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An Assessment of Farmers Use of Soil Survey Information in Crop Production and Local Classification of Soils, Niger State, Nigeria

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Abstract
The study assessed farmer's use of soil survey information in crop production and local classification of soils, Niger state. Nigeria. Multi stage sampling technique was used to select 120 respondents within the three agricultural zones of the state for the study. Data for the study were collected using a structured questionnaire. Descriptive statistics was used to analyse the data. The result revealed 99.2 % of the respondents know about soil information with 64.2 % introduced to soil information by extension agents. Majority of the respondents were not aware of the importance and use of soil information, with the mean level of awareness of farmers towards soil was low with average of 1.78. Majority of the respondents agreed with the notion that soil information can increase productivity and lead to sustainable agriculture, with the mean level of agreement revealed to be high with an average of 3.64. The respondents disagreed with the notion that soil information is needed for only large-scale farming. The study also revealed that 66.7 % of the respondents locally classify their soils in the study area, using topsoil physical characteristics such as soil colour, soil weight and feel as indicators for classification. The respondents were not aware of the importance of soil information, but are willing to adopt the use of soil information, if more awareness programs and reduced cost of soil analysis are in place. The respondents classify soils locally but their classification lacks depth, with need for in-cooperation of scientific classification, which can lead to a more accurate local classification of the soil.

Keywords: Soil survey information and Local classification

Introduction
Soil plays a major role in the quality of our environment. It is the foundation for food and fibre production. Knowledge of soil is required for land use planning activities and the decision of what use a particular soil type could be assigned. Moreover, understanding of soil properties and processes is important in evaluating the criteria for soil management and cultivation and agricultural production. Esu (2004), Lobry de Bruyn and Andrew (2016) noted that increase in demand and lack of information on soils contribute to the problem if soil degradation and world food crises, due to the wrong use and poor management of land resources. Achukwu *et al*. (2013), Sharu *et al*. (2013) stated that for sustainable land management, information on the soil resources and how to manage them is needed and this is achieved through characterization, classification and evaluation of the soil. Lobry de Bruyn and Abbey (2003), Lobry de Bruyn and Andrews (2016) all noted that there a lot of barriers to collecting and acting on soil information, with majority of farmers soil-information poor, or at least they are not informed as to the condition of their soil by soil testing. A challenge to agricultural production is that farmers, in particular small-scale farmers, do not know the status of their soils. The ability to have data that can move across states and borders are vital for the agricultural sector in today's global market environment (FAO, 2017), the only way agricultural production can be sustained is when farmers can assess adequate and accurate data. In Nigeria there is a lack of collection and management of agricultural data and inadequate data in agriculture will hinder foreign direct investment and governments efforts to reform the agricultural sector, since quality data improves both sectoral benefits and real economic benefits (Essiet, 2015). In Nigeria, like most developing countries, one primary

constraint to sustainable and successful agricultural program, is lack of knowledge about the soil resources and how to manage them (Achukwu *et al.,* 2013). Boonsompopphan *et al*. (2008) noted that with the ability of farmers to identify soil series farmers could obtain site-specific nutrient recommendations and as a result of applying site-specific nutrient management. In Niger, there have been wide spread survey of the soil, documenting the fertility status in conjunction with management practices which can improve the soil fertility and reduce soil degradation. However, these recommendations have majorly not been adopted by farmers, with the reason for this basically being the lack of knowledge and information by the farmers. Also, there has been lack of knowledge of the perception of farmers towards soil data and their willingness to use the data presented to them, which might have led to bridging the gap between researchers and farmers. Since, there have been few studies in Minna, that document farmers view on soil data and their utilization. The study was therefore designed to identify how soils are classified, assess the level of awareness, perception and use of soil information by farmers in crop production in Niger State, Nigeria.

