Socio-Economics Of Catfish Husbandry

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ABSTRACT: The study was to determine the socio-economics of catfish husbandry in Chikun local government of Kaduna State, Nigeria. A Sample of 80 respondents was selected for the study through simple random sampling technique and data were collected from them with the use of structured questionnaire. Analysis of the data was done using descriptive statistics, gross margin, and net farm income analysis and profitability ratios. The study findings show that most of the The data obtained were analyzed using simple descriptive statistical tools such as the percentage and frequency table averages also the gross margin analysis and farm net income was used. The result showed that most of the catfish farmers are within the age range of 36.55 years, it also shows that 75% of the farmers are males and 25% are female 90% of the respondents are married. All the respondents are educated with majority having tertiary education level. Considering the socio-cultural feasibility factors the 88% of the respondents admitted that the level of social acceptability is high, 9% said that the level of social acceptability is low. Considering cultural compatibility, 98% of the respondents said that the practise is compatible with their culture. In terms of job satisfaction 90% of the respondents admitted that the level of satisfaction is high. About 68% of the respondents considers the level of group formation to be low, 30% and the level of group formation is medium. 22.5% of the respondents admitted that the practice is quite interesting and are practicing it for pleasure. It was also discovered from the result of this study that about 41% of the respondents practice full-time catfish farming hwile about 58% carry out part-time catfish farming along side with other economic activities. Also majority of the farmers in the study area had years of experience in catfish husbandry ranging from 1-5years. Expressing their perception on the market performance of catfish about 79% of the responents said the market is excellent and this is due to the hihg level of demand of catfish. In terms of storage and processing, 29% of the respondents consider the makret level to be excellent, 60% said it is good and 11% said the market level on the basis of storage and processing is fair. Also about 72.5% of the respondents said based on the lelve of availbility and accessiblity to inputs, the market performance of catfish is good, 22.5% of the respondents consider the market performace of the fair while 5% consider the market level to be poor.Respondents admitted that catfish husbandry is capital intensive. Cost and returns analysis showed an average gross margin of ₦228,778.50 per production and a total net income of₦ 84,128.50 indicating how lucrative the enterprise is. In terms of management practices about 61% of the respondents considered management practices of catfish to be intensive in terms of capital labour. It was also observed that 70% the respondents source knowledge on catfish management from friends and fellow farmers, other sources identified are journals/text books, internet. In terms of supportive services majority of the respondents requires support in areas of medical and veterinary services, credit services, training services etc. about 53% of the respondents suggested that government should provide the various services needed, about 24% of the respondents suggested that the research institute should be the one to provide the supportive services. Majority of the farmers are faced with challenges such as high cost of inputs water quality problem, stock quality problem, lack of capital resources for start-up farmers or for expansion for practicing farmers and knowledge on appropriate medication. Opportunities identified in catfish husbandry are its economic advantage and provision of employment.

Keywords: Catfish husbandry, Gross margin , Socio-Economics

1.0 INTRODUCTION

1.1 BACKGROUND INFORMATION

Fish farming today is considered as a new form of agriculture which can be classified under aquaculture which is the cultivation of plants and animals in aquatic environment. In Africa, the mostly cultured species include catfish (Claries griepinus, C Lasera and heterobranchus spp), tilapia and carps. Many fish farms today focus on catfish, as they can have more market value of two or three times that of tilapia. (Olagunju et al, 2007). Catfish farming or husbandry is a new stem of aquaculture which has developed rapidly over the years. Catfish husbandry is practiced all over the world most especially in Malaysia, Singapore and other African countries (Adediran 2007). Catfish production is a capital intensive and involves much risk and has been described as one of the most management intensive forms of farming (Mc Gee and Lazur 1998). In addition to the high entry cost most farmer are faced with the growing pains of the young industry. Among these are the high operation cost associated with a small scale operation and limited developed infrastructure. Market conditions are influenced by large producer and processors which pose new challenges for small producers in finding their market niche. (McGee and Lazur 1998). Farm raised catfish can be marketed in a variety of ways; typical large producers sell to processing plants that can accommodate large quantities of fish. These processing plants have a specific fish size requirement and farmers must manage their production to meet processors demand. Most catfish processors demand a live cat fish of 1.5-3ibs in size for fillet products. Commercial catfish production requires significant start up and operating capital along with management skills and time and this is as a result of the cost of necessary equipments such as aerators, harvesting and feeding equipments as well as other cost such as pond construction cost. Also if a suitable land is not previously owned, the additional cost of must be incorporated into the total investment requirements (McGee and Lazur 1998). Total capital requirement can be significantly affected by site selection, pond size and facility design. Careful attention to pond design and construction is important to minimize cost. Major catfish farming operating cost include: feed, fingerling,

electricity for well and aerators, labour for feeding, water quality management and harvesting. Feed which makes up to about half of the operating cost of producing catfish is imported into the country from other countries in the U.K and USA. In most cases it is only the farmers who have land and equipment available that can diversity into catfish farming without incurring large expenses, because of high start up capital and operating expenses and risk of catfish production. It is therefore necessary for the producer to carefully consider the best market opportunity and follow recommended management practices to accurately evaluate the economic potential of catfish husbandry (McGee and Lazur 1998).

1.2 PROBLEM STATEMENT

The interest for catfish farming has increased over the years rapidly as a result of the awareness of the importance of this practice to individuals and the economy at large, as well as the advantage attached to it. The government of Nigeria has shown it interest through setting up of various national programmes and projects such as the aquaculture and inland fishery project (AIFP), presidential initiative on aquaculture (FAO 2005). Also the government has shown its interest through the sponsorship of researches on aquaculture, through grants and establishments of fish farm estates. Despite the interest shown so far by the government and the private sectors of establishment in the production of fish generally, the gap between the demand of fish in Nigeria (1.3 million metric tones annually) and the supply of fish from domestic production (about 0.45 million metric tones annually) have ever been widening (FAO 2000). Ita (1993) estimated if Nigeria is to be self sufficient in fish production generally, a total of about 900,000 ha of water surface must be cultivated to produce a minimum of 900,000 metric tonne of fish a year (estimating a minimum of 1 metric tonne per year) Despite the awareness of the need to improve production to m meet up with the gap between fish demand and fish supply, local production over the years have not been able to meet up, specifically in catfish production. Cat fish farmers have not achieved the desired output expected from their production that can make a significant change in closing up the gap between fish demand and fish supply in the country. And this can be attributed to some cultural and economic problems well as some social, and enlightenment problems affecting the farmer. Therefore it is against this background that this research work is embarked upon to provide answer to the following research questions that could be faced by practicing cat fish farmers.

1. What are the socio-economic characteristics of catfish farmers in the study area?
2. What is the level of awareness of improved management practices of catfish husbandry in study area?
3. What are the socio-cultural and economic feasibility of catfish husbandry in study area?
4. What are the supporting services available for catfish farmers in the study area?
5. What are the challenges and opportunity in catfish farming.

