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Gender Perception on Soil Fertility Management Practices among Smallholder Arable Crop Farmers in Kwara State, Nigeria

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Abstract

This study assessed gender perception on soil fertility management practices among smallholder arable crop farmers in Kwara State, Nigeria. A total of 650 arable crop farmers from 8 villages across four zones of Kwara Agricultural Development Programme were selected using a proportionate random sampling method and data were collected through structured interview. Data collected were analysed with using descriptive and inferential statistics and five points, Likert-type response scales were used to measure farmers' perception of the issues. Findings revealed that mean age of the male farmers was 48 years while that of the female farmers was 43 years. Most of the respondents 54.5% male and 63.7% female respectively had no formal education with male (88.6%) and female (79.3%) sourced information through farmers' union. Also majority (96% and 87%) of male and female respondents respectively practised soil fertility management in their farms with both male and female respondents' showed strong positive perception in the use of soil fertility management practices especially in the area of "increased crop yields/food product" (Mean scores 4.56 of male and 4.57 of female), and "Crop rotation helps in weed control" (Mean scores 4.35 of male and 3.73 of female) respectively. The study concluded that the perception of farmers about the benefit of practicing soil fertility management was high in both categories of gender but the perception in male category was higher than their female counterparts. It was therefore recommended that raising awareness of farmers in the low altitude areas about the benefits of improved soil fertility management practices through better field demonstrations by extension agents is highly essential.

Keywords: Perception, Gender, Soil Fertility Management Practices, Farmers

Introduction

Smallholder farming in developing countries is characterized by low productivity as a result of inappropriate agronomic and soil fertility management practices. The declining soil fertility is widely acknowledged as a major biophysical factor limiting agricultural productivity especially in sub-Saharan Africa (Daudu *et al*., 2016). This decline is particularly important in areas where rapid population growth, continuous cropping and restricted use of organic inputs and mineral fertilisers have led to low productivity of the systems (Ojiem, 2006). Soil fertility varies spatially and temporally from field to region scale, and is influenced by both land use and soil management practices of the smallholder farmers (Tittonell *et al.*, 2005). It is reported that differences in fertilization, cropping systems and farming practices are the main factors influencing soil fertility at field scale (Liu *et al.*, 2006).

Understanding variability of soil fertility, its distribution and the causes of the observed variability are important to improve sustainable land use strategies (Jing-wei *et al.*, 2011). Reduced soil fertility is leading to reductions in crop yield, which in turn compromises food security (Sanchez and Swaminathan, 2005). As a result, per capita food output has declined in sub-Saharan Africa and the region has the highest proportion of undernourished people in the world, estimated to be 30% of the total population or 239 million people in 2010 (FAO, 2010). However, in this part of the world, the availability, use and profitability of inorganic fertilizers have been low whereas, there has been intensification of land-use and expansion of crop cultivation to marginal soil. As a result, soil fertility has been declined and it is perceived to be widespread, particularly in sub-Saharan Africa (Belachew and Abera, 2010*).* So, soil fertility maintenance is a major concern in the region to improve agricultural production in order to feed the growing population. Also, inappropriate land use, overgrazing, deforestation and continuous cultivation of the same land without appropriate and sufficient management lead to soil degradation and its consequences like depletion of nutrients and reduction of output (Kebede *et al*., 2013).

Soil fertility management is a combination of all methods of management practices and land use that safeguard the soil against depletion or deterioration by natural or man-induced factors (Acton *et al*., 2013). The soil naturally replenishes itself when used properly. In most societies men and women play distinct roles within the farming household system. Gender differences in rural farming households vary widely across cultures but certain features are common. Women tend to concentrate their agricultural activities around the homestead primarily because of their domestic and reproductive roles. They play a critical role in food production, post harvest activities, livestock care (Akinsanya, 2002). Despite the fact that several studies have looked into the challenges facing men and women in agricultural productivity, the reasons for the relatively low income rates of smallholder farmers are still not fully understood. However, farmer perceptions of soil fertility depletion and soil fertility management problems in the study area have received little emphasis either in status analysis or use in conservation planning. In order to give a viable solution to all above mentioned challenges, farmers' response is very crucial. Generally, the study assessed the gender perception on soil fertility management practices among smallholder arable crop farmers in Kwara State, Nigeria.

