



Received: 07/04/2026 | Accepted: 20/05/2026 | Published: 30/05/2026

Entrepreneurial Skills Required by Agricultural Education Students in Tertiary Institutions for Fish Pond Application of Organic Manure and Water Management in Rivers State

¹BARIDOMA, M. P. (Ph.D)*

²LAZARUS, S. T. (Ph.D)

^{1&2}Department of Agricultural Education, Faculty of Education, Rivers State University, Port Harcourt

Abstract

This study focused on the entrepreneurial skills required by agricultural education students in tertiary institutions for fish pond application of organic manure and water management in Rivers State. Three objectives and three research questions guided and answered in the study. The population of the study was 64, comprises of lecturers in the department of agricultural education in tertiary institutions in Rivers State and extension officers working with Rivers State agricultural development programme (RSADEP). Census sampling technique was used due to manageable size of the population. The instrument used for data collection was structured research questionnaire. Mean and standard deviation were used in answering the research questions. The finding of the study among others shows that entrepreneurial skills required by agricultural education students in tertiary institutions for fish pond application of organic manure are; the doses and methods of application, procurement of organic manure, identifying organic composition that will give more growth to planktons, preparation of organic manure, use of cow dung and oil cakes in the production of planktons in fish pond, measuring the depth of water, calculate water volume and then calculate quantity of manure to be applied in the fish pond, principle of application of manure in fish pond, when to stop applying manure in fish pond and identifying when manure is required in fish pond. While the skills required for fish pond water management are; test for hydrogen ion in fish pond water, post fish stocking water management, culture of fishes in brackish water and marine water bodies, water quality monitoring, maintaining water quality in respect to acidic, alkalinity and turgidity of fish farm water, understanding water storage and Treatment, maintaining depth of water in different types of fish pond, water management with respect to quality and quantity (flooding) and calculating water volume in fish Pond. It was therefore recommended among others that, undergraduate students in tertiary institutions should be properly taught on how to apply organic manure, especially if earthy pond facility is to be used in order to enhance easy growth of planktons (fish food). Also, Government should organize seminars and workshops for lecturers and extension officers in order to equip them with the task of teaching.

Keywords: Entrepreneurial Skills, Agricultural Education, Students, Pond, Organic Manure, Water Management, Tertiary Institutions, Rivers State

*Corresponding Author:

BARIDOMA, M. P. (Ph.D)

Email: baridoma.monday@ust.edu.ng

Introduction

Fish enterprise which can also be referred to as fish farming involves raising fish in ponds and its distribution to the final consumers. It is an artificial method of raising fish for human consumption in tanks or enclosures, usually for food. Fish production enterprise is a profitable agricultural venture and a major source of food. In Nigeria, the role of fish enterprise in achieving household and national food security, poverty alleviation and job creation cannot be overemphasized. It is an ancient practice that can still provide profitable means of livelihood for both rural and urban dwellers. (Baridoma and Nlebem, 2024).

According to Food and Agricultural Organization (FAO) (2005) Fish is a popular source of protein and white meat in almost all parts of Nigeria. Its nutrient provides a good source of high-quality protein and other essential nutrients, which are especially important for mothers and growing children. It is low in calories and cholesterol levels, but rich in protein. However, besides this importance there are many technical problems arise in the fish production which are, lack of skills in water management and application of organic manure etc in order to allow the establishment and growth of planktons which is a free-living organism that fish feed on. These basic skills are necessary for effective

management of fish enterprise and its can be acquired either through formal or informal education.

Meaning that skill acquisition is very necessary, then what is skill acquisition? Skill acquisition is the development of a novice into an expert. To do this one must understand the physiological components that characterize skilled performers from unskilled performers, such as efficiency and accuracy in performing an operation. Skill acquisition can also be referred to as the ability to bring about some end result with maximum certainty and minimum outlay of energy or of time and energy. That is a novice could conceivably execute a particular task, yet not be able to perform it consistently, or with as little effort relative to an expert performer. Skills acquisition in this study is the process of training undergraduates in tertiary institutions who are novices in the areas of fish pond water management and application of organic manure to become experts in these areas.

According to National Special Programme for Food Security (NSPFS) in Baridoma (2024). The natural fish food production in the pond can be increased by applying fertilizer to the pond. Fertilizers which can be used include farmyard manure, compost and chemical fertilizers. Before filling the pond with water, spread fertilizer on the dry pond bottom.