Methodology

The study was carried out in the three agricultural zones of Niger State, Nigeria. It lies between longitude 6^0 25′ E and $6^0$45′ E and Latitude $9^0$24′ N and $9^0$48′ N and is at an elevation of 299 m above sea level. Niger falls under the Southern Guinea Savanna agro-ecological zone of Nigeria, the climate of Minna is sub-humid with mean annual rainfall of 1284 mm and a distinct dry season of about 5 months duration occurring from November to March (Ojanuga, 2006). The mean maximum temperature remains high throughout, about 33.5^0 C, particularly in March and June (Ojanuga, 2006). The soils of the study area are grouped under the Southern belt of forest soils which have underlying rocks of granite or clay, with soils rich in clay loam, and zone of alluvial soils which are fresh - water soil of grey to white sand, grey clay and sandy clay with humic topsoil (Iloeje, 2001). The soils are generally low in organic matter, total nitrogen and available phosphorus with high erodibility, are structurally weak, coarse textured with low organic matter status (Ahmakhian and Osemwota, 2012). A multi-stage sampling technique was used to select the respondents for the study. Stage one involved random selection of one (1) Local Government Area from each agricultural zone, stage two (2) was random selection of two (2) villages from each Local Government Area. Stage three (3) was random selection of twenty (20) rural farmers from each village to give 120 respondents for the study. Primary data was collected with the use of structured questionnaire, complimented with an interview schedule. Data collected was analysed using descriptive statistics such as mean, standard deviation, pie chart, bar chart, percentages and frequency distribution as appropriate. Attitudinal measuring scale like likert rating scale was also used to categorize the respondent responses into 3-point and 5-point likert rating scale.

Results and Discussion

Institutional characteristics

Table 1 shows that majority of the respondents (52.5 %) are permanently practising agriculture with 28.3 % utilizing trading as a secondary occupation. The table also shows that (99.2 %) of the farmers have contact with agricultural extension agents, with frequency of the contact majorly bi-weekly (42.5 %), which may lead to higher rate of adoption of information and new technologies. This is accordance with Shehu *et al*. (2016) who noted that farmers who had more contact with extension agents are more than two times likely to adopt modern technology than those with no access to extension agents.

Table 1: Some institutional characteristics of respondents

Variables	Frequency	Percentage
Secondary occupation		
Farming	63	52.5
Trading	34	28.3
Civil servant	2	1.7
Processing	21	17.5
Cooperative Membership		
Yes	88	73.3
No	32	26.7
Access to credit		
Yes	56	46.7
No	64	53.3
Source of Credit		
None	58	48.3
Agricultural bank	62	51.7
Extension Contact		
Yes	119	99.2
No	1	0.8
Frequency of Contact		
Weekly	28	23.3
Bi-weekly	51	42.5
Monthly	41	34.2

Source: Field survey, 2018

Distribution of respondents on knowledge about soil information

Majority (99.2 %) of the respondents know about soil information. This may be due introduction by extension agents, since the framers have a high level of contact with extension agents. Majority of the respondents (64.2 %) were introduced to soil information by extension agents and 57.5 % of the respondents use form soil information, while carrying out farming activities.

Local classification of soil

Table 3 shows respondents from different localities possess varying local classification of soils, which were based on colour, weight and feel of the soil, which are observable top soil characteristics. This is similar to the findings of Nethononda and Odhiambo (2011) who observed that farmers classified soils based on top soil characteristics not taking into consideration of subsoil characteristics. This may be due to the farmers believe that most crops they cultivate majorly occupy the topsoil. Kuyi village farmers classified soils based on colour (red and white soil). The red soils are regarded as light clay soils and white soils regarded as loamy dark soils, with both type of soils used for both yam and maize farming. Taxakpan village farmers classified their soils locally based on weight (light and heavy soil). Where the light soils are regarded as loamy soils used for Maize, Ground nut, Cowpea and Yam farming, while Heavy soils are regarded as clay soils used for majorly rice farming. Sabon Rijiya and Kakapanji village farmers classified their soils based on its feel. Sabon Rijiya respondents classified their soils as smooth and rough soil, with smooth soils regarded as clay soils used for majorly rice farming while rough soils are regarded as sandy to loamy soils used for maize and ground nut framing. Kakapanji village respondents classified their soils used smooth and stony soil, with smooth soils regarded as clayey soils used for rice farming while stony soils are regarded as sandy to loamy soils coarse feel used for Maize, yam and Ground nut farming. The table shows that 66.7 % of respondents within the study area classify their soils locally, which aid them in selecting crops that they cultivate, which in turn increase land sustainability. This is in collaboration with findings with of Nethononda and Odhiamo (2011) who stated farmers local classification is important for sustainable agricultural development planning and land suitability evaluation in developing countries where financial resources are scarce.