Methodology

The study was conducted in Kwara State of Nigeria. Kwara state has a total land area of around 32,500km^2, which is about 3.5% of the total land area of the country, with the land area of 923,768km^2. It's located between latitudes $7^0$45'N and $9^0$30'N of the equator and longitudes $2^0$30'E and $6^0$25'E of the equator. The estimated population of the state is about 2.37 million people out of this figure farmer's

account for about 70%. Analysis of gender distribution shows that about 49.6% of the total population of the state is male while the female is about 50.4% (NBS, 2010). 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. Agriculture is the main stay of the economy and the main crops are: sweet-potato, cassava, yam, cowpea, groundnut, maize, sorghum, wheat, melon, kola nut, shea-nut, tobacco, beni-seed, palm produce, okro, melon, pepper, some leafy vegetables and livestock reared include poultry, goats, sheep and cattle, fishing is also prominent along the lower River Niger Basin.

Two-stage random sampling technique was used to select the respondents. The First stage involves a purposive selection of t 8 communities from each ADP Zone. At second stage 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 but 317 of male and 305 of female were eventually used for the study. Data obtained were analysed with descriptive statistics such as frequency, percentages, mean, standard deviation and charts. Pearson Product Moment Correlation was used to make deductions from the study.

Perceived benefit of farmers' using soil fertility management practices:

Respondents were presented with a list of benefits which may be derived as a result of their involvement in soil fertility management practices and they were asked to rate their perception of these benefits on a 5-point likert scale of Strongly agree (5), Agree (4), Undecided (3), Disagree (2), Strongly disagree (1).

Analytical Tool

Pearson Product Moment Correlation (PPMC) was used to achieve hypothesis of the study.

$$r_{xr} = \frac{n\sum xy - (\sum x)\,(\sum y)}{\sqrt{\{n\sum x^2 - (\sum x)^2\}\{n\sum y^2 - (\sum y)^2\}}}$$

Where r = correlation coefficient
x = independent variables
y = dependent variable
n = total number of observation
$\sum$ = summation

Results and Discussion

Socioeconomic characteristics of the respondents

Results in Figure 1 revealed that majority (94.8% and 80.5%) of male and female respondents were married. This suggest that majority of the smallholder arable crop

farmers in the study area were married. 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. Moreover, further results in Figure 1 revealed that about 54.5% and 63.7% of male and female respondents had no formal education. This implies that there were more non-educated farmers in female category than the male category. This finding suggests that male respondents are more educated with higher education level than their female counterpart in the study area. The implication is that the level of education of farmers may helps in adoption of recommended soil fertility management practices.

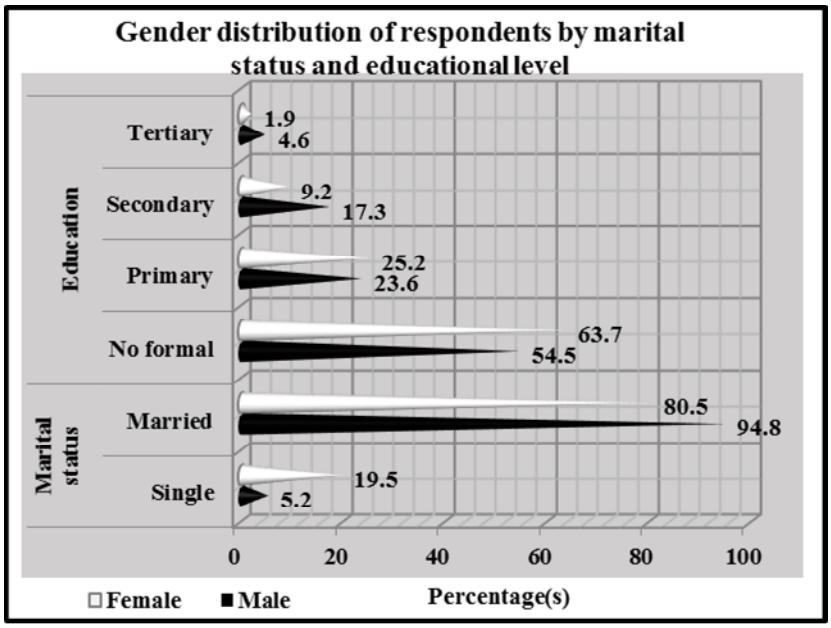

Fig. 1: Gender distribution of the respondents according to marital status and educational level