When the pond is filled with water, adding fertilizer to the pond water should take place at regular intervals, preferably late morning or early afternoon. The continuous addition of fertilizer ensures continuous production of zooplanktons and phytoplanktons which are natural food for the fish. Preparation of old and new ponds is done to create a requisite environment for the wellbeing and growth of the fish to be stocked. The principles of preparation are basically the same for old and new ponds, though there are minor contingent differences which generally involves lime and fertilizer treatment of pond bottom to reduce loss of seepage, improve fertility of the pond thus stimulate the growth of planktons (NSPFS, in Baridoma, 2024)

According to Ekong and Udoh (2014), in the application of organic fertilizer the management skills performed includes: obtain fertilizer materials from highly hygienic poultry farm, impound clean non-chlorinated water 2/3 of pond depth, calculate and measure out appropriate quantity of the fertilizer based on the square meter (m^2) of the pond, divide the fertilizer into 3-4 parts, put into separated sac bags, and tie the mouth with long strings, suspend the bags each at a corner of the ponds, allow the bags suspended in water for about 2 days and thereafter pull out, allow the water to stand for about 2 weeks for observations, watch out for gradual colouration to brownish and then to greenish,

the green colouration of the water, communicate that the water has been successfully fertilized, therefore ready for fish stocking. Also, Ekong and Udoh (2014) said management skills in application of inorganic fertilizers are impound water 2/3 of the pond water holding capacity, measure out correct quantity of fertilizer depending on square meter (m^2) of the pond, put into clean, open container e.g bucket, add clean water and stir to dissolve completely, allow the solution to stand for about 30 minutes to give out heat since inorganic fertilizers are exothermic, pour the solution into water in the pond, allow the water to stand for 2 weeks to be cultured, which out for gradually changing of the water from colourless to brownish then finally greenish, and the green colouration communicates that the water is effectively fertilized and ready for fish stocking. Water quality is important to the beneficial use of the fishes, but the parameters and levels of concern will vary depending on the intended use of the pond. For example, water quality criteria are much different in ponds used for animal and human drinking water compared to ponds used for irrigation and fishing. Water quality also plays an important role in determining the types and number of fish species that can will be reared in all fish ponds as well as their growth and survival rates (Pennsylvania State University, 2000).

Udoh (2012) opined that fish pond water effectively fertilized and rendered suitable for fish stocking should attain acceptable levels of required physical, chemical and biological components of pond water parameters suitable for fish culture. Omiloyin(2007) is of the opinion that the quality of pond water is determined by the presence of the following parameters: dissolved oxygen, the percentage of hydrogen ion (pH), water hardness and water turbidity. The concentration of hydrogen ion (pH) in pond water is measured and determine on a scale of 1-14 which is the acidity and alkalinity content in water. The (pH) range of 0 – 6.5 indicate that the pond water is described acidic. The pH of 7 the water is termed neutral which implies that the water is neither acidic or alkaline and the (pH) range 7.5 – 14 described the water alkaline fish however perform well at the pH of 6.5 – 9.0 anything less or high the fish are stressed and could head to mortality (Omitoyin, (2007). The pH of fish pond water can be determined using the following methods; litmus paper, source of water supply, pH meter instrument, tongue testing etc

1) Litmus Paper: This is a chemical paper that changes colour which exposed to different level of hydrogen ion in water. If the water is acidic, a blue litmus paper is turned red, if the water is alkaline, its turns red litmus paper blue. Pond water hydrogen ion

(pH) can be corrected to normal level of 6.5 – 9 to support fish high productive through addition of limestone (calcium carbonated). The chemical is applied by spreading on top of the pond. The quantity spread is determined by the area of the pond.

2) The source of water: If water supplied to pond is from swamp, stagnant base and properly contain decaying materials the water is likely to be acidic.

3) pH meter: is an instrument used to determine hydrogen ion in water. It is graduated from 0-14 when inserted in pond water it acidic it needs 1-65, if the water is neutral it read 7 and from 7.6 – 14 is alkaline

4) Tongue tasting: The tongue tasting could only be used as the last option, as it can be dangerous to human health, if not skillfully conducted. The acidity and alkalinity concentration of pond water can be determined traditionally using the tongue. Farmer taste-tongue pond water, if the water taste biter, sharp or vinegary the pH level is said to be acidic. But if the water tastes bitter the hydrogen ion (pH) level is alkaline, but when the hydrogen ion is neutral the water has no taste and is suitable for fish rearing. The acidity can be corrected by the application of lime-based substances, e g calcium carbonate, wood ash, plantain extract (liquid, ash, stem) while the alkalinity can be corrected by adding leaves with sharp taste, e

g bitter leaves, alum, fertilizer (NPK) (Udoh, 2012).

