DEVELOPMENT OF A TRAINING MANUAL FOR FISH POND FARMING IN ABIA STATE COLLEGE OF EDUCATION (TECHNICAL) AROCHUKWU

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Abstract

Fish pond farming practice has been in existence in Nigeria for several decades. Fish pond farming provide food and revenues for the farmers, employment for others and contribute to Gross Domestic Product (GDP). Fish pond farming is a teachable skill and hence this paper presents the development of fish pond farming training manual for students of Abia State College of Education (Technical) Arochukwu. To achieve these objectives, five research questions were formulated for the study. A questionnaire was constructed to answer the research questions raised. The questionnaire was validated and its reliability was found to be 0.82. The study used research and development design. The population of the study consisted of 26 fish pond farming practioners and researchers in Umuahia. There no was sample and sampling technique as the population was manageable. The copies of the validated questionnaire were distributed to fish pond farming practioners in Umuahia. The data collected from the filled questionnaires were analyzed using mean and standard deviation. The findings of the study revealed the objectives, contents, teaching strategies, instructional materials and evaluation criteria to be included in the development of the training manual.

Keywords: Manual, Training Manual, Fish Pond, Fish Pond Farming. Abia State College of Education (Technical) Arochukwu

Introduction

Fish belong a class of vertebrate animals. Fish has been identified as the cheapest source of animal protein. Fish as a source of protein form one of the components of balanced diet. In this sense, fish contribute to both physical and mental wellbeing of humans. In addition, fish has been the main source of livelihood of coastal communities and contribute immensely to the Gross Domestic Product (GDP) of many countries around the world. It is the main raw material for the manufacture of fishmeal for poultry and production of oils of various kind (Gaonkar, Rodrigues & Patil, 2012).

Fishes are cold-blooded aquatic animals with backbones, gills and fins (Shagufta, 2012). They are found in ocean, coastal areas, rivers, lakes and streams. There are different fish species. This includes tilapia, catfish, trout, hybrid striped bass, yellow perch, paddlefish, largemouth bass and carp among others. These species and others are found in different parts of the world. According to New Partnership Development (2005), in Africa, the fish sector provides income for over 10 million people engaged in fish production, processing and trade. Fish has also become a leading export commodity for Africa with an annual export value of $2.7 billion (Olaoye, Ashley-Dejo, Fakoya, Ikeweinwe,Alegbeleye, Ashaolu, & Adelaja, 2013).

Global fish stock has been on the decrease due to various forms of human activities. Evidently, overfishing as result of mechanization and commercialization of fishing couple with water pollution and dam building among others has seriously reduce the stock of fish in natural waters. This force scientists to invent various methods to increase fish production (Intensive Carp, 2015). One of the methods invented is fish farming. Fish farming according to shagufta (2012) involves raising fish commercially in tanks or enclosure usually for food. Although fish farming in most cases connotes raising fish for commercial purpose, but in some cases are for non-commercial purpose which include subsistence and hobby among

others. Helfrich, Orth and Neves (2009) corroborated this idea when they remarked that unfortunately, the term "fish farming" often suggests large-scale commercial enterprises directed at the production of food fish for marketing in restaurants and supermarkets. This common misconception of fish farming is misleading in many respects. They further stated that first many successful fish farming ventures are small, family- run, "backyard-type" operations that produce a limited number of food fish for sale in local markets. Second, many fish farms do not grow food fish at all, but instead rear (1) eggs and fingerlings (2-4 inch fish) for sale to food fish producers; or (2) fingerling sport fish for stocking in private ponds and streams; or (3) catchable-sized sport fish for stocking in recreational ponds and fee-fishing waters; or (4) bait minnows, frogs, crayfish, worms, and aquatic insects for sale to anglers as fish bait; or (5) goldfish, tropical fish, turtles, and other aquatic animals and plants for sale as aquarium pets. Finally, many successful fish farms are non-commercial, hobby-type operations that simply grow fish for home use and stocking personal recreational fishing ponds.

