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UTILIZATION OF SOIL FERTILITY MANAGEMENT PRACTICES AMONG ARABLE CROP FARMERS IN OSUN STATE, NIGERIA

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Abstract. This study examined the utilization of soil fertility management practices (SFMPs) among arable crop farmers in Osun state, Nigeria. Multistage sampling was used to select 160 arable crop farmers. Data were collected using a well-structured interview schedule and analyzed using descriptive statistics and Person Product Moment Correlation (PPMC). The results revealed that the majority of the farmers are married males, mostly aged 51 years old, with an average farm size of 2.6ha, and mainly growing maize (96.9%), cassava (91.9%) and yam (68.1%). The respondents use cultural methods, synthetic fertilizers and organic manure in that order as SFMPs. SFMPs are used at the following levels: cultural methods: ridging across the slope with a weighted mean score (WMS) of 2.81, rotational cropping (WMS = 2.66) and mulching (WMS = 2.47); synthetic fertilizers: NPK (WMS = 1.75) and urea (WMS = 1.27); organic manure: poultry manure (WMS = 0.77) and animal dung (WMS = 0.76). The major source of information for SFMPs was radio (95.6%). PPMC analysis showed that age ($r = 0.20$*; $p = 0.01$) and farm size ($r = 0.16$*; $p = 0.04$) are significantly related to the utilisation of SFMPs. In conclusion, the respondents were small scale farmers who mostly utilize cultural methods of SFMPs and are mainly influenced by crop type as a function of age and farm size.

Keywords: arable crop farmers, soil fertility management, socio-economic, information

INTRODUCTION

Arable crop production has remained a major component of all crop production activities in the agricultural subsector. Kindly delete 'including a large array of arable crops' These crops can be classified as cereals, legumes, roots and tubers, as well as horticultural crops. These crops are major sources of staple foods for people across the globe. A reduction in arable production will lead to a hike in the prices of available products and subsequently hunger and malnutrition. These crops differ in their soil and nutrient requirements (Adewumi et al., 2019).

Soil fertility is managed to conserve agricultural land and food security. Sustaining soil fertility and food security cannot be separated. The decrease in soil fertility is furthermore aggravated by continuous cropping, which results in nutrient depletion in the soil. As the human population increases, the indigenous farming system, such as shifting and fallowing, that used to be practiced by farmers to ensure soil fertility is being discontinued to continuously feed a large number of people (FAO, 2013).

Farmers use different methods to evaluate and identify their soils as fertile or infertile using soil colour, soil texture, depth, drainage and topography (Gebeyaw, 2015). The indigenous knowledge commonly used by farmers involves leaving of crop residues on the field.

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This is an organic matter management system. Some farmers apply animal waste or manure to their fields. Nutrient management is a vital factor for achieving the expected yield in arable crop production through the use of fertilizers, which is the major contributor to increasing productivity (Khoshgoftarmanesh and Eshghizadeh, 2011).

Xiaoying and Shubo (2015) reported that there is a transition in fertilizer application behaviour such that farmers now apply more fertilizers because of soil fertility decline and the desire to increase crop yield and density with the general use of chemical fertilizers instead of organic ones like animal manure and plant materials. However, this may not be true for different locations, thus the need to research the utilisation of SFMPs in Osun state.

Achieving the objective of this study combined the following tasks:

i. examination of the socio-economic characteristics of the respondents;
ii. identification of the arable crops cultivated by the respondents;
iii. identification of the various types of SFMPs used by the respondents as soil improvement strategies;
iv. identification of the level of utilization of SFMPs;
v. identification of the various sources of agricultural information on SFMPs.

Hypothesis of the study

The hypothesis was stated in a null form:

Ho_1: There is no significant relationship between the selected socio-economic characteristics of the respondents and the level of utilization of SFMPs.