- Dissolved oxygen in fish pond: This is the level of oxygen present in pond water. According to Omitoyin (2007), the dissolved oxygen level range of 4 and above per 1 part of a million (ppm) is accepted in fish farming. Traditionally dissolved oxygen in pond water could be detected through fish behaviour and a farmer's knowledge of water management skills such as farmers' observation of sluggish and vertical movement of fish with their head raise above water level and gulping air from outside, against the horizontal smart movement of fish. This behaviour according to Ekong and Udoh (2014) indicates that the dissolved oxygen of the water is very low and if the condition continues it can cause high mortality of fish. Alternatively, if a farmer spat into pond water, early in the morning wait for 2 – 3 minutes to observe the rate at which the spit dissolved in water. If the spit dissolved quickly with 2 minutes the dissolved oxygen level is high, but if delays the dissolved oxygen level is low. Low dissolved oxygen in pond water can be corrected through the following water management skills.

1. Aerate the pond water if water aerator was installed.
2. Reduce the volume of the water through water outlet system and

simultaneously impound fresh water into the pond through water inlet system until the deoxygenated water is displaced.

3. Stir up the water with plank to curb in oxygen if such provision is available.

- Hardness of water in fish pond: Pond water hardness refers to the total quantity of soluble salt dissolved in the water. The soluble salts are calcium (ca), magnesium (mg) and potassium (k). The soluble salt helps the growth of fish teeth and bones. It equally helps fish food (planktons) to grow. The presence of much soluble calcium and magnesium salt in pond water is described as "hard", while available of these salts in less quantity renders the water soft. Hardness in pond water range of 50 – 100 per 1 part of a million (ppm) is acceptable in fish pond (Ekong and Udoh, 2014). Hardness in pond water can be dictated by a farmer's management practices of using the pond water to wash hand with soap, if the pond water does not form lather with soap easily and if the lather does not remain in the hand for a long time, the water is hard and is good for fish culture. But if the water form lather with soap easily and the soap is difficult to wash off, the water is soft, thus the farmer needs to apply soluble salts such as lime, calcium, magnesium to increase the quantity of soluble salt in the water. Hardness in pond water could also be dictated traditionally

through salt deposition in the pond inner-walls. When a farmer looks closely on the inner walls of a pond, just before the water level falls, and observes whitish colour deposition, the dissolve soluble salt in the water is high which renders the pond water hard, the harder the water, the better for fish productivity (Ekong and Udoh, 2014).

- Pond water Turbidity: This is the degree of cloudiness and muddiness of pond caused by suspended particles in the water. Pond turbidity can occur as a result of bad source of water which might contain organic matter that makes the water muddy. It can also occur if there is deposition of mud on the bottom of the pond. This is common in earthen pond which is constantly stirred by bottom feeders' fish. High pond water turbidity prevents enough sunlight penetrating the water for microbial photosynthetic activities by phytoplankton's in producing oxygen and natural food (planktons) for fish food. Turbidity in pond water can be dictated through the farmer is water management skill of; suspending his hand in pond water and observes, if the hand disappears completely at the elbow depth, the water is turbid and need to be diluted. But if the hand still appears even at the elbow depth, the water is not turbid (Essien, 2005). Low turbidity in pond water can be increased through water fertilization whereby enhancing the activities of microbial organism in food formation.

High turbidity in pond water can also occur according to Ekong and Udoh (2014) when fish at the fingerlings /juveniles (baby) stage cannot consume the high rate of planktons (natural food) produced and made available in water through microbial activities. This is indicated by the presence of large quantity of planktons floating on the bottom of the pond. The pond water in this condition could be effectively managed by the farmer removing the excess planktons, using fine sieve materials. According to National Special Programme for Food security (NSPFS) in Baridoma (2024). The availability of good water quality is important for all fish farming systems, but water quantity is of even greater importance for lands-based fish farming system, A constant water supply is needed not only to fill the pond, but to make up for the losses caused by seepage and evaporation. Investigation of the amount and seasonality of the water sources, as well as their position in the field regarding possible pollution is very important in fish pond. Ideally water should be available all year round. Sufficient water should be of sufficient capacity to fill each pond within a few weeks and to keep them full throughout the growing season (NSPFS, in Baridoma (2024)). They continue by saying that, quality of water used for culture is one of the significant factors affecting fish yield. For optimal performance of species being cultured good quality water