1.3 OBJECTIVE OF THE STUDY

The objective of this study can be viewed to be in two folds; the broad objective which is to determine the socio economics of catfish husbandry in chickun local government area of Kaduna State. The specific objectives are to:

- Identify the socio-economic characteristics of catfish farmers in the study area.
- Identify the various improved management practices for catfish production.
- Examine the socio-cultural, technical, technical and economic feasibility of catfish farming in the study area.
- Identify the challenges and opportunities of catfish farming.
- Identify the various supporting services that are available for farmers in the study area.

1.4 JUSTIFICATION OF THE STUDY

Catfish farming has attracted must interest on the assumption that there limited risk in terms of mortality from natural sources and that the feeding of catfish is not as complicated as that of say poultry and may not require importation of feed concentrate with foreign exchange (Ita, 1993). Based on these assumptions investors have launched into this new field of catfish farming with little or no supporting information on its feasibility. It has been observed over the years that those farmers who have little or no knowledge on catfish husbandry launch themselves into the practice without the basic information on the important management practices and supportive services made available by the government or other non-governmental agencies. These have accounted majorly for the low rate of catfish production in Nigeria as production is still at the traditional level. The fish demand level of Nigeria is one that is far above the supply level, which means more production is needed. Catfish farmers can get improved results from their if the necessary information on how to improve production, how to use some special technologies which are new in the catfish industry and applying them rightly as well as information on how to guard against adverse conditions. Local catfish farmers and potential catfish farmers will find the information from this study useful as it will aid the local fish farmer increase their production by exposing them to practices that can improve their production levels, which in turn increase their profit level and this helps in improving their livelihood. Also the potential and beginning farmers will find information in this study useful as the information provided on the challenges and opportunities which will serve as a guard to what they should expect if they go into production and it will also give them a good stand in business since they have the basic information on how to improve production at their finger tips. In extension information provided in this work can be useful to police makers, as it can guard them in any plan relating to catfish husbandry. The general public can also benefit from the information provided in this work as it provides information on a lucrative.

2.0 LITERATURE REVIEW

2.1 HISTORICAL PERSPECTIVE OF CATFISH HUSBANDRY IN NIGERIA

Omitoyin (2007) stated that the history of catfish farming in Nigeria could be traced down to the early 1920's, when some traces of fish farming activities were carried out by some white missionaries in Ilora, Oyo state, the where fish was raise to supplement the protein of pregnant women. Conventional fish farming was introduced in Nigeria by Maclaren in 1949 on brackish water fish cultivation experiment in Onikan, Lagos and in Jos Plateau State (Fagbenro 1993). In experiment with grey to determine the potential of brackish water fish culrure in the Niger Delta region of Buguma, fish farming communities within the coastal flood plains have for decades practiced traditional fish farming. Presently this types of fish farming (traditional fish farming) does not play significant role in the national economy. Fish culture in ponds has been identified as a more reliable alternative which can contribute towards meeting the increasing fish demands of the teeming Nigerian population (Otubusin et al, 1991). Although these early practices of fish farming were not satisfactory, the trials however generated sufficient interest, which propelled the regional government to establish more fish farms (Oyedapo et al, 2003). Fish culturing is a relatively new practice particularly in the developing countries. The delay in it recognition in Africa especially in Nigeria is due to the fact that more emphasis has been given to crop agriculture and animal husbandry. In Nigeria, this practice occurs mainly in land and only recently has the coastal regions been the focus of development. The coastal zone covers an estimated area of one million ha and offers considerable potential for commercial fish production (Fagbenro, 1998). In essence this potential provides the impetus for subsequent government involvement and interest in the business enterprise. Researchers who want to further work on cat fish husbandry will find this work to be of great help.

2.2 AIM OF FISH FARMING

Aquaculturists manipulate certain components of the environment to achieve a greater control over production of aquatic organisms than is normally possible in nature. The primary aspects of fish farming include controlled breading and grow out. Interest in depopulation of wild fish caused by the increase in the number of anglers (fishermen) able to move quickly about and use sophisticated tackle as well as harm done by pollution and industrialization of water courses for navigation or for hydropower. Fish culture is principally practiced in ponds, which are easy to manage with respect to things such as breeding, determination of stocking rate, stocking and maintenance, (Omotosho and fagbenro, 2004). The main aim of catfish farming is principally to produce quality fish food for human consumption. Also to enhance culture base fishery by providing enough fingerlings for restocking open waters like natural and open lakes, reservoirs and running streams in order to prevent the extinction of commercially important species of fish especially when and where there is exploitation (Omitoyin, 2005).

2.3 THE AFRICAN CATFISH (Clarias pariepinns)

2.3.1 GENERAL BIOLOGY

The African catfish is a remarkable beast with genus displaying an eel shape (having an elongated cylindrical body with dorsal and anal fins being extremely long). Both fins contain soft fin rays. The head is flattened, highly ossified, the skull bone forms a casqued and the body is covered with a smooth scale less skin. The skin is usually dark pigmented on the dorsal and lateral part of the body. The colour is uniformly marbled and changes from prayish olive to blackish according to the substrate. On exposure to light the skin colour becomes lighter (Bruton 1989). They have four pair of unbranched barbles, one nasal, ona maxillary (longest and the most mobile) on the vomer and two mandibular (inner and outer) on the jaw. Tooth plates are present on the jaw as well as on the vomer. The major function of the barbles is basically prey detection. A super-brachial or accessory respiratory organ composed of a pair of pear-shaped air chambers constraining two arboresent structures is generally present. These arborescent or cauliflower-like structures located on the second and fourth branchial areas, are supported by cartilage and covered by highly vascularised tissues which can absorb oxygen from atmospheric air (Moussa, 1996). Catfish has a phenomenal distribution from cape province of South Africa throughout Africa into Asia-minor. This air breathing cleriid species exist in diverse environment ranging from tropical, and represented in a correspondingly diverse array of aquatic faunal assemblages from the species of poor Orange River system to species riche Lake of Malawi (Bruton, 1989). Natural history studies especially that carried out by Greenwood in the mind 1970's and later those of Bruton in the late 1980's have shown C. gariepinus to be a fascinating, extremely hard and adaptable animal, efficiently able to exploit a wide variety of both animal and plant protein, under diverse environmental and habitat instability. The animal is highly fecund; spawning usually takes place after rain with raising water level. Hatching although temperature dependent, occurs approximately 18-24 hours after fertilization at 24-28^{0}C. the offspring, by exploiting new inundated environment which are usually rich in food, operate temporarily in an iconological vacuum, free from inter and intra specific interactions. However, competition for food and cover which results in siblings cannibalism has recently been shown to be density dependent under culture conditions. Growth under normal conditions particularly under controlled aquaculture conditions is fast. The species is an opportunistic omnivore capable of switching feeding modes, depending on prey availability. It is hardy and do not easily succumb to disease. This is principally a consequence of its wide environmental tolerance. This ubiquitous fish is the most important individual species in the traditional African freshwater fisheries estimated to comprise some 20% of the total catch in Africa. (Clay 1997). Another exciting feature of the catfish in terms of aquaculture, is it's potential for highly intensive culture without pre-requisite 'pond accretion or high were exchange rates facilitated by it's air-breathing ability and tolerance of poor water quality. (Bruton, 1989).