MATERIALS AND METHODS

Procedure and sample size

The population of this study included all arable crop farmers in Osun state in the southwest of Nigeria. However, a multistage sampling technique was used to select the arable crop farmers across the state. The Osun State Agricultural Development Programme (OSADEP) has three agricultural zones (Ife/Ijesa, Iwo and Osogbo) with varying numbers of extension blocks. A random selection of two (2) extension blocks was made from each selected agricultural zone. Oriade, Obokun and Irewole were selected from Ife/Ijesa, while Iwo and Ola-Oluwa were selected from the Iwo Agricultural Zone. The next stage involved another random selection: three (3) extension cells from each selected extension block. The extension cells were selected based on the arable crop farmer's dominance and their involvement in arable crop farming. Furthermore, 30% of the farmers were randomly selected in each of the extension cells across the selected extension blocks that were used for this research work. The total number of respondents selected in Osun state was one hundred and sixty. Questionnaires and scheduled interviews were used to get information from the farmers.

Method of data analysis

The data for this study were analyzed by using descriptive and inferential statistics. The descriptive statistics included frequency count, percentages, mean, standard and weighted mean score, while the inferential statistics employed Pearson Product Moment Correlation (PPMC) to test the hypotheses.

RESULTS AND DISCUSSION

Respondents' socio-economic characteristics

Figure 1 shows the respondents' socio-economic characteristics.

Age of the respondents: About 33.5% of the farmers are aged between 41–50, 33.8% are between 51 and 60, 18.4% are above 60, 7.6% are between 31 and 40, 7.0% are between 21 and 30, while 0.6% are 20 or less. The farmers' mean age is 51.2. This reveals that most of the respondents are aged between 41–60. Igbalajobi et al. (2013) noted that Nigerian arable crop farmers are ageing. This is similar to the report of Adeola et al. (2014), who found that the average age of the farmers in southwestern Nigeria was 49.3%. This conforms with the report of John (2012) and Mahapatra (2019) that the average age of an Indian farmer is 50.1, while that of a US farmer is 58 (Zuluf, 2020), that of a Japanese farmer is 67, and that of a European farmer is more than 65. Ng'ombe et al. (2014) argued that age significantly influences perception and farmers' knowledge.

Sex of the respondents: Figure 1 shows the distribution of the respondents' sex. 72.2% of the respondents were male, and 28.7% were female. This study reveals that there is a dominance of male farmers in arable crop farming in the selected states, which could be attributed to the energy-demanding activities involved. Amanze et al. (2012) found that men participate more actively

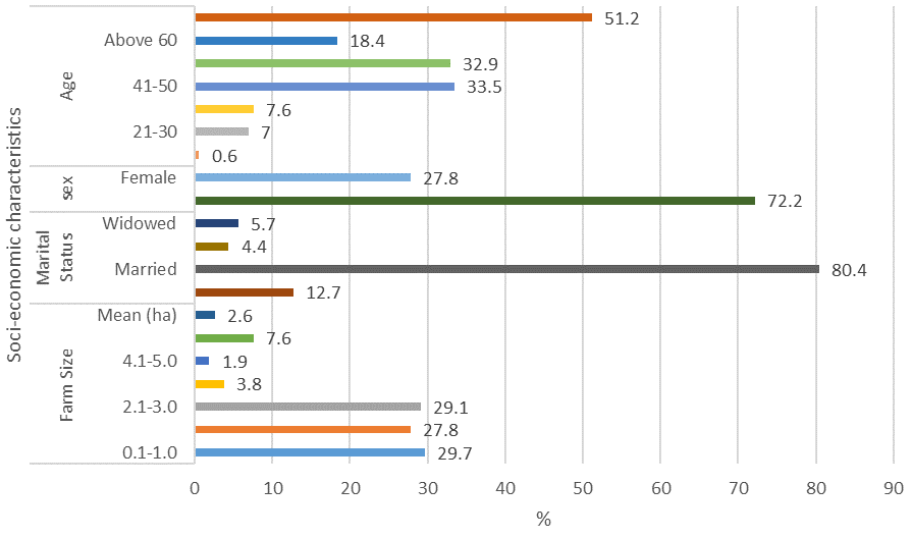

Fig. 1. Socio-economic characteristics of arable crop farmers
Source: field survey, 2021.

in arable crop farming than women, and Orifah et al. (2018) also observed that the dominance of males in farming could be a reflection of traditional restrictions placed on women which limit their right to own land and input resources in the study areas.