must neither be too acidic or alkaline, contain enough dissolved oxygen, not be muddy or turbid, not have offensive colour, be suitable temperature, salinity and colour be free from pathogens as well pollutants eg oil firms, petrochemicals, detergents, agrochemicals. Interaction between the water fish, soil and other organisms during the production cycle changes these water quality parameters and beyond certain tolerance levels, this imposes stress on the fish population. It is therefore very important for the fish farmer to maintain good water quality desirable for fish culture.

According to Ekong and Udoh (2014), pond water stocked with fish still requires basic management practices to maintain good level of water parameters, as well as to promote fish productivity. The basic skills management practices include: supply/maintain good level of water in pond at least 2/3 depth at all times. Dilute pond water weekly to increase the level of dissolved oxygen, shade water from high intensity of sunlight, change pond water if perceived offensive odour, shade water from direct heat of sunlight especially at dry season, remove, leaves dead plant and unwanted organic materials from water, remove excess left-over food floating in water, remove excess algae broom from water, do not allow salt, detergent or petroleum products into pond water and do not allow run-off water from rain into pond.

Fish can be farmed in different water environments with different levels of salt concentration (salinity) such as brackish water, marine water and freshwater environment (Ekong and Udoh, 2014). Brackish water is water environment with salinity range of 134 parts per thousand (ppt) (Omitoyin, (2007)). In Nigeria few species of fish are cultured in brackish water includes: Mullet (mugil cephalus), Tilapia (Tilapia Zilli) etc. Marine water is water environment where salt concentration (salinity) is higher than 35 parts per thousand (ppt). The potential of this fish water environment system is yet to be exploited in Nigeria (Omitoyin,(2007)). Fresh water environment is where salinity is less than 1 part per thousand (ppt). This is the most common type of water environment where fish is commonly raised in Nigeria even in homestead fish farming. Some of the cultivable fish species in fresh water are Africa catfish clarias goriepinus, mud catfish Heterobranchus bidorsali's, and common carp cypinus carpio.

Rearing of fish in the natural water environment requires no water management practices. But the collection of water into a pond facility for the purpose of rearing fish require basic water management practices in order to raise the quality of the water closer to that which is obtainable in the natural fresh environment e.g rivers and streams which favours and support fish growth survival and

productivity in open waters. According to Ekong and Udoh (2014) the management practice in fish pond water environment, however begins with the farmer's knowledge of the sources of water for pond fish farming which includes: river, spring, stream, rain and chlorinated free borehole water. Water supply into pond for fish farming should be absolutely free from impurities and pollutants of either organic or inorganic materials (Ekong & Udoh, 2014). The pond should be filled at least 2/3 of the depth, followed by the culturing of the water to promote the growth of fish pond (planktons). Culturing of pond water commences with fertilization as a soil is usually fertilized to promote plants growth. Pond water is always fertilized to facilitate the formation and growth of zooplankton and phytoplankton for fish food. Organic or inorganic fertilization are used for pond water fertilization. Organic fertilizers such as poultry dropping, pig manure, cow dung can be obtained from animal farms with high level of hygiene for fertilization. Contaminated and polluted organic manure is not advisable, as it could in turns be harmful and destructive to fish if not skillfully handled. Inorganic fertilizer that contains nitrogen, phosphorus potassium base like NPK, Ammonium and sulphates fertilizers are advisable. The application of 20kg of organic fertilizer and 500g of inorganic is suitable for 100m² homestead fish pond. Fertilized pond

water gradually changes from colourless to brownish and greenish in colour. The green pigment in water indicates the growths of planktons (fish food). At this point, the water is effectively cultured and ready for fish stocking.

Statement of the Problem

Fish farming is the principal form of aquaculture. Aquaculture involves raising fish under controlled environment where their feeding, growth, reproduction and health can be closely monitored for food and for other economic benefits (Ejiola and Yinka, 2012). It is an ancient practice that can still provide profitable means of livelihood for both rural and urban dwellers (Salau, Lawee, Luka and Bello, 2014). Fish is an important source of high-quality protein and other essential nutrients which are especially important for mothers, growing children and many households. According to FAO (2007), fish contribute more than 60% of the world supply of protein, especially in the developing countries.