Source: Field survey (2016)

Results in Table 1 revealed that the mean age of the male respondents was 48.3 years with standard deviation of 7.2 while that of the female respondents was 43.3 years and standard deviation of 6.3. The finding suggests that male farmers were older than their female counterpart but both were still within their active age in the study area. The implication is that most of the farmers are strong and energetic and they were still in their economic active age that can make positive contribution to agricultural production. Also, Table 1 showed that the mean household size of the male respondents was 8.5 with standard deviation of 4 while that of the female counterparts was 6.0 and standard deviation of 2. This suggests that male farmers with large household size would have comparative advantage of family labour than their female counterparts' household when carrying out farming operation.

Table 1: Gender distribution of the respondents according to age and household size

Variable		Male			Female		
		(%)	Mean	SD	(%)	Mean	SD
Age	≤ 30	1.9	**48.3**	**7.2**	5.2	**43.3**	**6.3**
	31 – 50	63.4			74.8		
	≥ 51	34.7			20		
Household size	≤ 5	16.4	**8.5**	**4.0**	26.6	**6**	**2.0**
	6 – 10	52.4			64.6		
	11 – 15	22.4			8.2		
	≥ 16	8.8			0.6		

Source: Field survey, 2016 SD= Standard deviation

The mean farm size for male respondents was 5.5 hectares with standard deviation of 3.1 while the mean farm size of female counterpart was 2.6 hectares and standard deviation 1.2 (Table 2). This suggests that male farmers have farm size larger than their female counterparts in the study area and could be attributed to the fact that female farmers may be engaged in other business that is fetching them extra income. Also, in Table 2 it was revealed that the mean farming experience was 20.5 years with standard deviation of 8.0 for male respondents while female respondents have mean farming experience of 15.3 and standard deviation of 5.5. This suggests that male respondents may be more experienced than their female counterparts in the study area and this could play vital role in adoption of sustainable soil fertility management practices.

Table 2: Gender distribution of respondents according to their farm size and farming experience

Variable		Male			Female		
		(%)	Mean	SD	(%)	Mean	SD
Farm size	≤ 5	37	**5.5**	**3.1**	89.8	**2.6**	**1.2**
	6 – 10	49			10.2		
	≥ 11	14			0		
Farming experience	0 – 10	3	**20.5**	**8.0**	39.5	**15.3**	**5.5**
	11 – 20	54.5			35.0		
	21 – 30	28.9			19.3		
	≥ 31	13.6			6.2		

Source: Field survey, 2016
SD= Standard deviation

Awareness of respondents on Soil Fertility Management Practices by gender

Results of the awareness of soil fertility management practices among the respondents in Figure 2 revealed that majority (91.5% and 86.9%) of male and

female respectively were aware of the soil fertility management practices in the study area while the remaining (8.5% of male and 13.1% of female) respondents was not aware of the soil fertility management practices. From the findings it could be deduced that, there is high level of awareness among the male respondents compare to their female counterparts in the study area. The implication of this is that, male smallholder farmers are likely to perceived and improve on the agriculture and support their livelihoods as a soil fertility management practice strategy is a driving force than their female counterparts. This suggests the existence of other important reasons for practicing and improving agricultural productivity not only focus on technical approaches to increase involvement rates, but also consider social aspects such as perceptions that are equally important in sustainable agriculture.