Marital status of the respondents: The respondents' marital status revealed that 12.7% are single, 80.4% are married, 4.4% are divorced, and 5.7% are widowed. This result shows that more than 80% are married. Ojediran et al. (2020b) suggested that marriage encourages people to explicitly focus on high-yielding activities such as farming to produce enough crops for domestic consumption and sales to satisfy other cash needs. The views of married people are respected within the rural communities (Ogunsumi, 2010; Adeola et al., 2017).

Distribution of the respondents by farm size: The distribution shows that about 29.7% have a farm size between 0.1–1 ha, about 27.8% have between 1.1–2.0 ha, 29.1% have between 2.1–3.0 ha, 3.8% have 3.1–4.0 ha, 1.9% have 4.1–5.0 ha, 7.6% have more than 5 ha, and the average farm size cultivated by the respondents is 2.6 ha. Adeola et al. (2017) also established that the average farm size used for cassava cultivation in Oyo State was 2 hectares. This result shows that arable farmers in southwestern Nigeria are small scale farmers and this could lead to more intensive and efficient use of land resources. Kassie et al. (2015) revealed that small landowner farmers in rural Tanzania were more liable to adopt intercropping, chemical fertilizers and conservation tillage as their integrated soil fertility management practices.

Arable crops cultivated by the respondents

The distribution of arable crops cultivated by the respondents is shown in Fig. 2. The respondents planted maize (96.6%), cassava (91.9%), yam (68.1%), cowpea (33.1%), okro (25.6%), cocoyam (25.6%), Pigeon pea (2.5%), pepper (20.0%), melon (18.1%), potatoes (12.5%), tomatoes (8.9%) and soybean (6.3%). This shows that most of the farmers cultivate cassava, maize and yam. This is in line with the work of Adeola and Adetumbi (2015), who found that most of the farmers in southwestern Nigeria plant maize and cassava.

Types of SFMPs employed by the farmers

Figure 3 shows the types of SFMPs employed by the farmers. In Osun, 30.0% used animal dung, poultry manure was used by 48.7%, 2.5% of the respondents reported the use of compost, and green manure was used by 33.1%. This reveals that the organic manure used most by the respondents is poultry manure, followed by green manure and animal dung. This is comparable to an investigation by Adeniran et al. (2017), who reported that poultry manure and cattle dung are the most common organic manures used among maize farmers in Ido, Oyo State.

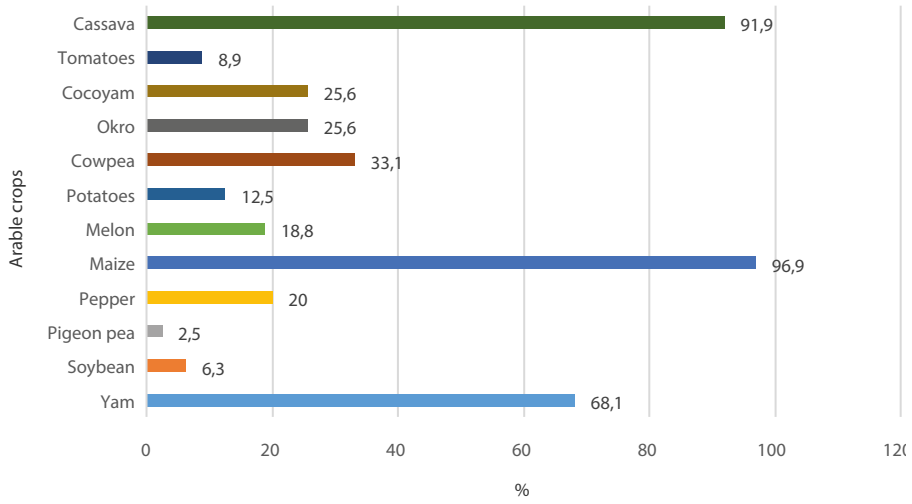

Fig. 2. Arable crops cultivated by the respondents
*Multiple responses recorded.
Source: field survey, 2021.

