Innovations

Gender Differentials in the Capacity Building Needs of Lecturers for Teaching Biological and Physical Properties of Soil Fertility Management Practice

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Abstract
The research determine gender differences in the capacity building needs of lecturers in teaching biological and physical properties of soil fertility management practice. Two research question and hypotheses were tested. A total of 201 agricultural education lecturers in Delta State served as respondents; hence an ex post facto designed was used. A structured questionnaire titled "Soil Fertility and Fertilizer Management Practices Questionnaire (SFFMPQ)" was used to gather data. It was created after the researcher studied the literature on soil fertility and fertilizer management and was found reliable and validated through experts. To obtain insights into the issues at hand, we analyzed the data at hand using descriptive statistics using mean and standard deviation. The t-test was used to determine whether or not the null hypothesis was correct. It was found that there was a significant difference in the mean ratings of male and female lecturers in teaching both the physical and biological properties of soil management practices. The results of the study show that lecturers in Delta State have different capacity development requirements based on whether they are teaching male or female students about biological and physical features of soil fertility management. As a result, male lecturers have a greater need than their female colleagues for training in how to effectively instruct students on the physical and biological properties of soil and how to effectively manage it during the teaching-learning process.

Keywords: ***1.****Gender; 2.Lecturers; 3.Gender Differentials; 4.Capacity Building Needs; 5.Teaching; 6.Biological and Physical Properties; 7.Soil Fertility; 8.Management Practice.*

Introduction:

Fertility of the soil is crucial to agriculture. According to the International Fertilizer Industry Association (IFIA, 2011), high yields are necessary to feed a growing population; soil fertility increases farmers' return per unit of land cultivated; soil fertility supports yields of renewable energy sources (for example, bio energy crops); and soil fertility supports plant growth to reduce nutrient runoff, surface water, and water over-enrichments. As noted by Hodges (2011), plants need micronutrients in extremely trace amounts, yet they are just as crucial as macronutrients. Joseph (2012) claims that decreasing soil fertility is a major threat to Nigeria's agricultural output and environmental wellbeing. Asadu (2010) defines fertilizer as "any organic or synthetic chemical put to or dispersed upon soil with the intention of enhancing the soil's capacity to sustain plant development." Fertilizer, as defined by Nnaji (2010), is any organic or inorganic material of natural or synthetic origin added to soil to supply specific components necessary for plant development. It is emphasized that the goal of fertilizer is to maintain a balance between nutrient inputs and outflows and to protect soil fertility, and that fertilizer may be a manufactured product containing a large amount of one or more of the primary, secondary, macro, or micronutrients. Nnaji (2010) further said that fertilizer overuse has some impacts, such as an increase in soil acidity, excessive salinity, buildup of heavy pollutants and nutritional imbalance in soil plants. As a result of these results, it is clear that proper fertilizer management is essential to avoiding fertilizer's deleterious effects on soil, soil organisms, and plants.

According to Akpokiniovo-Uwawah (2022), management is the process by which an organization allots its input (human and material resources) to the production of output (goods and services demanded by consumers) in order to achieve its objectives. The goal of fertilizer management is to keep soil fertile by applying fertilizers as needed to guarantee that agricultural plants get the most out of the soil for their investment. Consequently, this facet of agricultural education must be included in teacher preparation programmes so that the next generation of educators may learn the fundamentals of soil fertility management. There is a demand for instructors to instruct students in the various facets of soil fertility management approaches. However, professors who lack the ability to instruct cannot affect student learning. The lecturer is recruited to instruct the agricultural education curriculum because it is assumed that he possesses the knowledge and experience necessary to instruct students in the art of soil fertility management. This highlights the need of examining the requirements of agricultural instructors in terms of skill development.

The primary objective of capacity development is to increase individuals' capability based on perceived requirements, as defined by Starvrons (2018). This may be done via improving skills and capacities in individuals, groups, organizations, sectors, or countries. Teaching techniques like tillage, soil testing, manure preparation, crop rotation, erosion control, and irrigation, and coordinating human and material resources for the purpose of maintaining soil fertility using fertilizers to ensure maximum return of crop plants from the soil are all examples of capacity building in soil fertility management (Starvrons, 2018).