Fish farming as a business venture is capable of bringing significant development in the rural and urban areas by improving family income, providing employment opportunities and reducing problems of food supply and security (Oyinbo and Rekwo, 2013). Most especially the study area Where the institutions are, is blessed with a vast aquatic

medium of numerous water bodies like rivers, streams, lakes reservoirs, flood plains, irrigation canals, coastal swamps that are inhabited by a wide array of both fin fish and non-fish fauna that could offer great potentials for fish production (Akankali and Jamabo, 2011). Meaning that the study area will be appropriate for the establishment of fish pond if the undergraduates of agricultural education are properly train to acquired skills within the period of the study. This ascertain the idea of Baridoma (2024) which says training will expose trainees to the knowledge and skills in jobs related situation using functional training package in an environment that is a replica of work situation, hence the need for the study to ascertain the entrepreneurial skills required by agricultural education students in tertiary institutions for fish pond application of organic manure and water management in Rivers State

Purpose of the Study

The main purpose of the study was to ascertain the entrepreneurial skills required by agricultural education students in tertiary institutions for fish pond application of organic manure and water management in Rivers State. Specifically, the study sought to:

1. Determine the entrepreneurial skills required by agricultural education students for application

of organic manure in fish pond in Rivers State.

2. Ascertain the entrepreneurial skills required by agricultural education students for fish pond water management in Rivers State.

Research Questions

The following research questions guided this study.

1. What are the entrepreneurial skills required by agricultural education students for application of organic manure in fish pond in Rivers State?
2. What are the entrepreneurial skills required by agricultural education students for fish pond water management in Rivers State?

METHODOLOGY

The study employed survey research design. Survey research design involves gathering of information or asking questions from a group of individuals called respondents. According Baridoma and Nlebem (2024) survey research design is an investigation in which only part of sample of the population is studied and the selection is made so that the sample represents the whole population. The population of the study was 64 respondents made up of all the lecturers in the department of agricultural education in tertiary

institutions in Rivers State and the extension officers working with Rivers State Agricultural Development Programme (RSADEP). The selected tertiary institutions are Rivers State University, Ignatius Ajuru University of Education and Federal College of Education, Omoku. Census sampling technique was used due to manageable number of the population. A structured research questionnaire developed by the researcher consisting of 20 items developed in four-point rating scale of Strongly Agree

(SA), Agree (A), Disagree (D) and Strongly Disagree (SD). Responses to the questionnaire were analyzed using mean and standard deviation in answering the research questions with an acceptance mean value of ≥ 2.50 otherwise rejected.

Results and Discussion of Findings

Research Question 1: Determine the entrepreneurial skills required by agricultural education students for application of organic manure in fish pond in Rivers State?

Table 1: Mean and Standard Deviation response of lecturers and extension officers on entrepreneurial skills required by agricultural education for application of organic manure in fishpond

S/N	Items on application of organic manure in fish pond skills.	Group	Mean	SD	Remark
1.	When and how to apply manure to the pond	Lecturers	3.57	.514	SA
		Extension officers	3.53	.507	SA
2.	The doses and methods of application of organic manure	Lecturers	3.50	.519	SA
		Extension officers	3.56	.504	SA
3.	Procurement of organic manure	Lecturers	3.50	.519	SA
		Extension officers	3.50	.508	SA
4.	Identifying organic manure composition	Lecturers	3.57	.514	SA

	that will give more growth to planktons	Extension officers	3.63	.492	SA
5.	Preparation of organic manure	Lecturers	3.64	.497	SA
		Extension officers	3.63	.492	SA
6.	Use of cow dung and oil cakes in the production of planktons in fish pond	Lecturers	3.57	.514	SA
		Extension officers	3.63	.492	SA
7.	Measuring the depth of water, calculate water volume and then calculate quantity of manure to be applied in the fish pond	Lecturers	3.64	.497	SA
		Extension officers	3.59	.499	SA
8.	Principle of application of manure in fish pond	Lecturers	3.57	.514	SA
		Extension officers	3.56	.504	SA
9.	When to stop applying manure in fish pond	Lecturers	3.71	.469	SA
		Extension officers	3.59	.499	SA
10.	Identifying when manure is required in fish pond	Lecturers	3.57	.514	SA
		Extension officers	3.53	.507	SA

Source: Field Data, (2025)

N=64

Table 1 reveals that the mean values for the ten items on application of organic manure in fish pond treatment for the lecturers and

extension officers range from 3.50 to 3.71 and standard deviation from .469 to .519. This indicates that lecturers and extension officers strongly agree to all the items as the

entrepreneurial skills required by agricultural education students for application of organic manure in fish pond treatment.

