Original Article

Assessment of the Competency Needs of Agricultural Extension Workers in Disseminating Organic Soil Management Practices to Farmers in Kwara State, Nigeria

M. Aliyu *, **O. L. Abdulrahman**, **I. F. Ayanda**, **O. J. Yusuf**

Agricultural Economics and Extension Services Department, Kwara State University, Nigeria

Abstract

The importance of viable alternatives to soil management practices cannot be over emphasized. This is in an effort to mitigate the effects of land degradation on soil. Thus, the dissemination of such practices to ensure timely, efficient and effective soil management practices (OSMP) is crucial. This study therefore assess the competency needs of agricultural extension workers in disseminating OSMPs farmers in Kwara state, Nigeria. The specific objectives were to assess the level of importance attached to OSMPs by extension workers, examine their competencies and competency needs in OSMPs. A two-stage sampling technique was used to select 154 extension workers for the study. Data were collected with the aid of structured questionnaire and summarized using frequency, percentages, mean, standard deviation, and Borich model. The study showed soil erosion control to be of primary importance (70.1%), many extension workers (73.4%) attached moderate importance to selected OSMPs, while 84.4% were found to be moderately competent. The Borich model analysis showed that organic matter amendments (MWDS= 4.49) was the highest ranked area of competency needs. Also, the workers were observed to attach a moderate level of importance and were fairly competent in disseminating OSMPs to farmers. As such, there is a need for intensive training to promote better dissemination of information and practices to farmers and stakeholders.

Keywords: Competency needs, Extension workers, Soil fertility, Soil degradation.

Address for Correspondence:
Musa Aliyu, Agricultural Economics and Extension Services Department, Kwara State University, Nigeria. Email: aliyu.musaa@gmail.com

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Introduction

Soils perform a number of ecosystem functions, namely ensuring physical stability and support, nutrient cycling, water storage and release, pesticide retention, biodiversity and habitat protection, filtering and buffering, and cleaning of the environment (8). According to (12) soil fertility replenishment in Africa is a critical factor for poverty alleviation. As one of the major resources in agriculture soil needs to be well-managed to ensure that it does not become deficient in mineral elements or toxic to plants, and that appropriate mineral elements get into to the food chain. Although, several soil fertility-improvement technologies had been developed their adoption still remains low (19). According to (4), the inadequacy of soil knowledge by Nigerian farmers has caused much soil damage and over-exploitation. However, climatic and environmental factors

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also have a role when reviewing issues related to soil management. The intergovernmental panel on climate change (13) observed that climate-exposed sectors, like agriculture, forestry, fishery, energy, and tourism are negatively affected economically. Different livelihoods have been affected through, for example, destruction of homes, infrastructure, loss of property, income, human health, and food security, with adverse effects on gender and social equity.

According to (11), agricultural extension contributes to improving the wellbeing of farmers and other stakeholders by providing access to knowledge, skills and information. This is basically performed through the practice of extension services by extension personnels (1, 6, 13 and 18). This has resulted in increased emphasis on the development of core competencies of extension personnels especially in the area of subject matter and extension teaching methods. The maintenance of agricultural production systems in relation to the environment is of high concern nowadays, and the practice of organic farming is seen as a viable alternative to address the issue. Issues related to intensive use of agro-chemicals has caused an increase in soil erosion, environmental pollution, over exploitation of groundwater, soil salinization, genetic erosion, loss of biodiversity, and loss of food quality (7, 9, 14 and 15). Current soil management systems in Kwara state according to (20) are ineffective for enhancing soil carbon and most of the cultivated soils have been highly degraded due to emission losses as a result of continuous cropping. Most soil productivity parameters like nitrogen (N) and phosphorus (P) were low, exchangeable and micronutrients were low to medium and some were high. Management practices such as composting, green manuring, use of organic fertilizer and residue retention were not adopted.