The most crucial aspect of achieving professional success, according to Lee (2017), is developing one's own capabilities. Teachers who have completed a university-level Agricultural Education degree are sought after to instruct College of Education students on topics such as soil fertility management. This implies that professors in universities' agricultural education programmes pass on their knowledge to their students in colleges of education, and that more capacity is needed so that students in K-12 schools may learn about agriculture. According to Onipede (2013), many college students lack a solid background in soil science, which makes it difficult for them to succeed in soil science classes. There still appears to be a gap in gender inequalities despite the implementation of agricultural curriculum in colleges of education. Femininity and masculinity are defined according to socially assigned gender roles. Many educators have expressed anxiety over the gender gap.

Gender variations in curriculum implementation have been identified by some researchers, whereas others have found no such differences. Ndirika (2013) found, for instance, that men educators were more effective than female educators. While some research has revealed that men are naturally better at using analogies to solve problems, others, including that conducted by Lorchugh (2006), have found no such difference. Therefore, men were more likely to be effective educators than women. According to Maghsudi (2007), there was no significant difference between the sexes in studies of overall curriculum implementation; however, there were differences between the sexes in studies of agricultural curriculum implementation, with males consistently achieving scores that were indicative of greater curriculum delivery. O'kwu and Ijenkeli's (2012) hypothesis proposes that there has been widespread concern regarding gender inequalities in Curriculum delivery.

Statement of the Problem

Soil fertility management education unquestionably provides a valuable skills development programme, aimed at bridging the gap between classroom theory and real-world application in businesses, farms, and other settings. By virtue of right to education, both genders should have equal access to agricultural education so that all children may learn to become competent farmers. There has been a lot of study on soil fertility management, with the ultimate goal of raising agricultural output and revenues. However, due to gender bias, neither academics nor farmers are making full use of the data available to them. It is the purpose of this research to identify the gender-based gap between male and female lecturers in the field of soil fertility management by analyzing their individual demands for professional development. There also appears to be a lack of unanimity on the topic of gender differences in the presentation of agricultural curricula. This leads the researcher to wonder if there are any differences in the demands of training male and female professors in the field of soil fertility management. This research was inspired by the aforementioned questions.

Literature Review

This section has reviewed some literatures regardingcapacity building needs of lecturers in teaching biological and physical properties of soil fertility management.

The Agricultural Capacity-Building Concept

According to Abdullahi and Ajoku (2001), capacity building is the process of establishing or improving a society's potential to carry out designated activities and realize

predetermined goals of national development. Organizational and community resilience is the process of creating and maintaining the knowledge, policies, procedures, tools, and infrastructure necessary to deal with, and even prosper in, a world where the pace of change is accelerating at an unprecedented rate. According to Akpokiniovo (2018), "capacity development" is the process of providing an individual with the knowledge, understanding, and skills as well as the means to acquire new information, expertise, and training that he needs to fulfill his duties competently. In order to bring about the necessary developmental change in participants, the process centres on a sequence of activities aimed at enhancing their knowledge, skill, and understanding. According to Olaitan, Alaribe, and Nwobu (2009), "capacity building" is "the process of enhancing an individual's ability to do a task or fulfill an assignment." For the sake of this analysis, "capacity building" means improving professors' soil fertility and fertilizer management knowledge, abilities, and attitudes so that they can better instruct students. Researching soil fertility management strategies that might be utilized to retrain lecturers of Agricultural Education and increase their capacity and performance was aided by the researcher's understanding of capacity development.

Gender and Physical Attributes of Soil Fertility Management Practice

Components of soil fertility include the soil's physical, chemical, and biological processes. According to Starvrons (2018), soil's physical properties are its measurable characteristics. The author claims that the soil's physical features are what set them apart and reveal its overall condition. According to Chekene and Kashim, 2018), soil's physical properties determine things like the number, size, and arrangement of the soil's pores; the soil's ability to retain water for plant use (Water-Holding Capacity, WHC); the soil's permeability; the amount and rate at which nutrients are released for plant use; the soil's aeration; the soil's temperature; and the soil's cultivability. Soil texture, structure, colour, temperature, water holding capacity (moisture content), aeration, and compactions are the seven physical attributes cited by the sources (Asogwa, 2014). In order to better understand and address the disparities between the sexes, researchers have developed a method called "gender analysis" (Chekene and Kashim, 2018). Gender orientation, in a similar vein, refers to a person's propensity to value chances for people of both sexes. According to Daudu, Oladipo, and Kayode's (2019) research on the topic of gender capacity building needs on soil fertility management practices among smallholder arable crop farmers in Kwara State, Nigeria, the researchers found that while both male and female farmers needed training in this area, the female farmers needed it more.