2.3.2 SYSTEMATICS

Catfish are classified into the order suliriforms which include such familiar fish as the bull heads, squeakers, electric fish, sea barbell and armoured fishes, as well as less familiar forms such as the dodradids, plotosids, pimelodids and callithyids. There are about 2000 species of catfish in the word (about 8% of the total number of fish) (Teugels 1996). Most African catfish are either too small or too difficult to culture or world encounter too much consumer resistance to be successful aquaculture candidates. There are only three African siluoridea families which contain some species considered as suitable food fish aquaculture. There are Claroteidea (formerly Bagridea), the schilbedidea and the clariidea. The claroteidea include some aquaculture species in the genus chrysichthys and Bagrus. (Teugels 1996). Several species of the genues schilbe in the family schilbeidea also have aqucalture potential, although they generally have a slow growth rate. The meat of those in this species n as with those in the family claroteidea, is white. This a sharp contrast to the yellowed meat coloration of the clarified species of the genera clarias, heterobranchus, dinotopterus and Bathyclarias, (Teuguels 1996).

2.3.3 HABITAT

Clarias pariepinus inhabits calm water of lakes, rivers, streams swamps to flood plains, some of which are subjected to seasonal drying. The most common habitat frequented are the flood plain swamps and pools in which the catfish can survive in the dry season due to the presence of the accessory air-breathing organ. (Bruton 1989). This species has the qualities of an aggressive and successful invader which readily adapts to living in new habitat. Some of the qualities include high fecundity, flexible phenotype, wide habitat and environmental tolerance, ability to feed on a wide variety of prey, rapid early development and growth. Studies in East Africa have shown that introduced C. gariepinuys can decimate population aquatic invertebrate. At least 20species of parasites are carried by C. gariepinus of which one (Argulus japoncius) is an undesirable alien in Africa which could be spread to new localities via translocation. Aquaculturist in Africa and all over the world have been more careful about the danger posed by this aline and other translocated aquatic and this is because of the threat to the industry by the way of transfer of disease and parasites and mainly because of their negative effect on indigenous aquatic species and the possibility of hybridization and it's effect on biodiversity, (Clay, 19978). For the above reason and because of the particular threats which it poses it is recommended that C. gariepinus in Africa should only be cultured in catchment in which it naturally occurs. (De moore and Bruton, 1998).

2.3.4 FEEDING

The African catfish can truly be regarded as a mobile sense organ with thousands of tactile, electric, taste, chemical and sound receptors scattered all over the body. The eyes are relatively poorly developed and only appear to be able detect movement and change in illumination levels. African catfish are mostly efficient at capturing prey at low light levels (Merron, 1993). The African catfish is equipped to feed on a variety of food organism from plankton to fish. The month is wide, sub terminal, transverse and capable to considerable vertical displacement for engulfing large prey or large volume of water during filter feeding. Juveniles up to 50mm feed mainly on chimomid larvae, shrimps and small planktonic or benthic crustaceans. Large juveniles up to 100mm also feed on the above prey as well as dragonfly nymph fish fry and small crabs. Adult feed mainly on fish, crabs and snail. Predation is most efficient on relatively slow moving bottom living organism, but fast prey like the fish can be caught using the pack hunting tactics. Also the range of food taken by an adult catfish could cover frogs, snakes fledging birds and small mammals as well as algae, macrophyte, seeds and fruits. Some adults may strictly feed on zooplanktons or chirnomids. Studies have shown that there's high growth rate and maximum size occur when diet has high protein content. In catfish the sense of taste have been found to be of more importance than sight, (Meerron and Bruton, 1993, 1998).

2.3.5 BREEDING

Catfish have a very high reproductive ability (very prolific) the structure of both the make and the female differs and this forms the basis for distinguishing both sexes physically. The ovaries of C. garicpinus are pair clongated organs situated dorsally in the body cavity. The oviduct of the two ovaries fuses and opens into a urinogential papilla. Mature females have large ovaries which fill the body cavity and may constitute 7-10% of body weight. The testes are also pair and connected by a fused spermatic duct opening into an elongated, pointed urinogenital papilla. The elongated and pointed urinogental papilla of the male is the only external feature upon which makes and females can be distinguished. Gonad maturation begins in winter and associated with increasing water temperatures. The adults awaits suitable environmental conditions for spawning (egg production), which normally takes place in spring and summer in shallow water where the eggs fertilized adhere to leaves and stems of plants. Spawning generally takes place at night in recently inundated marginal area and mostly after heavy rain. The advantage of this is that the catfish would be vulnerable to visually-orientating predators, where as their own breeding activities would not be affected as they apparently rely mainly on non-visual cues. There's often a massive aggregation before spawning during which the make among themselves for the right to court with the female. In rivers massive migration of catfish may take place before spawning, sometimes numbering thousand of fish (merron, 1993). The courtship rituals are fairly complex. Pre-nuptial aggression can become intense and this can result in lacerations (cuts or body damages). The courtship behaviour culminates in the release of gamete, which involve the male fish twisting around the female in a U-shape prior to the release of the gamete. Fertilization of the eggs takes place externally. Catfish sperm is motile for 80 to 120 seconds which is very short compared to that of the tilapias. The male release it's sperm before the female spawns her eggs. There's no parental care for the young in African catfish except by the choice of suitable spawning site. the shallow

recently flooded highly vegetated areas usually chosen for spawning are typically free of predators and rich in food resources. Eggs and larvae development are usually rapid. Eggs hatch 42-28 hours, depending on incubation temperature. The larvae and juveniles are secretive and seek out confined micro habitats where they feed on small invertebrates in shallow inshore areas. (Merron 1993).

2.4 DEVELOPMENT OF THE CATFISH INDUSTRY

In comparison to the rest of the world, the industry in Africa is significant as the entire continent contribute only about 0.4% to the total world aquaculture production between 1984 and 1995 (PAO, 2000 Hecht, 2000) this corresponds to 60% increase over the previous decade. Similarly FAO (2003) describe Africa's aquaculture production at global level as insignificant as it account for about 0.9% (404571t) of the global aquaculture production in 2000. Nonetheless aquaculture in Africa is going through an exciting phase evolution and growth after numerous false starts that did not result in any meaningful aquaculture development. This lack of development exist against a backdrop of condition that would benefit greatly from the rapid development of aquaculture on the continent namely, high incidence of poverty, malnutrition and unemployment (Hecht, 2000). Various reasons have been adduced for the slow pace of aquaculture development in Africa. These include:

1. Lack of localized knowledge system on aquaculture among African farmers
2. Prevalence of foreign aid programmes organised on a top-down basis with inconsistent short term goals and excessive dependence on donor funded aquaculture development programmes.
3. Low allocation for aquaculture development in the national budgets.
4. Poor or slow growth of cultured species.
5. Poor stock management
6. Loss of genetic diversity to culture system

Others include contamination of the wild and indigenous gene pool, lack of baseline genetic data and poor species identification 9Pulin and Capilli 1998) According to Arookoyo and Bolounduro (1995), polices put in place for operational challenges in order to ensure the national goal of self sufficiency in fish production and over al food security include.