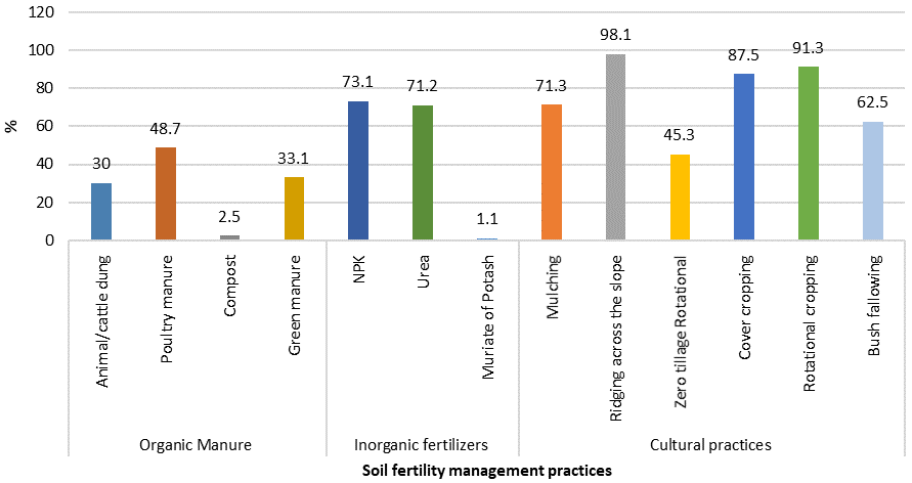

Fig. 3. Types of SFMPs employed
*Multiple responses recorded. Percentages are in parentheses.
Source: field survey, 2021.

The results showed that the synthetic fertilizers used by the respondents were NPK (73.1%), urea (71.2%) and muriate of potash (1.1%). This shows that NPK and urea are the major synthetic fertilizers used by arable farmers. This is comparable to the work of Bwambale (2015) on synthetic fertilizers. Orifah et al. (2018) revealed that farmers in Jigawa were favourably disposed to synthetic fertilizer, the traditional practice of conventional tillage and organic farmyard manure. Bwambale (2015) reported that farmers in Uganda commonly use traditional practices, organic manure, foliar fertilizers and synthetic fertilizers as soil fertility management practices. This shows that location can affect the trend of the prevalent SFMPs used.

Level of utilization of SFMPs employed

Table 1 shows the level of utilization of the SFMPs employed by the respondents. The results have been ranked in chronological order, with ridging across the slope coming in first (WMS = 2.81), rotational cropping second (WMS = 2.66), mulching third (WMS = 2.47), cover cropping fourth (WMS = 2.08), use of NPK fifth (WMS = 1.75), urea sixth (WMS = 1.27), the use of bush fallowing seventh (WMS = 0.98), green manure eighth (WMS = 0.88), poultry manure ninth (WMS = 0.77), animal dung tenth (WMS = 0.76), zero tillage rotational eleventh (WMS = 0.44), compost twelfth (WMS = 0.02) and muriate of potash thirteenth.

These results show that the farmers utilize ridging across the slope, rotational cropping, mulching, and cover cropping the most. It can be deduced that indigenous or traditional knowledge is more widely used in Osun state. This is followed by the usage of NPK and urea (synthetic fertilizer), then organic manure (green manure, poultry manure and animal dung). This shows that the farmers perceive soil fertility as a problem (Mugwe et al., 2009). This may be the reason for the use of various integrated practices (Bwambale, 2015). However, the major type planted by the respondents may also have played a role. Olaitan and Omomia (2006) and Orifah et al. (2018) observed that cultural management practices like crop rotation, planting of cover crops, mulching and ridging across the slope help in water conservation, controlling erosion and the improvement of soil organic matter through decomposed leaves and crop residues. The low use of organic manure may be connected with bulkiness, quantity needed, smell and drudgery (Edeoghon et al., 2008).

Sources of agricultural information

Table 2 shows the sources of agricultural information used by the farmers. The farmers had various sources, ranging from radio (95.6%), friends/neighbours/fellow farmers (92.5%), the marketplace (80.1%), farmers