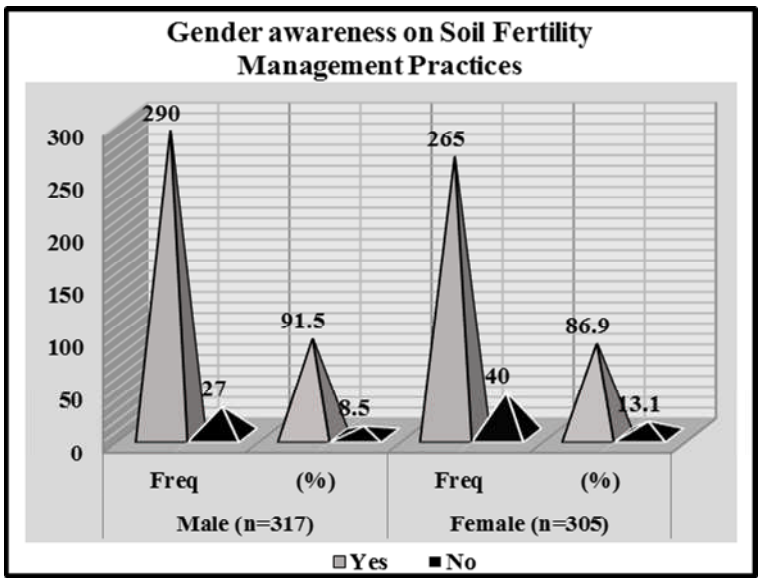

Fig. 2: Gender distribution of respondents' based on their awareness of soil fertility management practices

Source: Field survey, 2016 n=Number of respondents sampled

Sources of extension information on soil fertility management practices

Results in Figure 3 revealed that most (88.6% and 79.3%) of male and female respondents respectively sourced information on soil fertility management practices through Farmers' cooperative group, some male (63.7%) and female (66.9%) sourced information from Friends and Neighbour, 70.3% of male and 61.6% of female sourced information from Extension agents. Moreover, 38.2% of male and 32.8% of female respondents got information on soil fertility management practices during their schooling programme. This confirms that there is high level of education among the male respondents than their female counterparts in the study area. Also, some male (74.1%) and female (70.5%) sourced information from Radio/TV programme while 24.9% and 10.5% of male and female respectively

sourced information from print media. From the findings, information dissemination through Farmers' cooperative union appears to be the most effective means of informing farmers' about soil-fertility management practices in the study area followed by Radio/TV, followed by Friends & Neighbour and others. The implication is that given access to information and appropriate support, can be believed that farmer cooperative groups can effectively organize to produce good results through knowledge implementation and increase productivity and livelihoods amongst its members.

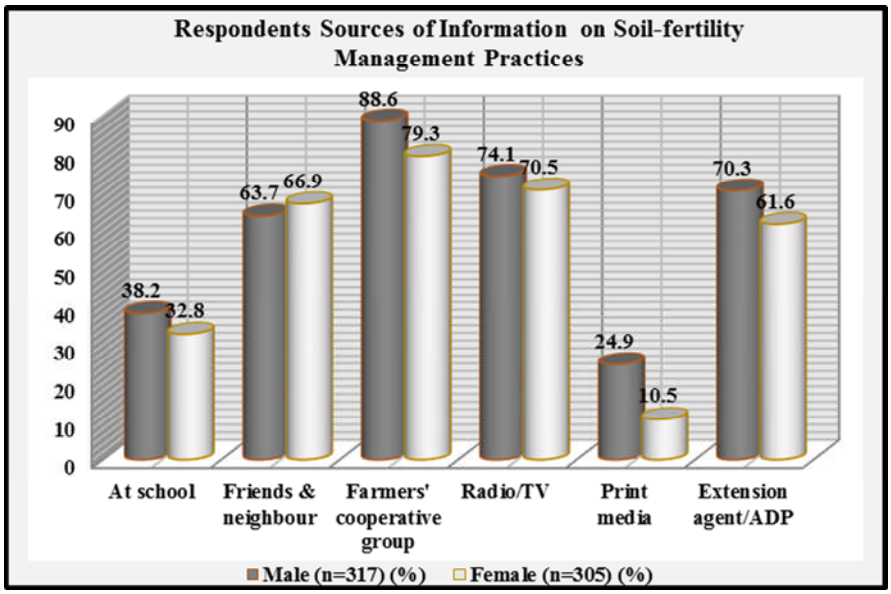

Fig. 3: Distribution of respondents' by sources of information on soil fertility management practices