1. Focusing on on-station and on farm adaptive research in aquaculture on the following.
    - Fish farm design and pond construction using cheaper and affordable materials.
    - Efficient pond fertilization technique using both organic and inorganic fertilities.
    - Choice of species combination and stocking density.
    - Fish send production technology.
    - Integrated fish and livestock, fish and arable farming system based on readily available resources.
2. Training of adequate manpower at various levels because of the te3chnical and professional demand of the sub sector in a serious attempt to fully develop it. The emphasis being to provide highly skilled, motivated staff to carry out research activities to generate technologies, which are well focused and targeted to client needs and leading to sustained agricultural development.
3. The poor investment in aquaculture research in the 1970's and 80's resulted in poor staffing, low output and performance of the research institute. To readdress this government has put in place a National Agricultural Research project (NARP) with assistance from the World Bank. Moreover the federal government investment in the agricultural sector increase from 2.4% of the total capital expenditure in 1992 to 4.3% in 1993, while the recurrent expenditure increased from 0.4% of the total to 1.1% when the same period (CBN, 1994).
4. Realizing the potentials of aquaculture, fish culture is being popularized through the establishment of home stead fish ponds in urban and rural area. Technologies adjudged to be feasible in terms of cost simplicity, profitability and compatibility are being disseminated across the country on fish culture by the agricultural development Projects (ADP's) and National Agricultural Institutes (NARI).

Fisheries research institutes have packed on shelf technologies at on station trials, of which only few have been disseminated resulting in low adoption level of fisheries technology (NAERLS, 1999). On shelf technologies available to tackles the low productivity problems include profitable homestead fish pond management, control production of catfish, control of the disease of catfish, appropriate species combination and stocking density, development of quality feed for and healthy growth, suitable manure and fertilizer procedures, improved smoking and longer shelf life of smoked an good fish methods (NIFFR 1997, NIOMR 1998, NAERLS 1997).

2.5 BENEFITS AND CONSTRAINS OF CATFISH FARMING IN NIGERIA

Catfish farming in Nigeria has been providing benefits for the past years even though its development and practice is running at a snail pace. (Bolorunduro 1995). With recent researches and dissemination of information to rural catfish farmers, positive contributions have been made from or by the sector to the livelihood of the people and the country's economy at large. Some of which include:

- Productive use of poor agricultural lands
- High economics value of aquaculture products.
- Integrated aquaculture is highly suitable form of agriculture.
- Self sufficient for subsistence farmers.
- High nutritional value of aquaculture products.
- It allows for conservation of natural resource (Bocek 1996).

Also road had not been too smooth for the catfish industry and some of the major constrains have been indentified by Ita (1993), include.

- Inadequate technical manpower.

- Trial and error method or approach.
- Poor feasibility studies prior to initiation of project.
- Limited resources in terms of finances, land etc.
- Species combination and poor pond management practice.

2.6 MANAGEMENT PRACTICES IN FISH FARMING

The development of important management practices in catfish husbandry may help to alter the negative perception of catfish farming (and aquaculture in general) and mitigate the potential for impact on an already delicate aquatic environment. The overall goal in the development of management practice is to assist farmer in managing their facilities more efficiently and profitably, while complying with effluent discharge regulations. For aquaculture purposes, important management practices may also focus on a number of issues including site selection, design requirement, use of treatment, management strategies or operational protocols to reduce or eliminate wastes and techniques to capture, treat and recycle effluent and waste products (Howerton 2001). Due to diversities in species and type of facilities and management techniques, it is possible to list management practices that would be standard for all aquaculture operations. Management practices should be site specific for each individual operation. It must be that, management practices suggested are strictly voluntary. The following management practices adopted for catfish can be categorised into four sections.

- Water quality management.
- Farm operation.
- Site selection
- Effluent management.

All suggested management practices could potentially result in positive benefits to the environment. However, prior to adopting any management practice the individual farmer should consider the cost benefit ratio.

2.6.1 WATER QUALITY MANAGEMENT

Since most of the management practices is directly or indirectly related to water quality, it is important to have a general understanding of water quality principle prior to starting the fish farming venture of any size and for many suggested practices to be effective. Water quality includes the physical, biological and chemical factors that affect and influence water use. The following water quality component plays an important role in catfish production; they include temperature, primary productivity, salinity. Ph, total all alkalinity, total hardness, dissolved oxygen. Important and inexpensive kits for best can be obtained, test kits that contains all the necessary reagents and instrument to monitor water quality variables such as oxygen meters, pH metres, automated temperature recorders and refretometers can also be purchased.

1. **Temperature:** Temperature has a profound effect on the chemical and biological process in fish. Increase in temperature usually increases the chemical and biological rates in fish which means that they will have to use more oxygen. Some warmer water are not able to hold as much oxygen as cooler water, the temperature for water for fish pond should be kept within the range of 20-30 ^{0}C for optimum production. the temperatures can be regulated by the use of instrument such as pond coolers and heaters. (Howerton 2001).
2. **Salinity:** This is the total concentration of all dissolved ions in water. It is expressed in parts per thousands, milligrams per liter or mg/l. fresh water is considered to be less than 300mg/l, for marine waters it varies but mostly ranges between 33-40 ppt. catfish can tolerate saline water, optimally salinity should be ranged within 15-30 ppt.
3. **PH:** This is the negative logarithm of the hydrogen ion (H+) concentration. It indicates whether the water is neutral, acidic or basic. The pH scale ranges from 0.14. pH values less than 7 indicates water to be acidic and that above 7 indicates water to be basic, pH is a dynamic water variable that fluctuates during throughout the day as a re3slt of photosynthesis and the use of CO process. generally pH levels between 6 and 9 are considered to be safe for aquatic animals. If pH falls below 6 for any length of time, growth is slowed. If values are below pH of 4 or above 11 death may occur.
4. **Dissolved Oxygen:** This is the most important water quality variable in aquaculture. All aquatic organisms need oxygen to survive. The capability of water to hold dissolved oxygen is affected by temperature, salinity, and elevation. Increase in any of these factors leads to decrease in the capacity of the water to hold dissolved oxygen. Oxygen can enter water in a number of ways, oxygen enter water directly from the atmosphere and are mostly confined to waters near the surface, unless there's some kind of circulation this allows more oxygen to diffuse into the water from the atmosphere and break up oxygen stratification.

Photosynthesis is the most significant source of dissolved oxygen in the water. As oxygen is on the end products of the process of photosynthesis and the oxygen from the process is more diffused in the water than from atmosphere diffusion. Hence healthy phytoplankton bloom is very important to keep dissolved oxygen within a safe range. High stocking density and feeding rates can lead to oxygen depletion also uneaten feed and metabolism by-products can result in high oxygen demand. (Howerton 2001).

