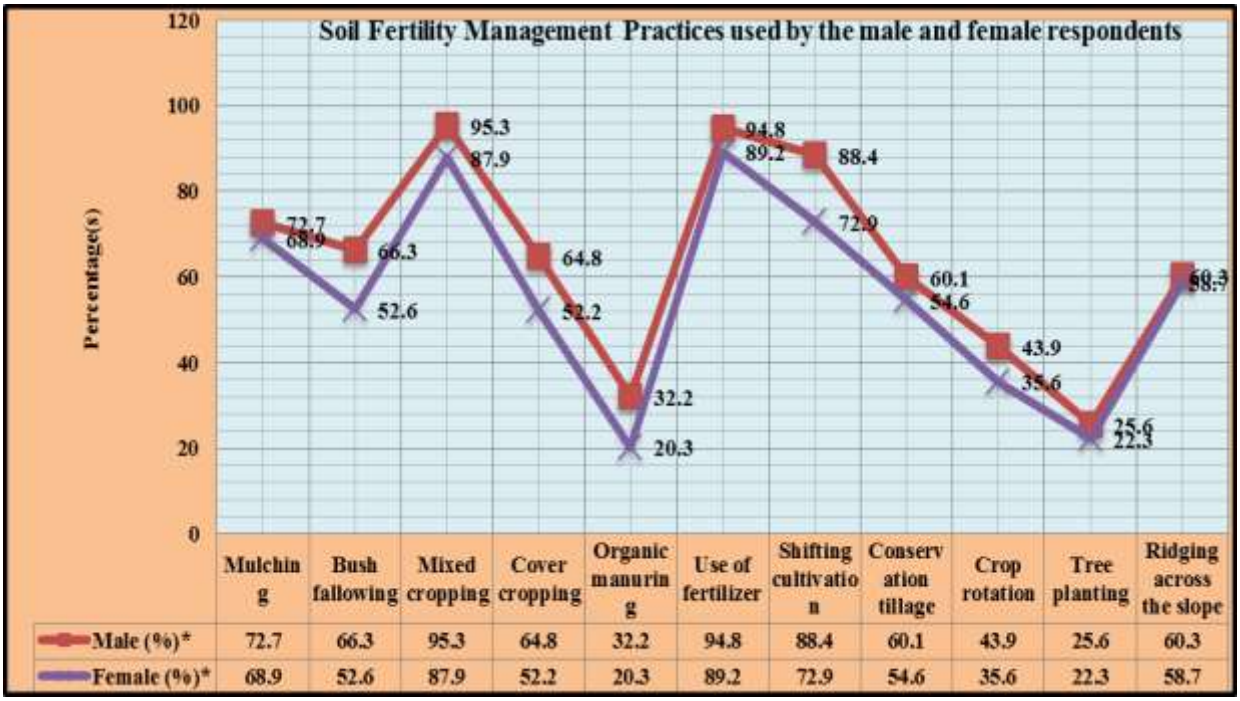
Table 1: Socio-economic characteristics of respondents

Variable		Male				Female			
		(f)	(%)	Mean	SD	(f)	(%)	Mean	SD
Marital status	Single	7	2.2			71	23.2		
	Married	310	97.8			234	76.7		
Education	No formal	116	36.6			123	40.3		
	Primary	85	26.8			77	25.2		
	Secondary	79	24.9			64	21		
	Tertiary	37	11.7			41	13.4		
Age	≤ 30	6	1.9	49.5	9.4	16	5.2	45.4	8.2
	31 – 50	201	63.4			228	74.8		
	≥ 51	110	34.7			61	20		
Household size	≤ 5	52	16.4	9.8	4.7	81	26.6	7.2	3
	6 – 10	166	52.4			197	64.6		
	11 – 15	71	22.4			25	8.2		
	≥ 16	28	8.8			2	0.6		
Farm size	≤ 5	187	59	6.2	4.2	281	92.1	3.4	1.8
	6 – 10	92	29			21	6.9		
	≥ 11	38	12			3	1		
Farming experience	0 – 10	19	6	26.2	11.0	51	16.7	20.3	8.4
	11 – 20	131	41.3			160	52.5		
	21 – 30	101	31.9			71	23.3		
	≥ 31	66	20.8			23	7.5		
Annual income	≤ 100,000	53	16.7	416,356		64	21	340,393	
	100,001 - 200,000	66	20.8			121	39.7		
	200,001 - 300,000	69	21.8			54	17.7		
	300,001 - 400,000	84	26.5			38	12.5		
	≥ 31	45	14.2			28	9.1		