The effectiveness of extension services is highly dependent on the preparedness and professional competencies of extension agents (11 and 20). In this regard, studies have been conducted in areas such as the competency needs of extension agents in disseminating weather forecast information in Kwara state (1), soil management practices adopted by farmers, and how conservation agriculture is conducted in some rural areas in Brazil. However, the competency needs of extension workers in disseminating organic soil management practices in the study area have not been adequately investigated. The objective of this study is thus to assess the importance that extension workers attach to OSMPs, examine their competence in OSMPs, and determine their competency needs for that purpose.

Materials and Methods

The study was conducted in Kwara State, Nigeria. The state has an estimated land area of 32,500 km and a projected population of about 3.2 million (National Population Commission, 2016). The vegetation of the state is mainly guinea savanna with large expanses of arable land and rich fertile soils. Agricultural production is largely peasant and small scale, relying on the use of manual labour, crude implements, fertilizers, mechanical implement, and some improved seeds and agrochemicals. The study population comprised extension officers from the state's ADP, Ministry of Agriculture and Rural Development, and the Fadama Development Project. A two-stage sampling technique was used. The first involved purposive selection of three major extension agencies, namely the Kwara State Agricultural Development Program (KWADP), Kwara State Ministry of Agriculture and Rural Development, and the Fadama Development Project. The second stage involved quota selection of respondent using the Yamane (1967) formula.

Data for the study was collected using a well-structured questionnaire on the socio-economic characteristics, level of importance attached, and level of competency on organic soil management practices. Descriptive statistics on frequency, percentage, weighted mean (Likert type scale), mean standard

deviation, and range were used to describe the level of importance attached and competency in organic soil management practices, mean was further categorised into not important ($\bar{x}$= 1 – 1. 49), less important ($\bar{x}$= 1.5 – 2.49), moderately important ($\bar{x}$= 2.5 – 3.49), very important ($\bar{x}$= 3.5 – 4.00). The Borich model was used to test for competency need, and the test-retest method was used to evaluate the reliability of the instrument. The interview schedule was administered to a sample group distinct from the primary study population. The data from both trials were analyzed using Pearson's Product Moment Correlation, which yielded a correlation coefficient of 0.71.

Table 1. Summary of sampling procedure and sample size.

Stage 1 Agencies involved	Number of extension workers	Stage 2 96% quota sampling
Kwara ADP	89	86
State Ministry of Agriculture and Rural Development	40	38
Fadama Development Project	32	30
Total	161	154

Results and Discussion

For the extension workers' view of the importance associated with OSMPs (Table 2), the top five issues were soil erosion control (mean=3.70), organic matter amendments (mean=3.68), agro forestry (mean=3.64), crop rotation (mean=3.62), and livestock manure management (mean=3.61). This differs from the study by (12) on training needs of extension agents on sustainability where participatory technology development was rated the highest competency requirement. This might be due to the fact that soil erosion was rated among the main causes of land degradation. Soil erosion control was ranked the most important OSMP as it reduces cropland productivity and contributes to the pollution of adjacent watercourses, wetlands and lakes. Also, soil erosion is a naturally occurring process that affects all landforms. In agriculture, it refers to the wearing away of a field's topsoil by the natural physical forces of water and wind or through forces associated with farming activities such as tillage, thus making it fit for all locations. This prenominal is the main cause of soil and water degradation, leading to losses of agricultural lands and contamination of water resources (20). It can be infer also that the extension workers realize the important of organic soil practises since they view all the listed practices to be very important which also denote readiness to either gain additional knowledge or to disseminate such practices to others.

Table 2. Agricultural extension workers' view of importance to disseminating organic soil management practices to farmers.