Adelakun, Oviawe, and Barfa (2015) proposed legal protections for women from discrimination in the workplace, including in hiring and promotion, policies to support and advance women's and girls' education, and bans on damaging widowhood traditions. Abali (2014) believed that capacity building and empowerment; policy dialogue (legislation), and many others were among the most crucial aspects of gender mainstreaming of development programmes in agricultural output.

Gender and Biological Attributes of Soil Fertility management Practice

Soil's biological attributes refer to its suitability for the growth of plants and the survival of animals that live there. That is, all the little and large creatures that call the soil home. Biological properties of soil were first described by Badldwin(2011) as those characteristics of soil that arise as a result of biotic activities (i.e., the actions of plants and animals) in the soil. Soil organic matter, respiration, microbial biomes (total bacterial, fungal), microbial biomes carbon and nitrogen, and mineral sable nitrogen are all examples of biological markers of soil quality mentioned by the author. According to Burdgett (2005), biological characteristics of soil are those features of soil that emerge as a result of the microbial and biotic activity and ecology of the soil. Author claims that several arthropods, nematodes, protozoa, fungus, and bacteria are involved. For example, Ogunlela and Mukhtar (2009) highlighted several obstacles that prevent women from working in agriculture. Indicators of systemic gender bias mentioned by the authors include laws and practices that limit women's access to financing, production inputs, employment, education, and healthcare, as well as conventions, beliefs, and attitudes that confine women primarily to the home sphere.

Garba (2014) echoed this sentiment, stating that girls are more often than boys consistently denied opportunities to attend school for a variety of reasons, such as HIV/AIDS, gender discrimination, domestic demands, traditional practices, safety concerns, and an inappropriate physical and learning environment at school. Research conducted by Ahiatrogah (2017) at the University of Cape Coast (UCC) looked at the role of gender in the formation of competent educators at a distance. This research looked at how gender plays a role in how students in distance education (DE) learn to be successful educators. The study found that both male and female DE students benefited greatly from their experiences in OCTP and SBTP in terms of developing their teaching abilities. Nonetheless, Huyer (2016) noted that a global gender gap in vulnerabilities, access to resources, and productivity is evident in women's agricultural activities, and that significant gender gaps in access and control continue to exist in regard to six key resources and inputs for agriculture, including land, labour, credit, information, extension, and technology.

Study Objectives

The ultimate goal of this research is

To compare male and female lecturers' requirements for professional development in the area of educating students about the physical features of soil

Teaching about the biological features of soil management practices: the demands of male and female lecturers in terms of capacity development

Methods of the Study

The study used an *ex-post facto* design since it looked into the past rather than the present, and because all the independent variables were previously established and uncontrolled. This study's sample includes all 201 agriculture education professors working at

Nigeria's postsecondary institutions in Delta State. The study included all 201 participants. Population size was so low that total sampling methods had to be applied. The data was gathered with the use of a questionnaire called the Soil Fertility and Fertilizer Management Practices Questionnaire (SFFMPQ), which was designed after a thorough examination of the existing literature on the subject of soil fertility and fertilizer management. Proficient members of the Department of Vocational Education checked the appearance of the instrument. The dependability of the SFFMPQ items was calculated using the Cronbach Alpha technique, and the resulting index was 0.86, indicating high levels of internal consistency. The researcher had study assistants hand out copies of the questionnaire to the participants.

Data Analysis

The data was analyzed using descriptive statistics to provide insight into the questions under investigation. To do this, we needed to calculate the mean and standard deviation. The t-test was used for statistical significance assessment of hypotheses.

Research Question 1: What are the capacity building needs of lecturers in in teaching physical properties of soil management practices?