Fish farming has so many advantages. Eer, Schie and Hilbrands, (2004) present the following are some advantages of fish farming: 1) Fish is a high quality animal protein provider for human consumption, 2) A farmer can often integrate aquaculture into the existing farm to create additional income and improve water management on the farm, 3) Fish growth in ponds can be controlled: the fish species raised are the ones the farmer selected, 4) The fish produced in a pond are the owner's property; they are secure and can be harvested at will. Fish in wild waters are free for all and make an individual share in the common catch uncertain, 5) Fish in a pond are usually close at hand, 6) Effective land use: effective use of marginal land e.g. land that is too poor, or too costly to drain for agriculture can be profitably devoted to fish farming if it is suitably prepared. However, pond grown fish are not always able to compete financially with fish caught in the wild waters. Despite the advantages of fish farming, it has some disadvantages for example fishing from natural waters does not require building enclosure as the case of pond fish farming. Neither does it require feeding fishes.

Fish farming can be classified in many ways depending on what one use as the basis for classification. Fish farming according to Bolorunduro, (2013) can be extensive, semi-intensive, intensive and super-intensive if one use the level of management input. Extensive fish farming systems are based on the natural productivity of the environment or the structure built for cultivation, using few if any external inputs. Semi-intensive fish farming systems depend on fertilization or complementary feeding for the fish, although a large proportion of nourishment is still provided by natural food. In intensive systems, external food supplies generally represent more than 50% of the total cost of production. In super-intensive systems, all of the fish's nutritional needs are provided through external inputs, and organisms naturally growing in the basin or water (lake, river, etc.) where the fish grow, provide very little nutrition (Velly, Bernard & Charrier, 2009). Using, fish culture practice as a basis of classification that leads to Monoculture and Poly culture. Monoculture is the practice of producing only one species while polyculture involves more than one species in fish farming structures. Fish farming can also be classified as homestead and commercial. In homestead (subsistence) fish farming, the product (fish) is meant for consumption by the fish farmer and his family. Commercial fish farming on the other hand has the goal of selling the product (fish) outside consumers.

Fish farming in addition, can also be classified based on the nature of enclosure used in raising the fish. This lead to cage culture, raceway culture, raft -culture, closed high density, ocean ranching and pond culture. Cage Culture: - Fishes cultured in this system are kept mostly in cages of metal mesh and left in the flowing water. Generally, floating-type of cages are used but submersible and rigid-walled cages are also used. Raceway Culture: - Raceway farms are farms designed or constructed in a way to have regular and abundant flow of good quality and well-oxygenated water. The main sources of water are springs, streams, deep wells or reservoirs. Raft Culture: In this system, the fishes are enclosed and reared in floating materials like raffia palms/bamboo in the water. Closed High density: - In this method the fishes are raised in very high densities in artificial tanks and subjected to supplemental feeding and fertilization. An essential factor considered in this system is aeration of the water. This is usually down with a water purification system. Ocean Ranching: Used mainly for rearing pacific salmon, wherein juvenile fish are hatched and reared, released to mature in the open ocean and caught when they are adults. Pond Culture: Pond culture is probably the most prevalent in the world today. Under this system, the fishes are confined in earthen, concrete, or

otherwise structured ponds whose waters are freshwater or brackish. This aspect of fish farming is comparable to land animal husbandry and is the most promising method for obtaining fry (Abowei &Tawari, 2011). Pond fish farming practice has been in existence in Nigeria for several decades. Pond fish farming provide food and revenues for the farmer, employment for others and contribute to Gross Domestic Product (GDP). Pond fish farming or culture is classified in many ways. If construction design is used as the basis for classification, fish pond fall into; earthen pond, concrete/embarkment pond, barrage pond, diversion pond, rosary pond and parallel pond (Bolorunduro, 2013).