Source: Field survey, 2016 SD= Standard Deviation

Soil fertility management practised by male and female respondents

The results in Figure 2 revealed the various common soil fertility management practices being carried out by the respondents in the study area. It was also revealed that about 72.7% and 68.9% of male and female respondents used mulching, 66.3% and 52.6% of male and female respondents respectively used bush fallowing as soil fertility management practices, 95.3% and 87.9% of male and female respondents, respectively used mixed cropping. Also, about 25.6% of male and 22.3% of female respondents' used tree planting and 60.3% and 58.7% of male and female respondents, respectively ridged across the slope direction. The disparities in the use of soil fertility management among the male and female respondents may be associated with the Some male (64.8%) and female (52.2%) practised cover cropping, 32.2% of male and 20.3% of female respondents used organic manuring. Also, about 94.8% and 89.2% of male and female respondents, respectively used fertilizer as soil fertility management practices, 88.4% and 72.9% of male and female respondents practised shifting cultivation. The findings revealed that 60.1% of male and 54.6% of female respondents used soil conservation tillaging, 43.9% and 35.6% of male and female respondents, respectively used crop rotation. tedious activities like tillage operation involve in soil fertility management.



	Mulching	Bush fallowing	Mixed cropping	Cover cropping	Organic manuring	Use of fertilizer	Shifting cultivation	Conservation tillage	Crop rotation	Tree planting	Ridging across the slope
Male (%)*	72.7	66.3	95.3	64.8	32.2	94.8	88.4	60.1	43.9	25.6	60.3
Female (%)*	68.9	52.6	87.9	52.2	20.3	89.2	72.9	54.6	35.6	22.3	58.7

Fig. 2: Common soil fertility management used by the respondents in the study area
Source: Field survey, 2016
*Multiple responses

3.3. Level of Gender Involvement in Soil Fertility Management Practices

Results in Table 2 revealed the level of involvement of male and female smallholder arable crop farmers in soil fertility management practices in the study area using mean scores and standard deviation to rate the respondents' responses. For the purpose of this study, any mean score of above 2.5 was regarded as "full involvement", mean score of 2.5 was regarded as "medium involvement" while mean score less than 2.5 regarded as "low involvement". Results showed that both male and female respondents were fully involved in mulching as soil fertility management practice with mean score of 3.29±0.89 and 3.17±0.97 respectively. Also, the mean score of male respondents for bush fallowing was 3.00±1.12 while the mean score for female respondents was 2.97±1.07. This suggests that both male and female farmers were fully involved in bush fallowing as soil fertility management practices. Likewise, the mean scores for male and female respondents in mixed cropping, use of fertilizers and shifting cultivation were 3.72±0.66 and 3.19±0.91, 3.35±0.88 and 3.58±0.88, 3.30±0.75 and 3.16±0.87, respectively indicating that both two categories of respondents were fully involved in multiple cropping, inorganic fertilizers and shifting cultivation as soil fertility management practices.

Meanwhile, the mean score of male farmers that involve in cover cropping as soil fertility management practices was 2.99±1.02 while the mean score for female farmers involved in cover cropping as soil fertility management practices was 2.46±1.04. This implies that male farmers had full involvement while female farmers had low involvement level in cover cropping in soil fertility management practices. Results in Table 2 also revealed that the mean score for male respondents in the use of organic manure in managing soil fertility was 2.50±1.19 while that of their female counterpart was 2.50±1.25. This means that both male and female smallholder arable crop farmers were moderately involved in the use of organic manure as soil fertility management practice in the study area. In conservation tillage, the mean score of male respondents was 2.50±0.99 while the mean score for female respondents was 2.44±0.96. This implies that male farmers were fully involved while, the female farmers had low level of involvement in conservation tillage as a soil fertility management practices in the study area.

Further results in Table 2 revealed that the mean score for male respondents in the practise of crop rotation was 2.02±1.00 while the mean score for female respondents was 2.05±1.04. This finding indicates that both male and female farmers had low involvement level in the use crop rotation as a soil fertility management practice. In addition, the mean score of famers that use tree planting was 1.71±0.95 for male respondents while the mean score for female respondents' involved in the tree planting was 1.54±0.80 indicating that both male and female farmers had low involvement level in the use of tree planting as a soil fertility management strategy. Also, male and female respondents had low involvement rate in term of ridging across the slope practice of soil fertility management with mean scores 2.45±1.16 and 2.33±1.03 respectively. This implies that both male and female respondents were categorized under low involvement level in ridging across the slope as a soil fertility management practice in the study area. The findings of this study revealed that male smallholder arable crop farmers were more fully involved in majority of the soil fertility management practices than their female counterpart in the study area. This finding is in agreement with the finding of Koledoye, *et al*. (2013) that men were more involved in soil management practices than their women counterparts in Osun state.