2.6.2 SITE SELECTION

Site selection and facility design are one of the most important factors in the success of commercial catfish farming. Most of the problems that arise during commercial production result from lack of planning prior of the construction of the facility itself. It is important to spend some time and expense before construction to ensure a particular site in suitable for aquaculture. For earthen ponds the following considered.

1. **SOIL:** Soil characteristics are an important consideration when selecting a potential aquaculture

site. Include adequate clay content, low organic content proper soil texture and proper pH.

2. **SOIL pH:** Soil pH best for catfish pond site include pH range from 608. When soil pH is below 6 the soil needs to be limed using either of quicklime, hydrated lime, and crushed limestone. this helps in increasing the total hardness and total alkalinity as well as stabilization of pH buffer system. Liming of ponds also serve as disinfectants in empty ponds, speeds up the decomposition of organic matter and adds calcium which is an element essential for the catfish.
3. **TOPOGRAPHY:** Earthen ponds should be constructed in area with a slope of less than 2%. This allows for less earth moving but contains sufficient slope to allow drainage of pond by gravity into effluent canal or settling ponds.
4. **Farm design and construction:** In designing a facility, operational factors such as total acreage, stocking density water exchange, harvesting schedules must be taken into considerations. The operational facilities should be planned and constructed within the environmental considerations being a top priority.
5. **farm design and construction:** In designing of facility, operational factors such as total acreage, stocking density water exchange, harvesting schedules must be taken into consideration. The operational facilities should be planned and constructed within the environmental considerations being a top priority.

Earthen ponds should be constructed on land that has proper soil texture, soil that minimize seepage and have low oranic matter content. Poorly designed facility increase maintenance cost, adds to erosion, negatively affects management decision and decreases farm profitability. (Howerton 2001).

2.6.3 FARM OPERATION

For a commercial aquaculture farm to the successful, it must be managed in an economically suitable manner. Rearing unit whether they are ponds, tanks, raceways, cage or net pens are usually stocked at high densities. Fertilization, liming, supplemental feeding and aeration are all strategies used by farmers which allow them to increase stocking densities. Additionally each technique increase the levels of management and expertise needed. To intensity production levels it is necessary to increase food supply for the cultured species. This is done by increasing nutrient availability either directly through supplemental feed or indirectly by fertilizing ponds to increase primary productivity. With an increase in crop production comes a concomitant build up in organic matter, nitrogenous waste and phosphorus. A pond ecosystem has only a certain capacity to recycle nutrients and organic matter. As stocking density is increased feed level increases, and for all practical purposes this is lost. In intensive culture system, organic matter in the form of uneaten feed and nitrogenous waste can accumulate on the pond bottom. Other management techniques may include supplemental aeration, water exchange and sludge removal.

2.6.4 EFFLUENT MANAGEMENT

The overall goal of the above listed management practices is to reduce or eliminate problems associated with effluent discharge. the water quality variables of most concentration in effluents include dissolved nutrients land and solids. High dissolved nutrient loads can cause adverse environmental impacts in areas which receive affluent discharge. Suspended solids may be either particulate materials or sort particle from erosion. Ultimately the quality of effluent will be dictated by management strategies and most significant decisions in culture intensity, stocking rates and hence feeding intensity are most important influencing the level of dissolved nutrient and toxic metabolite found in effluent. The use of sedimentation ponds constructed wet lands, biological filtration and water recirculation are all means of treating effluents in catfish ponds (Rober Howerton, 2001).

2.7 ACHIEVING A BREAKTHROUGH IN FISH PRODUCTION USING MODERN TECHNOLOGIES IN NIGERIA

Nigeria can achieve the desired breakthrough in fish production for both domestic and the export if catfish farmers and fish farmer in general can embrace modern techniques in fish cultivation. The catfish business has presently potent to a revolutionary stage with over 55 innovations that have taken place. For instance earlier than now farmer can only obtain about 200graams in 9 months if stocking density is at two fish per square meter. But today tremendous increase in yield have been obtain such that 300 fish per square meters can grow to 1.5kg on an average of I just 5 month, with this much interest have been shows in the catfish production. (Adediran 2007). In singaoiore which in equivalent to Bayelsa state in Nigeria in terms of size, has a population of about 3.5 million people, but produces about 30% of the world tropical fish and this is because they rely on modern technologies for their production. One important technology used in this area that (Sineapore) that can be adopted equally in Nigeria is the use of a palm size, convex glass lens that is used to enhance agricultural production. It is called the Bio-Disc. Another important innovation in the catfish industry used in Singapore is the Life Water technology to their farming, while in Nigeria we use dead Water, the culprit being the water pump that we use from our wells and boreholes. If Nigeria can adopt this simple, cheap innovation which Singapore has adopted, Nigeria can achieve a breakthrough in fish production.

2.7.1 MORDEN TECHNOLOGIES IN FISH FARMING PRODUCTION

As the world gravitates towards is knowledge based economy, entrepreneurs with the requisite knowledge backed by the cutting edge technology will always be ahead of the pack. According to reports and research fish farms live and die based on three things.

- The quantity and quality of water.
- The quality of parent fish.
- The amount of work put into the fish (proper management). (MeGee and Andrew, 1998).

1. THE BIO-DISC:

The bio-disc was invented by a British surgeon and is manufactured by school Glass Company in Germany. This is an important technology used in Sinpapore which has brought about remarkable results in their catfish industry. This means that fish farming is not all about space but about information and know how. Singapore is able to achieve this through energized water using the bio-disc (Adediran, 2007). The bio-disc looks like a small places of glass, like a concave magnifying glass, Biio-disc is made up of technically engineered natural minerals that are structurally bonded in the glass at a molecular level using high fusion heat method. combination of these techniques led to a kind of catalytic conversion of energy which creates techniques led to a kind of catalytic conversion of energy which creates a long lasting resonance, same kind of resonance seen in a turning fork. For instance when you strike a turning fork, it begins to make sounds and all the turning forks in that environment will start making same sound because of the vibration sent by the turning fork, and in twenty minutes if you have a glass cup besides the fork it will resonate and break the glass. This is the same thing that happens with the bio-disc, because the mineral have been fixed in a glass and they reasonable at the frequency of the natural environment. It is called Nano-Resonance, because it uses Nanotechnology. Basically, with bio-disc energizes the water or anything that comes in contact with using two methodologies. Either by passing the fluid through the glass or scalar energy which means it uses a kind of light life sunlight been directed into water using a glass, it begins to influence and catalyze the molecules in the water and makes them perform better on the fish. To energise the water first one must have access to the bio-disc. It is a once in a fifteen years purchase because the disc can last for fifteen year, all you need do is to pass the water over the disc since it radiates positive energy. When this is done the water is instantly energised. Secondly you can put the disc inside the pond for about 20 minutes and as the fish or the water moves the energy is radiated inside the pond and all the water is energised. Also the bio-disc can be tied at the supply end leading to the pond and all the water is energised straightway. The resultant effect is that you will have fished are alive and healthy. The bio-disc saves cost on medication, it reduces loses of fish in fingerling production. With the bio-disc 68% productivity is obtainable because fish energy level and their growth rate is doubled. With the bio-disc a fish that would take 8, 10 weeks to grow to biro size would now take about 6 weeks (Adebiran, 2007).