Practices	Not important	Less important	Moderately important	Very important	Mean±SD	Rank	Remark
Encouraging adoption of agricultural technology	0	0	74(48.1)	80(51.9)	3.52±0.50	16	Very important
Agro forestry	0	0	55(35.7)	99(644.3)	3.64±0.48	3	Very important

Livestock manure management	0	0	60(39.0)	94(61.0)	3.61±0.49	5	Very important
Biological control of pests	0	0	71(46.1)	83(53.9)	3.54±0.50	14	Very important
Reduce use of fertilizer	0	0	75(48.7)	79(51.3)	3.51±0.50	17	Very important
Reduce use of chemical	1(0.6)	0	62(40.3)	91(59.1)	3.58±0.53	12	Very important
Soil erosion control	0	0	46(29.9)	108(70.1)	3.70±0.46	1	Very important
Participatory technology development	2(1.3)	0	57(37.0)	95(61.7)	3.59±0.57	8	Very important
Integrated weed management	0	0	65(42.2)	89(57.8)	3.58±0.50	11	Very important
Herbicide resistant crops	0	0	67(43.5)	87(56.5)	3.56±0.50	13	Very important
Residue retention	0	0	65(42.2)	89(57.8)	3.58±0.50	10	Very important
Green manuring	0	0	61(39.6)	93(60.4)	3.60±0.49	6	Very important
Use of organic fertilizers	0	0	61(39.6)	93(60.4)	3.60±0.49	7	Very important
Crop rotation	0	0	59(38.3)	95(61.7)	3.62±0.49	4	Very important
No tillage	0	0	64(41.6)	90(58.4)	3.58±0.49	9	Very important
Water conservation	0	0	73(47.4)	81(52.6)	3.53±0.50	15	Very important
Organic matter amendments	0	0	49(31.8)	105(68.2)	3.68±0.47	2	Very important

Organic matter amendments refer to the act of adjusting macro/micro nutrients in plants to help alleviate the chemical, physical or biological properties of soil. This was ranked the second, as such practices help reduce costs, stress of framers on fertilizer use, and minimizes the toxicity effect on soils. As seen in Table 3, 73.4%, 25.3%, and 1.3% of the respondents attached high, moderate, and low levels of importance to OSMP, respectively. This will affect the competency of extension workers since the importance attached affects the rate of acquisition of a skill or practice.

Table 3. Level of importance attached by extension workers to disseminating organic soil management practices to farmers.

Obtained score	Level	Frequency	Percentage	Mean SD
15 – 38.3	Low	2	1.3	
38.4 – 61.7	Moderate	113	73.4	60.03±4.15
61.8 – 85.1	High	39	25.3	
Total		154	100.0	

Possible score range: 15 – 85.

The findings presented in Table 4 reveals no tillage (mean= 2.68) as the highest ranked area of capability to disseminating OSMP followed by soil erosion control (mean= 2.65), livestock manure management (mean= 2.63), reducing chemicals (mean= 2.60), and participatory technology development (mean= 2.59). Water conservation (mean= 2.36) was ranked lower followed by herbicide resistance crops (mean= 2.44). The efficiency of no-tillage in reducing soil loss is related to better soil protection by the straw on soil surface against raindrop impact, but isolated conservation strategies do little to mitigate erosive processes during medium to heavy rainfall events (3). This agrees with the study by (2) on training needs of extension agents on sustainability where practices like no-tillage were rated among their area of capability. This capability will assist in protecting the soil's macro and microorganisms and also reduce the rate of erosion.

Table 4. Competence of agricultural extension workers in disseminating organic soil management practices to farmers.