Source: Field survey, 2016 *Multiple responses, n= Number of respondents sampled

Cropping Systems of Male and Female Farmers

The results in Figure 4 revealed that 12.3% and 17.4% of male and female respondents adopted maize as a sole crop, 13.9% and 22.6% of male and female farmers respectively mixed maize with melon crop. Further results in Figure 5 revealed that 23.0% of male and 7.9% of female respondents followed maize-sorghum intercropping pattern, some male (18.3%) and female (15.7%) farmers mixed cereal with tuber crops (Maize/Cassava) and 15.1% of male and 5.9% of female farmers intercropped sorghum with yam. However, yam intercropped sorghum was the least crops grown/cultivated together by both male and female farmers. The adduced reason for this might be drudgery involved in cultivation of yam. Also, 7.3% and 18.7% of male and female respondents respectively mixed sorghum with melon crop while only 10.1% of male and 11.8% of female intercropped sorghum with cowpea. The intercropping of sorghum crop with

cowpea crop as used by few respondents may be due to the fact that leguminous crops helps in fixing nitrogen to the soil.

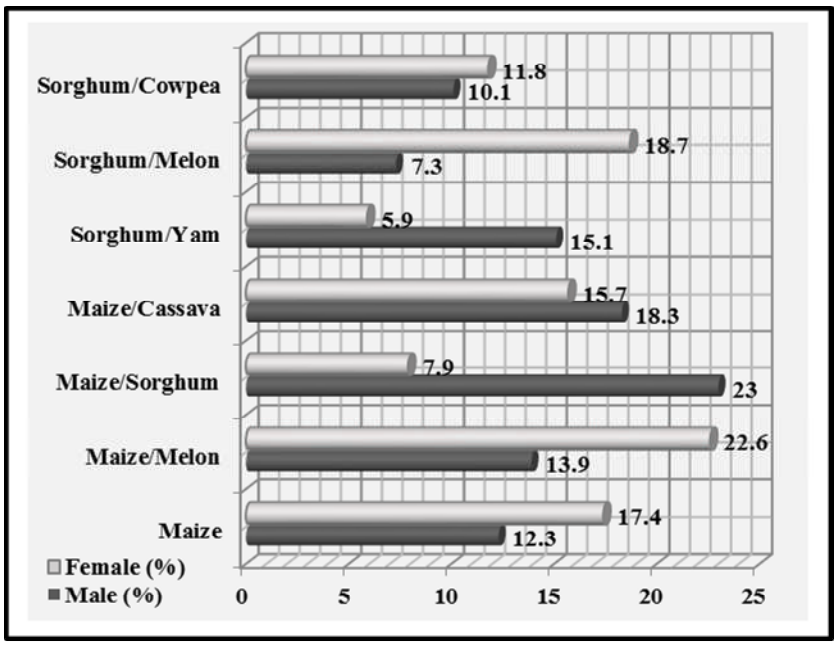

Fig. 4: Gender distribution of respondents according to cropping pattern employed
Source: Field survey, 2016

Soil Fertility Management Practices

Figure 5 revealed that majority (96% and 87%) of male and female respondents respectively practised soil fertility management in their farms while a lesser (4% of male and 13% of female) respondents did not practise soil fertility management in their farms. This implies that there was high level of practices of soil fertility management among the gender which may be due to their high level of awareness of soil fertility management between them through functional cooperative society in the study area.

Perceived benefit of male and female in using soil fertility management

As shown in Table 3, the farmers' (male and female) perceived benefit on their need to be involved in soil fertility management practices was revealed based on their agreement and disagreement with a number of statements. In the two categories of respondents', findings in Table 3 revealed that both male and female respondents' showed strong positive agreement with involvement in soil fertility management practices using beneficial statement such as "Increases crop yields/food product" (Mean scores 4.56 of male and 4.57 of female), "Mulching protects soil fertility" (Mean scores 4.31 of male and 4.32 of female), "Crop rotation helps in weed control" (Mean scores 4.35 of male and 3.73 of female) respectively.