2. USE OF LIVE WATER:

Most of the waters in their natural states are found underground or inside mountain springs. But they are right there with the crystals like the shape of hexagon. So, the water begins to get destroyed and pump if from the base of the waterbed up through the use of a water pump as the pump releases electro-magnetic energy which breaks the crystals of the water into what is called free radicals. Every pump has a coil and a magnet. Although the pump helps to bring the water from the underground at the same time, it kills the water. And that is the water you are going to use in the farm which is also called dead water. Fish mortality, water change and the use of drugs to get fish healthy can be averted by using energized water for fish production. This is an important innovation or modern technology used in Singapore, Malaysta, Vietnam and farmers there don't lose fish as a result of dead water and this is because they use energized water. The strength of fish, their ability to digest food, reducing their dependence on drugs to keep fish healthy and alive can be achieve through the use of new technologies like live water and bio-disc to energize the water in which the fish are kept (Adedira, 2007).

3.0 METHODOLOGY

3.1 STUDY AREA

The study area is Chikun Local Government of Kaduna State. Chikun local government was carved out of Kaduna by the General Babangida's administration in may 1989, presently it has 13 districts. Chikun local government is boarded to the North by Igabi local Government and Kaduna North local Government. To the south West, it is bounded by Kajuru and Kachia Local Government respectively. Chikun Local Government is located at latitude of 100 N and longitudes 90 East of Kajama. It has a land mass of 4456 sq kilometres with a rich fertile soil suitable for crop cultivation. The major ethnic groups are Gbagyi, Hausa and Fulani. Other ethnic groups found in this area are kataf, bajju, adara, kaninkum, ikulu, Yoruba, Igbo, lives and Idoma. In chikun local government is located at an intersection latitude of 100 N and longitudes 90 East of Kujama. It has a land mass of 445s sq kilometres with a rich fertile soil suitable for crop cultivation. The major ethnic groups are Gbagyi, Hausa and Fulnai. Other ethnic groups found in this area are Kataf, Bajja, Adara, kaninkum, Ikulu, Yoruba, Igbo, Tiv and Idoma. In chikun local government 75% of the population of the inhabitiants depends solely on farming for self sustenance. They are into trading, the people are fishermen, animal rearers, weavers and blacksmiths. The local government has a total population of 332,950 people according to 1995 projected census figures. (Kaduna state statistical year book, 1996). Like other local governments the population that makes up the local government is predominantly agrarian. It is a widely practiced vocation such that 99% of the populace are farmers. Among the inhabitants of this area are those that engage in nonfarm activities such as trading, carpentry, some are civil servants while others practices farming activities which ranges from crop cultivation, processing of agricultural produce, marketing of agricultural produce to animal production such as poultry, fish and large animal production. The real culture of the indigenous people is not fully made manifest in this area because of the mixture of the heterogenous nature of the population in terms of culture and the origin of the inhabitants. The people are predominantly Christians (Kaduna state local government and chieftaincy affairs, (2004-2006).

3.2 SAMPLING TECHNIQUE

The population of this study comprised of all catfish farmers carrying out their farming activities in chikun

local government of Kaduna state. According to the occupational statistical record in the local government secretariat, there are about 164 catfish farmer in the local government. Chikun local government area comprise of 8 district areas, out of which 5 will be randomly selected and these areas include, Narayi, Kujama, Sabo, Ungwan Boro, Ungwan Sunday. Simple random technique was used in selecting respondents. A total of 80 respondents were randomly selected for this study.

3.2 DATA COLLECTION

Data were collected from both primary and secondary sources. The primary data were collected through field survey using structured questionnaires. The secondary data were gathered from journals, textbooks, proceedings and other unpolished research findings from reputable sources. The secondary data were used to provide information about catfish such as the history of the practice in Nigeria, management practices of catfish husbandry, the level of production and level of demand for catfish in the country. Data collected, comprised of information on the socio-economics of catfish farmers and these would include their age, educational level, religion among others. And this information is aimed at achieving the first objective of this study. Data on the economic cost and returns, technical and cultural feasibility were also collected and is aimed at achieving the third objective of this study. Data regarding information on the supportive services available and opportunities including challenges of catfish farming were also collected and these helped to achieve the third and fourth objectives of this study.

3.3 ANALYTICAL TECHNIQUE

In this study various kinds of analytical tools were used to analyze the data collected. These tools include simple descriptive statistics gross margin analysis and net farm income. For objective one which is identifying the socio-economic characteristics of catfish famers, tools such as percentages, frequency distribution tables were used. For objective two which is to identify the various improved practices for catfish production, analytical tools such as the mean, frequency distribution table and percentages were used. For objective there which is examining the socio-cultural, technical, and economic feasibility of catfish husbandry, tools such as the frequency distribution tables, averages, the gross margin analysis and net farm income (to analyze the cost and returns of the production) were used. For objective four which is to identify the types of supportive services available for the catfish farmers, the tool used is the percentage and the frequency distribution tables. For objective five which is to identify the challenges and opportunities of catfish farming, tools used here, were percentages and frequency distribution tables.

4.0 RESULT AND DISCUSSIONS

This chapter deals with the presentation and discussion of analyzed data collected through structured questionnaires. It involves the use of tables to present the result obtained from analyzing data collected.

4.1 SOCIO-ECONOMIC CHARACTERISTICS OF RESPONDENTS

4.1.1 AGE DISTRIBUTION OF THE FARMERS

Table 4.1 *farmers age distribution*

Age (years)	Frequency	Percentage (%)
25-35	12	15
36-45	24	30
46-55	36	45
56 and above	8	10
Total	**80**	**100**

Source: *Field survey 2018*

From table 4.1, 15% of the farmer full within the ages of 25-35 years, the least range of farmer is the age range of 56 and above the only 8 farmers. 45% of the farmer fall within age range of 46.55, and this age have the largest number of respondents (farmers). The survey revealed that most of the respondents were within the age range described as economically productive in a population (FAO 1998), that is with the rage range of 15-64 years. The age distribution of farmers shows whether the majority of the farmers are within the labour work force or not it also determine their level of maturity decision making process in the management of an enterprise.

4.1.2 Sex distribution respondents

The results obtained from the research study shows that 75% of the respondents were males while 25% were females. This implies that male engage in catfish production more than females in the study area.

Table 4.2: *showing the sex distribution of the respondents.*

Sex	Frequency	Percentage
Male	60	73
Females	20	25
Total	**80**	**100**

Source: *Field survey 2018*

4.1.3 Marital status respondents

The distributions of farmers by their marital states is shown in table

Table 4.3: *Marital status farmers.*

Status	Frequency	Percentage(%)
Married	73	91.25
Single	7	8.75
Total	80	100

Source: *field survey 2018*

From table 4.3 above, about 91% of the respondents were married while about 9% were single, none of the respondents were divorced. This shows that most of the farmers practicing catfish husbandry in the study area are married and this means that there could be availability of family labour.