Activities	Less capable	Moderately capable	Highly Capable	Mean±SD	Rank
Encouraging adoption of agricultural technology	4(2.6)	56(36.4)	94(61.0)	2.58±0.54	6
Agro forestry	0	73(47.4)	81(52.6)	2.53±0.50	8
Livestock manure management	1(0.6)	58(37.7)	95(61.7)	2.63±0.50	3
Biological pest control	1(0.6)	83(53.9)	70(45.5)	2.47±0.51	14
Reduce use of fertilizers	0	82(53.2)	72(46.8)	2.47±0.50	13
Reduce use of chemicals	1(0.6)	62(40.3)	91(59.1)	2.60±0.50	4
Soil erosion control	0	54(35.1)	100(64.9)	2.65±0.48	2
Participatory technology development	1(0.1)	64(41.6)	89(57.8)	2.59±0.51	5
Integrated weed Management	0	79(51.3)	75(48.7)	2.49±0.50	11
Herbicide resistance crop	2(1.3)	82(53.2)	70(45.5)	2.44±0.52	16
Residue retention	0	76(49.4)	78(50.6)	2.51±0.50	10
Green manuring	2(1.3)	79(51.3)	73(47.4)	2.48±0.53	12
Organic fertilizer use	0	74(48.1)	80(51.9)	2.52±0.50	9
Crop rotation	0	66(42.9)	88(57.1)	2.57±0.50	7
No tillage	1(0.6)	50(32.5)	103(66.9)	2.68±0.48	1
Water conservation	2(1.3)	78(50.6)	72(46.8)	2.36±0.51	17
Organic matter amendments	4(2.5)	78(50.6)	72(46.8)	2.46±0.55	15

Table 5 shows that 84.4% of the extension workers rated themselves moderately capable of disseminating some of the listed soil management23 practices to farmers, 14.9% rated themselves low, and 0.6% rated themselves high. The results indicate a moderate level of competence in disseminate OSMPs to farmers among the extension workers and also indicates opportunities for an improvement in their competence. This finding differs from that in (8) where the workers were seen to possess a high level of competency in group facilitation.

Table 5. Level of competence of extension workers in disseminating organic soil management practices to farmers.

Obtained score	Level	Frequency	Percentage	Mean SD
15 – 38.3	Low	23	14.9	
38.4 – 61.7	Moderate	130	84.4	43.03±3.58
61.8 – 85.1	High	1	0.6	
Total		154	100.0	

Possible score range: 15 – 85.

As seen in Table 6, organic matter amendments (MWDS= 4.49) was the highest ranked area of competency needs of extension agents, followed by water conservation (MWDS= 4.13), and agro-forestry, indicating the competency areas that should be addressed. This finding matches that of (1) on disseminating weather forecast information in Kwara state as a major competency need among extension agents, since knowledge on rain variability will aid in water conservation.

Table 6. Borich model analysis of extension workers competency need in disseminating organic soil management practices to farmers.

Areas of Competency	Level of Importance Mean±SD	Level of Competence Mean±SD	MWDS	Rank
Encouraging adoption of agricultural technology	3.52±0.50	2.58±0.54	3.31	16
Agro forestry	3.64±0.48	2.53±0.50	4.04	3
Livestock manure management	3.61±0.49	2.63±0.50	3.54	14
Biological control of pest	3.54±0.50	2.47±0.51	3.79	11
Reduce use of fertilizers	3.51±0.50	2.47±0.50	3.65	12
Reduce use of chemicals	3.58±0.53	2.60±0.50	3.51	15
Soil erosion control	3.70±0.46	2.65±0.48	3.89	7
Participatory technology development	3.59±0.57	2.59±0.51	3.59	13
Integrated weed management	3.58±0.50	2.49±0.50	3.90	6
Herbicide resistance crop	3.56±0.50	2.44±0.52	3.99	5
Residue retention	3.58±0.50	2.51±0.50	3.83	9
Green manuring	3.60±0.49	2.48±0.53	4.03	4
Organic fertilizer use	3.60±0.49	2.52±0.50	3.89	7
Crop rotation	3.62±0.49	2.57±0.50	3.80	10
No tillage	3.58±0.49	2.68±0.48	3.22	17
Water conservation	3.53±0.50	2.36±0.51	4.13	2
Organic matter amendments	3.68±0.47	2.46±0.55	4.49	1

Conclusion

Based on the findings of this study, it can be inferred that extension agent in Kwara state rated all the mentioned practices to be critical for OSMPs. Soil erosion control was ranked first, where the level of importance attached to OSMPs and the level of competence of extension workers was observed to be moderate. The Borich model analysis on the agents' competency needs in disseminating OSMPs to farmers revealed the need for training on organic matter amendments and water conservation.