Finally, since male were involved in eight (8) out of eleven (11) soil fertility management practices and female farmer involved in five (5) out of eleven (11) soil fertility management practices. The percentage of male and female respondents' level of involvement in soil fertility management practices were 72.7% and 45.5% respectively. This further suggests that male respondents were more involved in soil fertility management practices than their female counterparts in the study area.

Table 2: Level of male and female involvement in soil fertility management practices in the study area

Soil Fertility Management Practices	**Male Mean (±SD)**	**Rank**	**Decision**	**Female Mean (±SD)**	**Rank**	**Decision**
Mulching	3.29±0.89	4th	Full involvement	3.17±0.97	3rd	Full involvement
Bush fallowing	3.00±1.12	5th	Full involvement	2.97±1.07	5th	Full involvement
Mixed cropping	3.72±0.66	1st	Full involvement	3.19±0.91	2nd	Full involvement
Cover cropping	2.99±1.02	6th	Full involvement	2.46±1.04	7th	Low involvement
Organic manuring	2.50±1.19	7th	Medium involvement	2.50±1.25	6th	Medium involvement
Use of fertilizer	3.35±0.88	2nd	Full involvement	3.58±0.88	1st	Full involvement
Shifting cultivation	3.30±0.75	3rd	Full involvement	3.16±0.87	4th	Full involvement
Conservation tillage	2.50±0.99	7th	Medium involvement	2.43±0.96	8th	Low involvement
Crop rotation	2.02±1.00	10th	Low involvement	2.05±1.04	10th	Low involvement
Tree planting	1.71±0.95	11th	Low involvement	1.54±0.80	11th	Low involvement
Ridging across the slope	2.45±1.16	9th	Low involvement	2.33±1.03	9th	Low involvement

Source: Author's computation, 2016

Bench mark: Mean score = 2.49 and below (Low involvement), mean score = 2.5 (Medium involvement), mean score > 2.5 (Full involvement)

Table 3: Independent sample t-test showing differences in the level of involvement in soil fertility management practices by male and female arable crop farmers

Variables	N	Mean	Standard Deviation	Standard Error	Mean Difference	t-value	*p*-value	Df	Decision
Male	317	3.297	0.897	0.043	0.159	2.418	0.016	620	S
Female	305	3.138	0.740	0.050		2.406			

Significance tested at 0.05 level
Source: Data Analysis, 2016

Table 3, revealed that there was a positive and significant difference between male and female respondents' level of involvement in soil fertility management practices in the study area. The t-test values were 2.418 and 2.406 for male and female respondents respectively at a p-value of 0.016. Also, male respondents had a mean value of 3.297 with standard deviation of 0.897 while female respondents had a mean value of 3.138 and standard deviation of 0.74. These findings suggest that male respondents were more involved in soil fertility management practices than their female counterpart in the study area. This finding corroborates previous findings by Koledoye *et al*. (2013) that male arable crop farmers are more involved in soil fertility management practice than their female counterpart in Osun State, Nigeria. Further result in Table 12 showed that the mean difference for male and female respondents was 0.159 which may be accounted for the significant difference between the two categories of respondents in the involvement in soil fertility management practices in the study area.

Conclusion

Based on the findings of the study, it was concluded that the level of involvement of male and female farmers' in soil fertility management practices was significant with male farmers' being more involved than their female counterparts in all various practices of soil fertility management. Also, there have been poor contacts between the farmers and the extension agents and this reduces the rate of information flow to both categories of farmers and which affects their involvement in these practices. Extension frequency positively and significantly influence the involvement of male and female farmers' in soil fertility management practices, therefore attention should be given to improve extension service by increasing coverage and number of extension workers so that the use of the soil fertility management will be improved at farm level and among the categories of farmers. Farmers too should be encouraged to attend meetings, on-farm demonstrations, trainings and workshops organised by the extension workers for farmers as this will encourage a wider involvement in soil fertility management practices

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