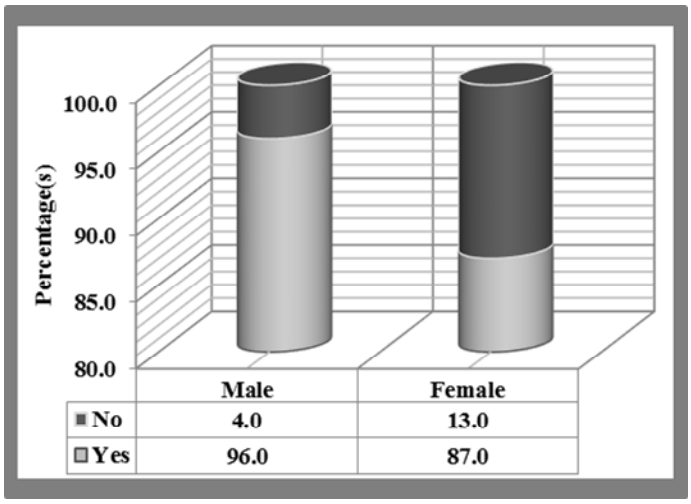

Fig. 5: Gender distribution of respondents according to practise of soil fertility management
Source: Field survey, 2016

Crop rotation makes rational use of the land, assures steady high yields and permits greater diversification. This is because different crops are planted, tilled and harvested at different times and agricultural work is spread out more evenly over the year. These findings tally with those observed by Bagheri (2010) where potato farmers had a positive perception about the role of crop rotation in Ardabil Province of Iran. Table 3 also showed that both male and female farmers strongly have positive perception that soil fertility management practices "Mixed cropping enhance nutrient recycling" (Mean scores 3.10 of male and 3.57 of female), "Cover cropping preserves soil moisture" (Mean scores 4.21 of male and 3.78 of female), "Conservation tillage improve gentle flow of water in soil" (Mean scores 3.85 of male and 4.01 of female), "Ridging across the slope reduce flooding/water runoff" (Mean=3.36), "Tree planting maintains balanced ecosystem" (Mean score 4.04 of male and 3.48 of female) respectively. This implies that they perceived that soil fertility as an important sources of nutrient uptake for plant should be protected both for the present use and for future generations even if this will lead to farmers incurring losses in the short run. These findings tally with those of Rahman (2003). Also, both the male and female respondents were in agreement that "Application of fertilizer reduce risk of crop failure" (Mean scores 4.39 of male and 4.01 of female), "Organic farming leads to reduced cost of production" (Mean score 4.38 of male and 3.46 of female), "Crop rotation and planting of legumes improve soil fertility" (Mean scores 4.29 of male and 3.94 of female) respectively. This planting of legume fixing nitrogen and cover crops also help suppress weeds and reduce insects' pests and diseases.

On other hand both male and female respondents' showed their disagreement with negative statements on the need to be involved in soil fertility management practices. These negative statements include "Conservation tillage operation decreases soil fertility" (Mean score 2.02 of male and 2.21 of female) respondents respectively. The respondents were not sure if conservation tillage would reduce soil erosion, soil disturbance and soil exposure. However, the advantages of conservation or minimum tillage include reduced costs and time, betterment of soil structure and drainage (Hao *et al.,* 2001). Likewise, both male and female were on negative perception that "Green plant residues are useless and hence they should be burned" (Mean score 2.19 of male and 2.10 of female) and "Application of organic manure decrease crop yield" (Mean scores 1.99 of male and 2.15 of female) and "Cover cropping cause soil erosion" (Mean scores 2.13 of male and 2.41 of female) respondents' respectively. This implies that both categories of farmers generally have good perception about soil fertility management practices. The above finding is in line with UNCCD (2009) that maintaining soil fertility is a prerequisite for sustainable agricultural and land management practices. Sustainable land management has great potential for preservation and enhancement of ecosystem services in all land use systems. Sustainable land management limits soil degradation, water and vegetation depletion.