Research Question 2: What are the entrepreneurial skills required by agricultural education students for fish pond water management in Rivers State?

Table 2: Mean and Standard Deviation response of lecturers and extension officers on entrepreneurial skills required by agricultural education for fish pond water management

S/N	Items on fish pond water management skills	Group	Mean	SD	Remark
1.	Fish pond water management	Lecturers	3.71	.469	SA
		Extension officers	3.59	.499	SA
2.	Test for hydrogen ion in fish pond Water	Lecturers	3.57	.514	SA
		Extension officers	3.53	.507	SA
3.	Post fish stocking water Management	Lecturers	3.50	.519	SA
		Extension officers	3.56	.504	SA
4.	Culture of fishes in brackish water and marine water bodies	Lecturers	3.50	.519	SA
		Extension officers	3.50	.508	SA
5.	Water quality monitoring	Lecturers	3.57	.514	SA
		Extension officers	3.63	.492	SA
6.	Maintaining water quality in respect to acidic, alkalinity and	Lecturers	3.64	.497	SA
		Extension officers	3.63	.492	SA

	turgidity of fish farm water				
7.	Understanding water storage and Treatment	Lecturers	3.57	.414	SA
		Extension officers	3.63	.492	SA
8.	Maintaining depth of water in different types of fish pond	Lecturers	3.64	.497	SA
		Extension officers	3.59	.499	SA
9.	Water management with respect to quality and quantity (flooding)	Lecturers	3.57	.497	SA
		Extension officers	3.56	.499	SA
10.	Calculating water volume in fish Pond	Lecturers	3.71	.469	SA
		Extension officers	3.59	.499	SA

Source: Field Data, (2025)

N=64

The data presented in table 2 revealed that the mean values for the ten items on fish pond water management for lecturers and Extension officers ranges from 3.50 to 3.71 and standard deviation from .469 to .519. This indicates that lecturers and extension officers strongly agree to all the items as the entrepreneurial skills required by agricultural education students for fish pond water management.

Discussion of Findings

Table 1 reveals that the mean values for the ten items on application of organic manure in

fish pond treatment for the lecturers and extension officers range from 3.50 to 3.71 and standard deviation from .469 to .519. This indicates that lecturers and extension officers strongly agree to all the items as the entrepreneurial skills required by agricultural education students for application of organic manure in fish pond treatment. This is in agreement with the findings of National Special Programme for Food Security (NSPFS) in Baridoma(2024) which says natural fish food production in the pond can be increased by applying fertilizer to the pond. This is true because the continuous

addition of fertilizer ensures continuous production of zooplanktons and phytoplanktons which are natural food for the fish. Also this is in consonance with the findings of Ekong and Udoh (2014), which says, in the application of organic fertilizer the management skills performed includes: obtain fertilizer materials from highly hygienic poultry farm, impound clean non-chlorinated water 2/3 of pond depth, calculate and measure out appropriate quantity of the fertilizer based on the square meter (m²) of the pond, divide the fertilizer into 3-4 parts, put into separated sac bags, and tie the mouth with long strings, suspend the bags each at a corner of the ponds, allow the bags suspended in water for about 2 days and thereafter pull out, allow the water to stand for about 2 weeks for observations, watch out for gradual colouration to brownish and then to greenish, the green colouration of the water, communicate that the water has been successfully fertilized, therefore ready for fish stocking

The result from table 2 revealed that the mean values for the ten items on fish pond water management for lecturers and extension officers ranges from 3.50 to 3.71 and standard deviation from .469 to .519. This indicates that lecturers and extension officers strongly agree to all the items as the entrepreneurial skills required by agricultural education students for fish pond water management.

This is in consonance with the findings of Ekong and Udoh (2014) which says pond water stocked with fish still requires basic management practices to maintain good level of water parameters, as well as to promote fish productivity. Also, Pennsylvania State University (2000) maintained that water quality also plays an important role in determining the types and number of fish species that can reared good and quality fishes in ponds as well as their growth and survival rates.