4.1.4 Educational level of respondents

From the result obtained the respondents have different level of education as shows in the table below.

Table 4.4 *Educational level of respondents*

Level of education	Frequency	Percentage (%)
Primary education	-	-
Secondary education	15	18.75
Tertiary education	65	81.25
Total	80	100

Source: *field survey 2018*

As shown in table 4.4, about 19% had secondary education only, while about 81% had tertiary education and these reflect that all the respondents in the study area were educated.

4.1.5 Years of experiences of farmers in catfish husbandry

As shown in table 4.5, majority of the respondents interviewed had years of experience ranging from 1.5 years and only a few had above 5 years of experience of cat fish husbandry.

Table 4.5 *Years of experience in catfish farming*

Years of experience	Frequency	Percentage
1.5	64	80
6.10	16	20
Total	80	100

Source: *Field survey 2018*

This implies that the respondents are not too old in the enterprise and this level of experience can also determine the level of knowledge on management practices that is, they older they get in the enterprise, the more they get to know and understand the management practices of catfish husbandry. From the result, it was observed that some of the farmers are into full-time catfish farming while where are into part-time farming catfish while they carry out other economic activities.

Table 4.6 *showing level of engagement of farmers in catfish husbandry*

Level of engagement	Frequency	Percentage (%)
Part-time	47	58.75
Full-time	33	41.25
Total	80	100

Source: *Felid survey 2018*

About 41% into full-time while about 59% are into part-time farming. This indicates that catfish husbandry can be conveniently combined with other economic activity and depending on the choice of the farmer it can be practiced full-time. Various activities engaged in by respondents practicing part-time catfish farming include trading, rentals, business of different types and majority of them are civil servants. Most importantly the respondents admitted that the other economic activity in which they engage in do not affect their level of production.

4.2 SOCIO-CULTURAL AND ECONOMIC FEASIBILITY OF CAT FISH HUSBANDRY IN THE IN STUDY AREA

4.2.1 Socio-cultural Feasibility of catfish husbandry in study area

This section shows the response of farmers to socio-cultural feasibility factors in the study area. Results are shown in the table below.

Table 4.7: *socio-cultural feasibility indictors.*

Feasibility indicators	Response				
	High	Medium	Low	No response	Total
Social acceptability	70(87.5)	7(8.75)	3(3.75)	-	80(100)
Cultural compatibility	76(95)	-	-	495)	809(100)
Job satisfaction	72(90)	-	-	6(7.5)	80(100)
Group formation	-	24(30)	52(65)	4(5)	80(100)
Pleasure / interest	-	-	18(22.5)	65(77.2)	80(100)

Source: *Field survey 2018*

Note numbers in parentheses represents the percentages. From table 4.7, about 88% of the respondents admitted the social acceptability of the practice is high which means that it is compatible with their way of life. About 9% and level of social acceptability is medium while the remaining 3% did not respond to this. In terms of cultural compatibility, 95% of the respondents consider the practice compatible to their culture while the remaining 5% did not respond to this. In terms of job satisfaction 90% of the respondents admitted the level of satisfaction is very high and this accounts for the reason why some of farmers are into full-time engagement of the practice. The level of group formation is study area for catfish famers is considered low by 65% of the respondents, 30% of the respondent considers level of group formation to be medium while 5% did not respond to this. Some of the respondents admitted that they engage in the practice for fun as they consider it quite interesting. Only 22.5% responded to this.

4.2.2 Economic Feasibility of Catfish husbandry in study area

The economic feasibility of catfish husbandry in the study area gives information on the level of profitability of the enterprise and the market performance of the produce. From the responses obtained most of the farms are small scaled in terms of number of ponds which ranged between 1-5 with an average size of 6.32 square

meters and an average stocking density of 120 fingerlings per square meter. In order to determine the economic feasibility of an enterprise such as catfish farming, the level of market for the produce has to be critically considered as this will greatly determine the framers level of returns and also whether it will be profitable to venture into the business or not. The table below shows the framers perception of catfish market in the study area.

Table 4.8: *market performance of catfish.*

Market performance	Excellent	Good	Fair	Poor	Total
Demand for catfish Storage/processing Availability/accessibility to input	6.3 (78.75) 23(28.75) -	15(18.75) 84(60) 58(72.5)	2(2-5) 9(11.25) 18(22.5)	- - 4(5)	80(100) 80(100) 80(100)

Source: *Field survey 2018*

Note: *numbers in parenthesis represents the percentages.*

From table 4.8 about 79% of the respondents said the level of demand for catfish is high and that makes the market performance excellent, about 19 said the market performance is good while 2% said the market performance is poor based on the level of demand. In terms of storage and level of processing 29% considers the level of market to be excellent, 60% said it is good while 11% admitted that it is fair. Also about 72.5% of the respondents said that based on the level of availability and accessibility inputs, the market performance is good, 22.5% of the respondents admitted that the market performance is fair while 5% said the market performance on this same basis is poor.

Cost of production in catfish husbandry

The cost of production refers to the total cost incurred during the production, For the purpose of this study the cost of production is considered on the basis of an average pond size of 6.32 square meters and an average stocking density of 120 fingerlings per square meter. The total cost of production include cost incurred on variable inputs (variable cost and cost incurred on fixed input (fired cost). The variable inputs, their quantities and their cost per unit are shown in the table below.

Table 4.9: *showing inputs, their qualities and cost.*

INPUTS	**QUALITY**	**COST/UNIT INPUT**
Feed	15 bags	₦2300
Fingerlings	500 fingerling	₦35per fingerling
Water	3000 liters	₦0.50per liter
MEDICATIONS:		
Ovaprim	1 pack	₦5000 per pack
Fishvitplus	15 sachet	₦400 per sachet
Vitamin C	1 kg	₦3000 per 1 kg
Pond neutralizer	2 bottles	₦2000 per bottle

Source: *field survey 2018*

The fixed cost include, cost of pond construction, cost of pumps and machines, cost of equipments such as pond heaters, coolers, pH, meters etc. The total cost of production per pond in presented in the table below

Table 4:10: *cost of variable and fixed inputs.*

INPUTS	COST
Variable cost	₦34,500
Feed	₦1,500
Water -	₦ 21,000
Labour -	₦14,525
Juvenile/fingerlings -	₦18,000
Medication -	₦55,059
Total	₦55,059
Fixed cost	
Pond construction	₦68,850
Pumps and machine	₦48,500
Pond equipments	₦27,300
Total	₦144,650

Source: field survey 2018

Total Revenue

The total revenue is the total returns obtained from the production. The average selling price of catfish is 450.00per kilograms, average quality sold out was 630.75kg per pond. So therefore the total revenue obtained from an average pond size of 6.32 square meters is ₦283, 837.50.