Table 1. Level of utilization of SFMPs employed

Management practices	Always	Occasionally	Rarely	Never	WMS	Rank
Organic manure						
Animal/cattle dung	32 (20.3)	8 (5.1)	8 (5.1)	110 (69.6)	0.76	10th
Poultry manure	36 (22.8)	23 (14.6)	18(11.4)	81 (51.3)	0.77	9th
Compost	–	–	–	155 (98.1)	0.02	12th
Green manure	42 (26.6)	2 (1.3)	9 (5.7)	1.5 (66.5)	0.88	8th
Synthetic fertilizers						
NPK	72 (42.6)	30 (19.0)	15 (9.5)	41 (25.9)	1.75	5th
Urea	42 (26.6)	59 (37.3)	14 (8.9)	43 (27.2)	1.27	6th
Muriate of Potash	0 (0.0)	1 (0.6)	0 (0.0)	157 (99.4)	0.01	13th
Cultural practices						
Mulching	102 (64.6)	41 (25.9)	2 (1.3)	13 (8.2)	2.47	3rd
Ridging across the slope	134 (84.8)	20 (12.7)	2 (1.3)	2 (1.3)	2.81	1st
Zero tillage rotational	1 (0.6)	23 (14.6)	20 (12.7)	114 (72.3)	0.44	11th
Cover cropping	75 (47.5)	39 (24.7)	26 (16.5)	18 (11.4)	2.08	4th
Rotational cropping	87 (55.1)	41 (25.9)	17 (19.0)	13 (8.2)	2.66	2nd
Bush fallowing	13 (8.2)	32 (20.3)	52 (32.9)	61 (38.6)	0.98	7th

WMS – weighted mean score. Percentages are in parentheses.
*Multiple responses recorded.
Source: field survey, 2021.

Table 2. Sources of agricultural information of the respondents

Sources of agricultural information	Frequency	Percentage
Radio	153	95.6
Internet/social media group	31	19.4
Phone messages	18	11.3
Friends/neighbours/fellow farmers	148	92.5
Agro/fertilizer dealers	80	50.0
Extension agents	101	63.1
Newspapers/magazines	23	14.4
Television	64	40.5
Traditional ruler	40	25.0
Market place	129	80.1
Cooperative socjety	119	74.4
Farmers' meeting	121	75.6

WMS – weighted mean score. Percentages are in parentheses.
*Multiple responses recorded.
Source: field survey, 2021.

meetings (75.6%) and co-operative society (74.4%) as the main sources of information. Others include extension agents (63.1%), agro-fertilizer dealers (50.0%), television (40.5%), traditional rulers (25.0%), internet or social media groups (19.4%), newspapers or magazines (14.4) and phone messages (11.3%). Major sources of information were 2-way and regular sources of interaction. Nowadays, radio has call in options, and because of the coverage, somebody's question may have provided answers for others (Mittal and Tripathi, 2009). The observed results are unlike those found by Adeola and Adetumbi (2015), who reported extension agents as prominent sources of information for farmers.

Correlation between socio-economic characteristics and level of utilisation of SFMPs

The results of the Pearson's product-moment correlation (PPMC) analysis show that a significant relationship exists between age (r = 0.20*; p = 0.01), farm size (r = 0.16*; p = 0.04), and the level of utilisation of SFMPs. This shows that the level of SFMPs used by the farmers was a function of their age and farm size. The alternative hypothesis was accepted. This is similar to a report by Ojediran et al. (2020a).

Table 3. Correlation between socio-economic characteristics and level of utilisation of SFMPs

Variable	r-value	p-value	remarks
Age	0.20*	0.01	S
Marital status	0.67	0.39	NS
Farm size	0.16*	0.04	S

NS – not significant, S – significant.
*Significant at 5% level.
Source: field survey, 2021.

CONCLUSION AND RECOMMENDATION

This study reveals that arable crop farmers are mostly married males, aged 51 years, using an average of 2.6ha farm size and cropping mainly maize, cassava, and yam. The respondents use cultural methods, synthetic fertilizers, and organic manures in that order as SFMPs. The level of utilisation of SFMPs is predominantly cultural methods of ridging across the slope and rotational cropping and mulching; synthetic fertilizers: NPK and urea; and organic manure: poultry manure and animal dung. The major sources of information regarding SFMPs were radio, fellow farmers and the marketplace. PPMC analysis showed that age and farm size are significantly related to the level of SFMPs. This shows that the level of SFMPs used by the farmers is a function of their age and farm size. In conclusion, the respondents were small scale farmers who mainly utilize cultural methods of SFMPs and are mainly influenced by crop type as a function of age and farm size. Therefore, farmers need to be educated in the utilization of relevant SFMP techniques or those combinations of them that conserve soil fertility sustainably.

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