The study recommends refresher extension training on OSMPs to ensure extension workers knowledge and competencies remain updated. Areas of competency needs such as organic matter amendments, water conservation, agro-forestry, etc. should be the focus of training programs. Also, there should be an in-depth analysis on the weakness and strengths of extension methods and approaches used in the dissemination of organic soil management practices to farmers.

Supplementary Materials
No Supplementary Materials.

Author Contributions
Musa Aliyu: methodology, writing—original draft preparation and editing; Ololade. Latifat. Abdulrahman, editing, review and proofread Olayinka Jelil Yusuf and Ibrahim. Folohunsho. Ayanda: review. All authors have read and agreed to the published version of the manuscript.

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No Informed Consent Statement.

Data Availability Statement
The study was based on primary data collected from respondents.

Conflicts of Interest
The authors declare that the absence of any conflicts of interest during the information gathering phase was essential to completing this research project.

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مقالة أصيلة

تقييم احتياجات الكفاءة للعاملين في الإرشاد الزراعي في نشر ممارسات إدارة التربة العضوية للمزارعين في ولاية كوارا، نيجيريا

موسى عليو * ، أولوليد لطيفة عبدالرحمن ، إبراهيم فولوهونسو أياندا، أولينكا جيليلي يوسف

قسم الاقتصاد الزراعي وخدمات الإرشاد، جامعة ولاية كوارا، نيجيريا

الخلاصة لا شك أن وجود بدائل عملية لممارسات إدارة التربة أمر بالغ الأهمية. هذا جهد للتغلب على آثار تدهور الأراضي. وبالتالي، فإن نشر هذه الممارسات لضمان ممارسات إدارة التربة (OSMP) في الوقت المناسب وكفؤة وفعالة أمر بالغ الأهمية. لذلك، ان هذه الدراسة تقيم احتياجات الكفاءة للعاملين في الإرشاد الزراعي في نشر ممارسات إدارة التربة (OSMP) للمزارعين في ولاية كوارا، نيجيريا. تهدف الدراسة الى تحديد مستوى الأهمية التي يوليها العاملون في الإرشاد لممارسات إدارة التربة (OSMPs)، وفحص كفاءاتهم، واحتياجات الكفاءة في ممارسات إدارة التربة (OSMPs). استخدم أسلوب أخذ العينات من مرحلتين لاختيار ١٥٤ عاملاً في الإرشاد للدراسة. جمعت البيانات باستخدام استبيان منظم وتلخيصها باستخدام التردد والنسب المئوية والمتوسط والانحراف المعياري ونموذج بوريش. أظهرت الدراسة أن مكافحة تآكل التربة ذات أهمية أساسية (٧٠.١٪)، حيث أولى العديد من العاملين في الإرشاد (٧٣.٤٪) أهمية متوسطة لممارسات إدارة التربة (OSMPs) المختارة، بينما وجد أن ٨٤.٤٪ يتمتعون بكفاءة متوسطة. أظهر تحليل نموذج بوريش أن تعديلات المواد العضوية (MWDS 4.49) كانت أعلى مجالات الكفاءة المطلوبة. كما لوحظ أن العمال أولوا أهمية متوسطة، وكانوا على درجة معقولة من الكفاءة في نشر برامج إدارة الموارد الطبيعية (OSMPs) للمزارعين. لذا، ثمة حاجة إلى تدريب مكثف لتعزيز نشر المعلومات والممارسات بشكل أفضل بين المزارعين وأصحاب المصلحة.

كلمات مفتاحية: احتياجات الكفاءة، العاملين في الإرشاد الزراعي، خصوبة التربة، تدهور التربة.

***المراسلة الى:** موسى عليو، قسم الاقتصاد الزراعي وخدمات الإرشاد، جامعة ولاية كوارا، نيجيريا.

البريد الالكتروني:aliyu.musaa@gmail.com