Table 3: Respondents' Perceived benefits of male and female involvement in soil fertility management practices

Perceived benefits of Soil Fertility Management Practices	**Male (%)**						**Female (%)**					
	SA	**A**	**U**	**D**	**SD**	**Mean**	**SA**	**A**	**U**	**D**	**SD**	**Mean**
Increases crop yields/food product	63.4	29	7.6	0	0	4.56	63.6	30.5	5.2	1	0	4.57
Mulching protects soil fertility	39.7	51.7	8.5	0	0	4.31	40	52.5	6.9	0.7	0	4.32
Crop rotation helps in weed control	43.8	48.6	6.3	1.3	0	4.35	32.5	56.1	9.5	2	0	4.19
Mixed cropping enhance nutrient recycling	21.8	34.7	37	4.4	1.9	3.1	19.3	39.7	37.4	2.3	1.3	3.73
Cover cropping preserves soil moisture	60.6	30.5	8.2	1	0	4.21	43.6	30.4	15.2	6.1	4.7	3.57
Conservation tillage operation decreases soil fertility (n*)	2.1	0.7	8.6	48.4	43.3	2.02	0.7	2.1	20.3	34.4	42.5	2.21
Green plant residues are useless & hence they should be burnt (n*)	0	12	9.5	44.1	34.5	2.19	5.3	6.6	11.1	43.8	33.2	2.1
Conservation tillage improve gentle flow of	20.3	38.5	35.4	4.3	1.5	3.85	18.1	39.7	35.4	4.3	2.5	3.78

water in soil												
Ridging across slope reduce flooding /water runoff	39.2	30.1	19.3	9.3	2.1	3.36	37.5	47.6	9.5	5	0.3	4.01
Application of organic manure decrease crop yield (n*)	0	5.5	24.6	28.6	41.3	1.99	2.1	5.3	13.3	35.7	44.5	2.15
Tree planting maintains balanced ecosystem	36.7	48.7	9.5	5	0	4.04	35.8	28.4	26.3	6.4	2.9	3.48
Application of fertilizer reduce risk crop failure	41.6	38.6	15.3	2.3	2.2	4.39	33.5	44.6	16.3	5.3	0.5	4.01
Bush fallowing cause soil erosion (n*)	1.9	6.4	27.1	32.6	31.8	2.13	1.6	9.4	22.8	32.3	35.7	2.41
Organic farming leads to reduced cost of production	52.2	40.3	6.9	0.7	0	4.38	37.3	28.5	24.6	5.5	4.1	3.46
Crop rotation improve soil fertility	42.5	36.1	19.4	2	0	4.29	35.2	40.7	12.5	10	1.5	3.94

Source: Field survey, 2016
Keys: SA= Strongly agree, A= Agree, U= Undecided, D= Disagree, SD= Strongly disagree
(n*) = Negative statement

Table 4 revealed that in male category only farm size (r=0.132, p= 0.000) was significant and positive at 1%. The implication is that male respondents' with large farm size will perceive more benefit of soil fertility management practices than those with small farm size. In the female category, education, household size and farm size were significant at 1% level suggesting that these variables would have influence on the perception of female farmers positively.

Table 4: Results of correlation analysis showing the relationship between some selected socioeconomic characteristics of male and female farmers' and their perceived benefit of using soil fertility management

Male		**Variables**	**Female**	
r-value	**p-value**		**r-value**	**p-value**
0.065	0.248	Age	0.050	0.344
0.074	0.172	Education	0.154**	0.001
0.064	0.553	Household size	0.073**	0.000
0.132**	0.000	Farm size	0.161**	0.002

** Correlation significant at 0.01 level (2-tailed)
Source: Data Analysis (2016)

Conclusion

In conclusion, the perception of farmers about the benefit of practicing soil fertility management was high in both categories of gender but the perception in male

category was high than their female counterparts. The study has identified different sources of extension information exploit by male and female farmers in the study areas including extension agents, friends and neighbour, farmers cooperative union, radio/television, print media and at school. Farmers' education, household size and farm size had significant positive influence on farmers' perception on the use of soil fertility management. Accordingly, raising the awareness of farmers in the low altitude areas about the benefits of improved soil fertility management practices through better field demonstrations by extension agents needs to be emphasized. Also efforts have to be made to improve the level of education of both categories of farmers for improved use of soil fertility management practices.

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