Table 3: Local classification of soils by respondents

Classification	Frequency	Percentage
KUYI VILLAGE		
Red soil	20	100
White soil	20	100
TAXAKPAN VILLAGE		
Light soil	20	100
Heavy soil	20	100
SABON RIJIYA		
Smooth soil	20	100
Rough soil	20	100
KAKAPANJI		
Smooth soil	20	100
Stony soil	20	100
Total	80	66.7

Source: Field survey, 2018

Awareness if respondents about soil information

Table 4 shows the awareness of farmers about soil information in the study area. Awareness about soil information (1.98), awareness on use of soil information (1.93) and awareness that soil information improves yield (1.79) were the statements the farmers were most aware about. All the mean scores were than 2.00 indicating they are generally not aware of all the statements on table 4. This may imply that most farmers do not use standard soil information for farming. Okunola (2009) stated that awareness is the first stage of adoption before respondents develop interest in the technology and later decide on adoption.

Table 4: Awareness of respondents about soil information

Statements	HA	A	NA	WS	WM	Decision
Awareness about soil information	0	118	2	238	1.98	Not aware
Awareness of use of soil information	0	112	8	232	1.93	Not aware
Awareness on importance of soil information	9	49	62	187	1.56	Not aware
Awareness that soil information improve yield	23	49	48	215	1.79	Not aware
Awareness that soil information improves fertility	13	61	46	207	1.73	Not aware
Awareness that soil information reduces cost of production	11	66	43	208	1.73	Not aware
Awareness that soil information reduces soil deterioration	14	61	45	209	1.74	Not aware

HA = Highly aware, A = Aware, NA = Not aware, WS = Weighted sum, WM =Weighted mean

Farmers' perception about soil information

Table 5 shows the perception of farmers towards soil information. Improvement of yield (3.98), improvement of soil fertility (4.20), encouragement to farm (3.86), lack of knowledge on soil information (3.83) and high cost of soil analysis (3.71) were the statements the respondents majorly agreed upon with the mean scores above 3.00. This means that if farmers are educated about soil information, they are able to understand, utilize and transfer soil information to other farmers. This is similar to the findings of Duruiheoma *et al.* (2015) who stated that highly aware farmers aid in transferring knowledge between older farmers and farm owners, through a possible knowledge transfer network, where knowledge about soils are shared.The farmers majorly disagreed with the perception that soil information is only necessary for large scale farming (2.14), which may mean farmers are willing to adopt use of soil information in their farming activities if made available to them, with reduced cost of soil analysis being the incentive they require.

Table 5: Perception of respondents about soil information

Statement	SA	A	UD	D	SD	WS	WM	Decision
Soil information improves yield	0	118	2	0	0	478	3.98	Agree
Soil information improves soil fertility	27	90	3	0	0	504	4.20	Agree
Soil information is necessary for agricultural production	22	51	43	4	0	451	3.76	Agree
Soil information encourages people to farm	30	45	43	2	0	463	3.86	Agree
Soil information reduces soil deterioration	16	35	68	1	0	426	3.55	Agree
Soil information is only necessary for large scale farming	0	0	18	101	1	257	2.14	Disagree
Soil information reduces stress	1	72	47	0	0	434	3.62	Agree
Soil information is too expensive	0	85	35	0	0	445	3.71	Agree
There is lack of knowledge on soil information	4	93	22	1	0	460	3.83	Agree
Inadequate information on soil information	5	76	38	1	0	445	3.71	Agree

SA = Strongly agree, A = Agree, UD = Undecided, D = Disagree, SD = Strongly disagree

Conclusion

The result of this research showed that majority of the farmers have been introduced to soil information but not all use it for farming. Even though, they were introduced to soil information there is a gap in knowledge regarding the relevance and use of soil information, due to the fact that extension agents did not disseminate such information to the farmers. The farmers also agree with the notion that soil information can increase agricultural productivity and bring about sustainable agriculture, although this depends on the availability of soil information to them in terms of reduced cost of soil analysis and more awareness programs. The farmers identify fertile soils based observable characteristics majorly crop yield, soil colour and soil texture, this form of identification does not take into consideration of the fertility status of the subsoil. Most of the farmers classify their soils locally and this serves as a means of selecting specific crops to suit specific crop types, although there is a gap between scientific classification of soils and local classification with local classification only taking into consideration the colour and texture of the soil, linkage between farmers, extension agents and soil scientist can bridge the gap in classification allowing for farmers to in-cooperate more parameters into their form of classification.