Prospective fish pond farmer must possess knowledge and skills in various aspect of fish pond farming. This include knowledge on fish biology and fish pond construction, In addition, the prospective fish pond farmer must possess skills in raising fish to market size, harvesting as well as marketing. Most of these knowledge, information and skills are found in training manuals. Abia State College of Education (Technical) Arochukwu has built an ultra-modern fish pond to be used in training students and outsiders on fish pond farming. At the moment the College has no single manual for teaching students on fish pond farming. Hence, the authors set out to develop a fish pond training manual for students of Abia State College of Education (Technical) Arochukwu.

Problem Statement

Fish production (or farming) course has long been added to the curriculum of NCE (Nigeria Certificate in Education) Agricultural Education programme in Nigerian Colleges of Education. The library of Abia State College of Education (Technical), Arochukwu contains a variety of textbooks on fish farming for both lecturers and students usage. However, such textbooks are mostly foreign ones, which do not only focus on the farming of the fishes found in Nigeria, but also on the home grown practices of fish farming in Nigeria. In addition, the few indigenous textbooks found in the library are outdated and in black and white prints. Producing updated and coloured indigenous textbook in form of training manual for fish farming in Nigeria will go a long way for enhancing teaching and learning of fish farming in Abia State College of Education (Technical). Therefore, the purpose of this proposal is to develop a training manual for fish pond farming to be used by both lecturers and students in Abia State College of Education (Technical), Arochukwu.

Objectives of the Study

The major objective of this study was to develop a training manual for fish pond farming. Specifically, the study sought to:
1. determine the objectives of the fish pond training manual to be developed.
2. determine the contents of the fish pond training manual to be developed.
3. determine the instructional materials to be used in the teaching of fish pond farming.
4. determine the instructional strategies to be used in the training manual to be developed.
5. determine the evaluation criteria for assessing students' performance.
6. develop the fish pond farming training manual.

Research Questions

The following research questions were formulated to guide the study:
1. What are the objectives of the pond fish pond training manual to be developed?
2. What are the contents of the fish pond training manual to be developed?
3. What are the instructional materials to be used in the teaching of fish pond farming?
4. What are the instructional strategies to be used in the training manual to be developed?
5. What are the evaluation criteria for assessing students' performance?

Fish Pond Training Manual

Generally, manual is one of the most effective materials used for impacting technical skills. Tonge (2010) defined manual as a book of information or instruction. Training manual on the other hand is a material that contains specialized information or instruction in short print. Lanigan, (2010) identified three steps for composing training manual. The steps are: 1) complete a front-end analysis, 2) divide the content

of training into modules or chapters and 3) select a style manual and prepare a style sheet to ensure consistency. Sembai (2019) on the other hand listed six steps for writing manual. The steps include,1) identification of the objectives of the training manual, 2) identification of the target audience, 3) selection of tools, 4) development of the training material, 5) development of assessment component and 6) getting feedback and performing usability testing.

Training manual is broadly divided into preliminaries, modules (or chapters), references, glossary and appendices. The preliminaries contains title page, copy right page, foreword, preface, acknowledgements, Abbreviations/ Acronyms, target audience, purpose of the manual, executive summary and table of contents. The content of the manual is divided into modules (or chapters). The number of modules to be included in a training manual depends to a large extent on the nature of the learners competencies that the author intended to developed. Each module contains introduction, objectives, sections, summary, exercise, answers (optional) and references (Civil Service Training Centre, Ghana, 2013; Nsonga & Imelda, 2016).

Several pond fish training manuals were developed with the aim of helping fish farmers with information and techniques for effective fish farming. Notably, NSPFS (2005) developed a manual on fish pond construction and management. The manual serve as a quick-reference manual and informative material to arouse the interest of the general public and stimulate investment in fish farming. The manual contain the following chapters: Planning the Site and Type of fish Farm, Guidelines for Pond Design and Construction, Aquaculture Management, Application of Fertilizer, Lime and Pond Preparations, Fish Pond Stocking, Water Quality Monitoring and Maintenance, Fish Feeds and Feeding, Preparation of Complete Artificial Feeds, Aquatic Weeds, Predator and Disease Control, Harvesting and Marketing, Record-Keeping in Aquaculture, Live Fish Transportation, Mono sex Tilapia Culture.