Table 1: Lecturers mean ratings of physical attributes of soil management approaches in which they needed more training

S/N	Items	$\bar{X}n$	$\bar{X}p$	D (NG= Xn-Xp)	Remark
1	Detail the soil's measurable attributes, please.	3.65	2.79	0.86	CBN
2	Identify the distinguishing features of various soil textures.	3.63	2.61	1.01	CBN
3	Describe the significance of each physical attribute.	3.63	2.65	0.97	CBN
4	Give some examples of how soil structure affects agricultural production.	3.58	2.81	0.76	CBN
5	Sort soils into categories based on their properties.	3.64	2.54	1.10	CBN
6	Establish the role of agricultural operations in altering soil structure	3.67	2.85	0.82	CBN
7	List some of soil's physical characteristics.	3.68	2.91	0.77	CBN
8	Recognize the Soil's Physical Characteristics	3.78	2.77	1.01	CBN
9	Separate soil structure classes based on shared and unique features	3.63	2.61	1.01	CBN
10	List the characteristics that may be observed in the soil's physical makeup.	3.62	2.74	0.88	CBN

**N =201, level of need (Xn), level of performance (Xp) and capacity building needed (CBN)*

Table 1's data indicated that, on average, students had a favorable opinion of their professors. The table comprised 10 groups, each having a need gap value between 0.76 and 1.10 and a performance gap value between -0.16 and 0. This suggested that Agricultural Education faculty in South-South Nigerian universities need capacity building (CBN) on 9 clusters in physical features of soil management procedures in order to effectively teach students.

Hypothesis 1: There is no significant difference in the capacity building needs of male and female lecturers in in teaching physical properties of soil management practices

Table 2: test of Physical features of soil management procedures required by educators of Agricultural Education, as rated by male and female lecturers

Variable	N	Mean	SD	DF	t-cal	t-tab	p-value	Remark
Male	143	3.65	0.06	198	1.78	1.665	0.023	Reject Null
Female	58	2.79	0.64		2			Hypothesis

The tabulated t value of 1.665 is larger than the computed t value of 1.782 at a p-value of 0.023, as seen in Table 2. The results showed that male and female lecturers did not have similarly different opinions on the importance of addressing the physical features of soil in agricultural education curriculum. As a result, male Agricultural Education lecturers need capacity building (CBN) on all 10 clusters in physical features of soil management methods for successful instruction of students more than female lecturers.

Research Question 2: What are the capacity building needs of lecturers in teaching biological properties of soil management practices?

Table 3: Mean rating of capacity building of Agricultural Education lecturers on biological properties of soil management practices.

S/N	**Cluster Items**	**Xn**	**Xp**	**D (NG= Xn-Xp)**	**Remark**
11	Explain soil fauna	3.78	2.77	1.01	CBN
12	State importance of soil fauna	3.68	2.91	0.77	CBN
13	Describe classes of soil fauna	3.63	2.65	0.97	CBN
14	Identify factors that influence soil fauna	3.62	2.70	0.92	CBN
15	Explain soil flora	3.63	2.65	0.97	CBN
16	State importance of soil flora	3.63	2.80	0.83	CBN
17	Describe classes of soil flora	3.67	2.85	0.82	CBN
18	Identify factors that influence soil fauna	3.67	2.74	0.93	CBN
19	Explain soil organic matter	3.63	2.61	1.01	CBN
20	Identify components of soil organic matter	3.63	2.65	0.97	CBN

**N =201, level of need (Xn), level of performance (Xp) and capacity building needed (CBN)*

Table 3 shows the average ratings for lecturers; the need gap values for the 10 groups all fall within a positive range, from 0.77 to 1.01. For efficient instruction of students at South-South

Nigerian Colleges of Education, it was clear that the Agricultural Education lecturers needed capacity building (CBN) on all 10 clusters in biological characteristics of soil management approaches.

Hypotheses 2: There is no significant difference in the mean ratings of male and female lecturers in teaching biological properties of soil management practices.

Table 4:Mean difference of male and female lecturers in teaching biological properties of soil management practices

Variable	N	Mean	SD	DF	t-cal	t-tab	p-value	Remark
Male	143	3.78	0.05	198	1.884	1.773	0.038	Reject Null Hypothesis
Female	58	2.77	0.64					

At a significance level of 0.038, Table 4 demonstrates that the computed t value of 1.884 is larger than the reported t value of 1.773. The results showed that male and female lecturers do not differ in their delivery of the material about the biological features of soil management methods, thereby refuting the null hypothesis. That means male agricultural lecturers are in more need of training on how to teach the biological characteristics of soil management than their female counterparts.