Conclusion

The study concluded that, entrepreneurial skills required by agricultural education students for application of organic manure in fish pond involves the following; when and how to apply manure to the pond, the doses and methods of application, procurement of organic manure, identifying organic composition that will give more growth to planktons, preparation of organic manure, use of cow dung and oil cakes in the production of planktons in fish pond, measuring the depth of water, calculate water volume and then calculate quantity of manure to be applied in the fish pond, principle of application of manure in fish pond, when to stop applying manure in fish pond and identifying when manure is required in fish pond. While the skills required for fish pond water management are; test for hydrogen ion

in fish pond water, post fish stocking water management, culture of fishes in brackish water and marine water bodies, water quality monitoring, maintaining water quality in respect to acidic, alkalinity and turbidity of fish farm water, understanding water storage and Treatment, maintaining depth of water in different types of fish pond, water management with respect to quality and quantity (flooding) and calculating water volume in fish Pond.

Recommendations

Based on the findings, the following recommendations were made.

1. The undergraduate students in tertiary institutions should be properly taught on how to apply organic manure, especially if earthy pond facility is to be used in order to enhance easy growth of planktons (fish food).
2. Skill in fish pond water management should be taken very seriously by the lecturers as to create the awareness in their students the importance of water quality in fish production.
3. Government should organize seminars and workshops for lecturers and extension officers in order to equip them with the task of teaching in their areas of jurisdiction.

REFERENCES

- Akankali, J. A. and Jamabo, N.A. (2011). A Review of Some Factors Militating Against Sustainable Artisanal Fisheries Development in Niger Delta, Nigeria. *Asian Journal of Agricultural Sciences*, 3(5): 369-377.
- Baridoma, M.P. (2024). Development of fish enterprise training package for skill acquisition for out-of-school youths in Rivers and Bayelsa States (PhD Thesis, University of Uyo, Uyo, Akwa-Ibom State, Nigeria)
- Baridoma, M.P. and Nlebem, B.S.(2024). Entrepreneurship skills required by undergraduate students of agricultural education for fish pond construction and management in Rivers State. *African Journal of Information, Economics and Management Research (AJIEMR)* 2(1), 41-43
- Ekong, A. O; and Udoh, F.E. (2014). Fish pond water management practices and students acquisition of skills in Homestead fish farming. *Journal of Education*. 7(1): 77 – 88.
- Ejiola, M.T, and Yinka, O.F.(2012).Comparative Cost Structure and Yield Performance Analysisof Upland and Mangrove Fish Farms in Southwest, Nigeria. *InternationalJournal of Agricultural Management &Development*, 2(3);187-198.

Essien, A.A. (2005). The basics of successful fish farming in coastal and semi coastal zones of Nigeria, Uyo: Impact Ventures.

Food and Agriculture Organization of the United Nations (FAO, (2005) Small scale aquaculture in sub-Sahara Africa: Revisiting the aquaculture target group paradigm. Rome: FAO Fisheries.

Food and Agriculture Organization of the United Nations (FAO, 2007). Inland Fisheries Resources of Nigeria. Corporate Document Repository. Produced by Fisheries and Aquaculture Department; Available: <http://www.fao.org/documentts/en/detail/64969>. Retrieved. 04/02/2025 (Accessed on 7 March 2025.).

Omitoyin, B.O. (2007). Introduction to fish farming in Nigeria. Muslim, Lagos: Royal Bird Venture, 58p.

Oyinbo and Rekwot (2013) Fishery Production and Economic Growth in Nigeria: Pathway for Sustainable Economic Development. Journal of Sustainable Development in Africa, 15 (2): 99-109

Pennsylvania State University (2000) College of Agricultural Sciences. Agricultural Research and Cooperative Extension. <https://freshwater-aquaculture.extension.org/wp-content/uploads>, 50p.

Salau, E.S, Lawee, A.Y, Luka, G.E. and Bello, D. (2014). Adoption of improved fisheries technologies by fish farmers in southern agricultural zone of Nasarawa state, Nigeria. Journal of Agricultural Extension and Rural Development, 6(11): 339-346.

Udoh, F. E. (2012). Effect of pond culture practices on students' acquisition of skills in homestead fish culture in Akwa Ibom State. A PhD Thesis submitted to the Department of Vocational Education, Faculty of Education, University of Uyo.