Velly, Bernard & Charrier, (2009) developed a training for subsistence fish farming in Africa. The objective of this manual is to explain how to build facilities that produce animal protein — fish — using minimal natural resources and minimal external supplies. The manual is divided into two parts. Part one contains three chapters viz: Fish farming and issues, types of fish farming and Biogeography and fish species. Part two on the other hand consist of seven chapters; the Initial Pre-project Assessment, Village and Site Selection, Characteristics of Ponds, Pond Construction, Biological Process, Handling the Fish and Maintaining and Managing the Ponds

De Graaf and Janssen (1996) wrote Handbook on the artificial reproduction and pond rearing of the African Catfish Clarias Gariepinus in sub-saharan Africa. The handbook is based on the practical field experience of Gertjan de Graaf and Johannes Janssen on the artificial reproduction and rearing of the African catfish within FAO field projects in the Central African Republic, Republic of Congo, Kenya and Nigeria. The manual is divided into five major sections, 1) general biology, including feeding habits and reproduction; 2) artificial reproduction, including induced propagation without and through hormone injection; 3) fry nursing in earthen ponds, including pond preparation, fertilization, feeding and management; 4) monoculture, including feeding methods; and 5) poly culture with Tilapia. In addition, information is provided concerning the economics of different fingerling and grow-out farming practices in Africa, and concerning diseases and hybridisation.

Patongkam, and Miller (2006) developed a manual on Catfish Hatchery and Production. The purpose of the manual is to guide small to medium scale hatchery farm producers in Nigeria. The manual is divided into ten chapters. Viz; requirement for a successful African Catfish Hatchery, Hatchery Facilities and Equipment, African Catfish, Hatchery Techniques for Spawning, Feeding Fry, Rearing of Fry in Fingerlings, Fish Disease, Catfish production in Grow out Pond, Transport of Fish and Business of Fish.

The purpose of the training manual to be developed is to guide small to medium scale hatchery farm producers in Nigeria. This study will take into account of the inadequacies and lack of focus on pond fish farming in Nigeria in the aforementioned training manuals to develop a training manual suitable for use in pond fish farming in Abia State College of Education (Technical), Arochukwu.

Materials and Method

This study adopted research and development design. Research and development according to Gall, Gall and Borg (2007) is an industry-based development model in which the findings of research are used to design new products and procedures, which then are systematically field tested, evaluated, and refined until they meet specified criteria of effectiveness, quality, or similar standards. Research and development design has 10 phases. The phases include; (1 identification of instructional goal, (2 conduct instructional analysis, (3 analyze learner and context, (4write performance objectives, (5 Revise instruction, (6 develop assessment instrument, (7 develop assessment strategy, (8 develop and select instructional materials, (9 Design and conduct formative evaluation and 10) conduct summative evaluation. Since the aim of this study is to develop a training manual for fish pond farming as new product, then research and development design is appropriate for this study. Furthermore, since this study is pilot study, only two phases will be utilized in the project. The phases are as follows:

Phase I Needs Assessment (Determination of objectives, content and evaluation criteria)

Phase II Development of the Training Manual.

The research was conducted in Umuahia, Abia State. The total population of the study comprised of 26 practitioners of fish pond farming drawn from various fish ponds in Umuahia. The instrument used for the study was Fish Pond Farming Instruction Questionnaire (FPFIQ). FPFTQ was validated and its reliability was found to be 0.81.FPFIQ contains six sections; A, B, C, D, E and F. Section A solicits information on the personal data of the respondents. Section B contains items seeking information on the objectives of the training manual on five-point scale. (Very Highly Needed, Highly Needed, Moderately Needed, Slightly Needed and Not Needed). Section C comprises items eliciting information about contents of the training manual to be developed. Section D contains items seeking to find the instructional materials to be used in the training manual. Section E comprises of items focusing on the teaching strategies to be used. Section F on the other hand contains items soliciting information on the evaluation criteria to be used in assessing students after instruction. FPFIQ was administered to 26 fish pond practitioners and the filled questionnaires were collected. The responses of the respondents were analyzed using mean and standard deviation respectively

Findings

Research Question 1

What are the objectives of the fish pond training manual to be developed?