Discussion of Findings

According to the data in table 1, Agricultural Education lecturers require capacity building to better educate their students on the importance of understanding the physical characteristics of soil. Table 2's hypothesis testing demonstrates that the computed t value of 1.782 is larger than the tabulated t value of 1.665 at a p-value of 0.023. The results showed that there is a substantial difference in the mean ratings of male and female lecturers in the teaching of physical features of soil management procedures, therefore ruling out the null hypothesis. This demonstrates that male professors require more capacity building need (CBN) than their female colleagues in order to effectively instruct students on the physical features of soil management techniques. These results are at odds with those of Daudu, Oladipo, and Kayode (2019), who conducted a study on the topic of gender capacity building needs on soil fertility management practices among smallholder arable crop farmers in Kwara State, Nigeria. They found that while both gender needed training in this area, women needed it more than men. In addition, the findings of this study lend credence to the claims of Giroud and Huaman (2019), who noted that the agricultural sector is crucial to economic growth, employment, poverty reduction, and food security in developing countries, and that, given the central role that women play in the agricultural sector, ignoring gender issues in agriculture can have negative social and economic consequences.

Table 3's findings also showed that Agricultural Education lecturers required capacity building in order to effectively educate their students about the biological features of soil management techniques. The results of the table 4 hypothesis tests demonstrate that the computed t value of 1.884 is larger than the tabulated t value of 1.773 at a p-value of 0.038. As a result, we cannot accept the null hypothesis that there is no difference between male and female lecturer mean ratings when it comes to educating students on the biological features of

soil management approaches. This suggests that male agricultural lecturers are more in need of training in how to explain the biological aspects of soil management approaches than their female colleagues. These results support the research of Ahiatrogah (2017), who looked at how gender affects students' ability to learn and use effective teaching techniques when studying remotely. The study found that both male and female DE students benefited greatly from their experiences in OCTP and SBTP in terms of developing their teaching abilities. There is, nevertheless, a statistically significant gap in the pedagogical knowledge and abilities acquired by male and female DE students. It was also discovered that there was a gender difference in how teachers learned new techniques. However, these results are consistent with those found in a research by Nwabueze, Nwokedi, and Edikpa (2018) on the training requirements of university lectruers in the field of information and communication technology.

Conclusion/Recommendations

The results of this study indicate that agricultural education lecturers have different capacity development requirements based on their gender while educating students about the biological and physical features of soil fertility management practices. Therefore, male agricultural educators require capacity building (CBN) in instructing students on the physical and biological aspects of soil management procedures than their female counterparts. The gender disparity in Agricultural Education can be reduced if female professors are not singled out during capacity development workshops but are instead actively encouraged to participate in such workshops.

References

1. *Abali, I (2014). Gender mainstreaming in agricultural production: A reviewNigerian Journal of Rural Sociology. 15, 135-141*
2. *Abdullahi, A. &Ajoku, K.B. (2001). Capacity building for sustainable industrial development a Nigerian perspective / by Abubakar Abdullahi, Kemjika B. Ajoku in collaboration with Raw Materials Research and Development Council, Abuja Nigeria.*
3. *Adelakun, O. Oviawe, J. &Barfa, G. (2015). Strategies for enhancing females participationin technical, vocational education and training (TVET) in Nigeria. Advances in SocialSciences Research Journal 2 (4), 110-120*
4. *Ahiatrogah (2017). Gender dimension in the development of effective teaching skills amongUniversity of Cape Coast (UCC) distance education students.World Journal of Education, 7 (4), 12-23.*
5. *Akpokiniovo, S.R. (2018). Science and technology of education: panacea for ensuring peace, national unity and sustainable development in the 21st century Nigeria. EuropeanJournal of Education Studies. 6(1):128-140.*
6. *Akpokiniovo-Uwawah, F.T (2022). Staff working conditions and organizationalcommitment: a correlational analysis of Delta State Universities. Innovations, 70 (1), 123-134.*
7. *Asadu, C.L.A. (2010) Definitions of fertilizers and associated terms. Lecture note on TOTon fertilizer Analysis for crop facilitators. University of Nigeria Nsukka. 29 Nov-Dec 02,2010).*
8. *Badldwin, O. (2011). Enabling possibility: Women associate professors' sense of agency incareer advancement. Journal of Diversity in Higher Education, 7(1), 58-76.*