References

Achukwu, E. M., Raji, B. A., & Lya,` U. S. (2013). Compilation of Existing Soil Series In North-Eastern Nigeria: Problem And Prospect. *Nigerian Journal of Soil Science*, 23(2), 189-195

Amhakhian, S. O., & Osemwota, I. O. (2012). Physical and Chemical Properties of Soils in Kogi State, Guinea Savanna Zone of Nigeria. *Nigerian Journal of Soil Science*, 22(1), 44

Boonsompopphan, B., Vearasilp, T., Yost, R. S., & Attanandana, T. (2008). Field Identification of Soil Series: Indexing and Retrieving Soil Information While Sharing Experience and Knowledge. (Soil Science 2008 ;173(10),736–744) Lippincott Williams & Wilkins, Inc

Duruiheoma, F. I., Burek, C. V., & Alexander, R. (2015). Farmers perception of soil: implications for soil conservation and susutainable agriculture in the UK *European centre for research training and development UK* 3(3), pp 11- 24

Essiet, D. (2015) Combating challenges of poor data-driven agriculture Retrived:01/05/18 http://thenationonlinng.net/combating-challenges-of-poor-data-driven-agriculture/

Esu I. E. (2004). Soil Characterization and Mapping for Food Security and Sustainable Environment in Nigeria: In Proceeding of the 29th Annual Conference of The Soil Science Society of Nigeria. Pp 10-1

FAO (2017). Food and Agricultural Organization, FAO in Nigeria: Nigeria improve data collection on agriculture http// ww.fao.org/Nigeria/news/detail-event/en/c/891622/ retrieved 01/05/2018

Iloeje, N. P. (2001). A New Geography of Nigeria. New Revised Edition. Longman Nigeria PLC. pp 200.

Lobry de Bruyn, L. A., & Abbey, J. A. (2003). Characterization of farmers' soil sense and the implications for on-farm monitoring of soil health. *Australian Journal of Experimental Agriculture*, 43, 285–305.

Lobry de Bruyn, L. A., & Andrews, S. (2016). Review Are Australian and United States Farmers Using Soil Information for Soil Health Management? *Sustainability* 2016, 8(4), 304; doi:10.3390/su8040304 March 2016

Nethononda, L. O., and Odhiambo, J. J. O. (2011). Indegineous soil knowledge relevant to crop production of smallholder farmers at Rambuda irrigation scheme, Vhembe district South Africa. *African journal of agricultural research*. 6(11), 2576 – 2581.

Ojanuga, A. G. (2006). Agroecological Zones of Nigeria Manual. FAO/NSPFS, Federal Ministry of Agriculture and Rural Development, Abuja, Nigeria, 124 Pp

Sharu, M.B., Yakubu, M., Noma, S. S., & Tsafe, A. I. (2013). Characterization and Classification of Soils on An Agricultural Landscape in Dingyadi District, Sokoto State, Nigeria. *Nigerian Journal of Basic Applied Science*, 21, 137-147.

Shehu, J. F., Gaya, A. S., Msheliu, S. I., and Adebayo, E. F. (2016). Determinants of innovativeness. The case study of smallholder rice farmers in North eastern Nigeria. In Nwachukwu, I. N., Amadi, C. O., Ewuziem, J. E., Okoye, B. C., Afuape, S. O, Agwu, N. M. and Oteh, O.U (Eds.) Economic dicersifiaction: the agricultural road map. Proceedings of 50th annual conference of agricultural society of Nigeria, Abia 2016, October 3 – 7, 2016, pp 157 – 160.