Table 1: Mean and Standard Deviation of Responses of Fish Pond Practitioners on the Objectives of the Training Manual to be developed

N=26

S/N	Objectives	$\overline{X}$	SD	Remark
1	To acquire knowledge and skills of conducting fisibility study/Market survey on fish pond farming	4.27	1.82	Needed
2	To acquire knowledge and skills of contruction and repairs of fish pond	4.58	0.70	Needed
3	To acquire knowledge and skills of managing fish pond	4.54	0.58	Needed
4	To acquire knowledge and skills of feeding a variety fishes in fish pond	4.35	0.75	Needed
5	To acquire knowledge and skills of treating fishes in fish pond	4.46	0.76	Needed
6	To acquire knowledge and skills of harvesting fishes	3.92	0.69	Needed
7	To aquire knowledge and skills of marketing and selling the harvested fishes	4.15	0.57	Needed
8	To aquire knowledge and skills of preservation of the harvested fishes	4.54	0.90	Needed

Table1 shows that all the items in the table had mean values more than 3.50.This implies that such items (Objectives) are to be included in the training manual to be developed.

Research Question 2
What are the contents of the fish pond training manual to be developed?
Table 2:*Mean and Standard Deviation of Responses of Fish Pond Practitioners on the content of the Training Manual to be developed*

			N=26	
S/N	**Content**		**SD**	**Remark**
	Fisibility/Market Survey Study			
9	Definition of fisibility/market survey study	3.81	0.75	Needed
10	Importance of conducting fisibility study/market survey in fish pond farming	3.69	1.09	Needed
11	Steps in conducting fisibility study/market survey for fish pond farming	4.00	0.40	Needed
12	How to write fisibility study/market survey report	3.85	0.73	Needed
	Construction and Repairs of Fish Pond			
13	Designs of various types of fish ponds	4.00	0.53	Needed
14	Construction of diffent types of fish pond	2.42	2.04	Not Needed
15	Neting of pond	3.00	2.00	Not Needed
16	Liming of pond	3.81	1.44	Needed
17	Fertilization of pond	3.73	1.16	Needed
18	Conducting water analysis	4.04	3.48	Needed
19	Repairs of fish pond	4.00	0.69	Needed
	Management of Fish Pond			
20	Maintaining the physical structure of fish pond	3.73	1.16	Needed
21	Cleaning of fish pond	4.46	0.58	Needed
22	Replacing fish fond water	4.58	0.58	Needed
23	Production of fry/fingerlings	4.00	1.02	Needed
24	Stocking of fish pond	4.07	0.80	Needed
25	Feeding pond fishes	3.81	1.13	Needed
26	Timely feeding of pond fishes	4.73	2.07	Needed
	Checking of fish motality	4.15	0.97	Needed
27	Treating fish with diseases	3.85	1.16	Needed
28	**Harvesting**			
	Cocept of fish market size	4.03	0.92	Needed
29	How and when to conduct fish harvesting	4.12	0.86	Needed
30	**Marketing and Record Keeping of harvested Fish**			
	Meaning of marketing and its importance as regard to fish farming	3.92	0.92	Needed
	Ways of marketing harvested fish	4.04	0.72	Needed
31	Fixing of price	3.69	0.62	Needed
32	Record Keeping	2.65	2.19	Not
33	**Fish Preservation**			Needed
34	Meaning and importance of fish preservation	4.12	0.55	
	Ways of preserving harvested fishes	4.27	0.51	Needed
				Needed
35				
36				

Table 2 reveals the items to be included in the training manual based on the mean values of the items. In specific, item 14, 15 and 34 are not to be included in the training manual as their mean values are less than 3.50.However, the rest of the items are to be included in the training manual as their mean values are morethan cut-off point of 3.50. that all the items had mean values more than 3.50.