9. *Burdgett, I. (2005). Elements of the nature and properties of soils. New York, Person Education International, 341 - 244.*
10. *Chekene M.B, Kashim I.U (2018). Gender equality: women in agriculture or gender in agriculture. Agricultural Research and Technology: Open Access Journal, 18(5), 00239-00242*
11. *Daudu, A.K, Oladipo, F.O and Kayode, A.O. (2019) Gender capacity building needs onsoil fertility management practices among smallholder arable crop farmers in Kwara State,Nigeria. Journal of the Saudi Society of Agricultural Sciences. 18(3), 241-248*
12. *Garba, J.A. (2014). Factors militating against the enrolment and retention of girl-childstudents in junior secondary schools in Kaduna State. Unpublished M.Ed Thesis, ABU Zaria. Pp.95*
13. *Giroud, A. Huaman, J.S (2019). Investment in agriculture and gender equality in developing countries. Transnational Corporations, 26(3), 89-113*
14. *Hodges, S.C. (2011). Soil fertility Basics. Soil Science Extension: North Carolina StateUniversity Press*
15. *Huyer, S. (2016). Closing the gender gap in agriculture. Gender, Technology andDevelopment, 20(2), 105-116*
16. *InternationalFertilizerIndustryAssociation(IFIA,2011).Fertilizersandthe Industry. www.fertiliser.com.Retrieved on 15/08/2011*
17. *Joseph, O. (2012). Green Manuring: principles and practices. New York. John. Wiley andsons, Inc.*
18. *Lee (2017). Factors affecting availability of inorganic nutrients in soils with special reference to micronutrient metal. Annual Review of plant physiology 3:1-16*
19. *Lorchugh, T. (2006). Effect of tillage and farm yard manure on physical properties of soil.International research journal of plant science 1 (4), 075-085*
20. *Maghsoudi, T. (2007). Agricultural and Rural Development: concept of cooperation andcooperatives and their differentiation with similar terms.*
21. *Ndirika, M. C. (2013). Game-Based learning: A panacea for better attitude and academicachievement in basic science. Journal of Educational and Social Research, 3(8), 91.*
22. *Nnaji, G.U. (2010). Fertilizer types and specifications including the effects of fertilizermisuse. Lecturer note on TOT on fertilizer analysis for crop facilitators, University ofNigeria, Nsukka on 29 Nov-Dec 02, 2010.*
23. *Nwabueze, A. I., Nwokedi, O.C.U. &Edikpa, E. C. (2018). Capacity building needs ofeducation lecturers in information and communication technology in universities.International Journal of Scientific & Engineering Research, 9(6), 1266-1287*
24. *Ogunlela, Y. I., & Mukhtar, A. A. (2009). Gender issues in agriculture and rural development in Nigeria: The role of women. Humanities and Social Sciences Journal, 4, 19-30.*
25. *O'kwu, E.I &Ijenkeli's, E. (2012). A sustainable vocation and technical agriculturaleducation for national economic empowerment and development strategy (NEEDS).Journal of Vocational Education, 1, 1-6.*
26. *Oladipo, F.O. & Kayode's, E (2019). Assessment of poverty alleviation strategies used byrural farming households in Ondo State, Nigeria. International Journal of Agricultural Science Research and Technology in Extension and Education Systems, 7(2), 73-78.*

27. *Olaitan, S.O; Alaribe, M.O &Nwobu, V.I. (2009). Capacity building needs of teachers ofagriculture for effective teaching in basic schools in Abia State. A paper presented atthe Annual Conference of Faculty of Education, University of Nigeria, Nsukka.*
28. *Onipede, I. (2013). Effectiveness of resource inputs into the implementation of agriculturaleducation programme in Colleges of Eduction in South-West, Nigeria. Unpublished Ph.D thesis. Department of Vocational Teacher Education, University of Nigeria, Nsukka.*
29. *Starvrons, J.M (2018). Capacity building: An appreciative approach. Unpublished thesis,case western Reserve University Cleveland, Ohio.*