Research Question 3
What are the instructional materials to be used in the teaching of fish pond farming?
Table 3:*Mean and Standard Deviation of Responses of Fish Pond Practitioners on the Instructional Materials to be used in the Training Manual to be developed.*

N=26

S/n	Instructional Materials	$\overline{X}$	SD	Remark
37	Short Video Clips	3.54	1.03	Needed
38	Short Audio Clips	2.92	1.94	Not Needed
39	Chalk and Chalkboards	3.42	0.86	Not
40	Drawings	3.65	0.85	Needed
41	Flow charts	3.46	0.95	Needed
42	Block diagrams	3.50	0.99	Not
43	Computer assisted instructional packages	3.58	0.99	Needed
44	Computer simulation packages	3.54	1.04	Needed
45	PowerPoint	3.58	1.40	Needed
				Needed
				Needed

In Table 3, items 37,40,42,44 and 45 had mean values of equal or greater than 3.50.These items according to the respondents represent the instructional materials to be used in the training manual. On the other hand, items 37,38 and 41 had mean values of less than 3.50.Therefore, such items will not to be included in the training manual.

Research Question 4
What are the Teaching strategies to be used in the training manual to be developed?
Table 4:Mean and Standard Deviation of Responses of Fish Pond Practitioners on the Teaching Stragegies to be used in the training manual

N=26

S/N	Teaching Strategies	$\overline{X}$	SD	Remark
46	Demonstration method	4.69	0.62	**Needed**
47	Lecture method	4.08	084	**Needed**
48	Project method	4.27	0.67	**Needed**
49	Discussion method	4.04	0.82	**Needed**
50	Problem Practice method	3.77	0.82	**Needed**
51	Field Trip method	3.88	0.16	**Needed**
52	Case study method	3.88	0.98	**Needed**
53	Barainstorming technique	3.27	1.51	Not Needed
54	Use of examples technique	4.19	0.90	**Needed**
55	Questioning technique	3.81	1.10	Needed
56	Stimulus variation technique	3.62	1.10	Needed
57	Set induction technique	3.73	0.92	Needed

A close look at table 4 shows that all the items had mean values of more than 3.50 exept item 53 which has a mean of less than 3.50. This implies that item 53(Barainstorming technique) is no to be included in the training manual.

Research Question 5

What are the evaluation criteria for assessing students' performance?
Table5:Mean and Standard Deviation of Responses of Fish Pond Practitioners on the Evaluation Criteria for Assessing Students Performance

N=28

S/n	Evaluation Criteria	$\overline{X}$	SD	Remark
58	Completion of task given by a teacher within a specified time	4.35	0.89	Needed
59	Completion of task given by a teacher accurately	3.81	1.02	Needed
60	Completion of task given by a teacher safely	4.08	0.74	Needed
61	Completion of task given by a teacher with minimum of steps specified by the teacher	4.27	0.67	Needed

Table 5 reveals that all the items had mean values more than 3.50.This implies that such items are to be included into the training manual.

Conclusion
Fish farming course has long been included into the curriculum of NCE programme. This implies that all students of agric education must acquire knowledge and skills of fish farmimg.Furtunately, Abia State College of Education has a newly bult ultra-modern fish fond where students can learn fish farming. But presently, the College is facing problem of relevant text books of fish farming. Hence, the authors set out to develop one. The development effort began with formulation of objectives of the study, research questions and construction of a questionnaire. The copies of the questionnaires were then distributed to the respondents and their responses were aqnalyzed. The findings of the study then emerged. The findings will then be used in the development of the training manual.

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