Gross Margin analysis

This expresses the differences between the total value of production and the variable cost of the production. The gross margin is expressed thus:

Total revenue (TR) =₦283,837.50

Total variable cost (TVC) = 55,059.00

Gross margin (GM) = 228,778.50

Therefore on an average pond size of 6.32 square meters and a stocking density of 120 fingerlings per square meter, a gross margin or profit of 228.778.50 was obtained.

Net income

The net income gives an overall level of profitability of the enterprise putting both the fixed and variable cost into consideration.

Thus, N1-Tr-TC

TR (Total revenue) = ₦283,837.50

TC (Total cost =fixed cost + variable cost) = ₦144,650 + ₦55,059 = ₦199.709

N1 = ₦283,837.50 - ₦199,709=₦84,128.50

Therefore from an average pond size of 6.32 square meters and a stocking density of 120 fingerlings per square meter, an average net income of ₦84,128.50 was obtained. From the cost return analysis above, the result indicate that catfish farming is economically feasible and profitable, so it is advisable for farmers to invest in it.

4.3 MANAGEMENT PRACTICES IN CATFISH HUSBANDRY

Management practices carried out by catfish farmers is considered intensive by 61% of the respondents in terms of labour and capital, while about 38% admits and catfish farming is only capital intensive. Farmer's source knowledge on catfish management practices from various sources, the table below shows the different sources of knowledge on management practices.

Table 4.11 *sources of information on management practices.*

Source of information	Frequency	Percentage (%)
Books/journals Friends Internet Research institute Others	9 56 10 - 5	11,25 70 12.5 - 6.25
Total	80	100

Source: *field survey 2018*

Table 4.11 revealed that despite the most of the farmers are educated a considerable number of them still depend on friends and other farmer on information on catfish husbandry. This is as a result of quick and cheap accessibility to information to information. Also from the table above we can see that no farmer sourced information from any research institute on catfish husbandry. 6.25% of the respondents said that they depend on other sources such as information from private consultants, trial and error method etc. The management practice adopted has tremendous effect on the total yield of the production, if management practice is poor the yield of the production definitely decrease and vice versa. About 75% of the respondents said that they are not getter the desired response in terms of yield from the management practiced adopted. This result reflects that management practices are posing a problem of many catfish farmer in the study area.

4.4 SUPPORTIVE SERVICES

Farmers most at times do have problems with their enterprise; hence they do rely on other sources for help and support. This section shows the types of supportive services needed by the farmers and who is in the right position to provide such services.

Table 4.12: *shows farmers response to types of supportive services they need.*

Areas of supportive services	Frequency	Percentage(%)
Medical/vet services Credit services Training services Incentives/input provision services	6* 34* 25* 15*	7.5 42.5 31.25 18.75
Total	80	100

Source: *field survey 2018.*
Note: *******Indicates areas with multiple responses.*

4.5 CHALLENGES IN CATFISH HUSBANDRY

Several challenges are being faced presently by practicing catfish farmers and these problems and farmers responses are to them are shown in the table below;

Table 4.13; *showing challenges of catfish farmers in study area.*

Challenges	Frequency	Percentage (%)
High cost inputs Water quality and availability Poor quality bread Lack of information on medications Lack of credit/capital resources	25* 10* 5* 18* 22*	31.25 12.5 6.25 22.5 27.5
Total	80	100

Sources: *field survey 2018*
Note: **indicates areas with multiple responses*

From table 4.13 about 31% of the respondents admitted that one of the major challenges faced by farmers is the high cost of inputs as fish medications etc, others include lack of capital resources and appropriate infuriation on medications.

4.6 OPPORTUNITIES AND SUGGESTIONS

Despite the problems being faced by farmers in the catfish industry, they still believe it is a lucrative enterprise and very economically advantageous to engage in, as shown in section 4.2.2. Also the enterprise provides an opportunity of employment as it gives room for hired labour and can be practiced full-time and part-time as it also gives room for other economic activities. Suggestions by farmer on how to improve production and they fell should provide them with supportive services are shows in the table below.

Table 4.14; *responses on supportive services providers.*

Supportive services provider	Frequency	Percentage (%)
Government Association of Catfish farmers Research Institute Foreign Organisations NGO's Others	43 13 19 5 -	53.75 16.25 23.75 6.25 -
Total	80	100

Source: *field survey 2018*

From the table 4.14, it is observed that much of the services is expected from the government and also the research institute and this is because the government will have the capacity to provide the capital intensive services and the research institutes will provide the most reliable source of information on catfish management practices. From the response of the farmer interviewed in the study area there have been no association of catfish farmers so they are not part of any, also majority of the respondents admitted that there is no link between any research institutes and their community. This means that the need for in association and a link or the services of a research institute has been indentified to be very important in alleviating some of the problems of catfish farmers in the study area.

5.0 SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 SUMMARY

The general objective of this study is to determine the socio-economics of catfish husbandry in Ckikun local government of Kaduna state. To achieve this, and sample size of 80 catfish farmers was selected from five different areas using random sampling technique. The data were obtained through the use of well structured questionnaires which were used to interview the respondents. The data obtained were analyzed using simple descriptive statistical tools such as the percentage and frequency table averages also the gross margin analysis and farm net income was used. The result showed that most of the catfish farmers are within the age range of 36.55 years, it also shows that 75% of the farmers are males and 25% are female 90% of the respondents are married. All the respondents are educated with majority having tertiary education level. Considering the socio-cultural feasibility factors the 88% of the respondents admitted that the level of social acceptability is high, 9% said that the level of social acceptability is low. Considering cultural compatibility, 98% of the respondents said that the practise is compatible with their culture. In terms of job satisfaction 90% of the respondents admitted that the level of satisfaction is high. About 68% of the respondents considers the level of group formation to be low, 30% and the level of group formation is medium. 22.5% of the respondents admitted that the practice is quite interesting and are practicing it for pleasure. It was also discovered from the result of this study that about 41% of the respondents practice full-time catfish farming hwile about 58% carry out part-time catfish farming along side with other economic activities. Also majority of the farmers in the study area had years of experience in catfish husbandry ranging from 1-5years. Expressing their perception on the market performance of catfish about 79% of the responents said the market is excellent and this is due to the hihg level of demand of catfish. In terms of storage and processing, 29% of the respondents consider the makret level to be excellent, 60% said it is good and 11% said the market level on the basis of storage and processing is fair. Also about 72.5% of the respondents said based on the lelve of availbility and accessiblity to inputs, the market performance of catfish is good, 22.5% of the respondents consider the market performace of the fair while 5% consider the market level to be poor. Respondents admitted that catfish husbandry is capital intensive. Cost and returns analysis showed an average gross margin of ₦228,778.50 per production and a total net income of ₦ 84,128.50 indicating how lucrative the enterprise is. In terms of management practices about 61% of the respondents considered management practices of catfish to be intensive in terms of capital labour. It was also observed that 70% the respondents source knowledge on catfish management from friends and fellow farmers, other sources identified are journals/text books, internet. In terms of supportive services majority of the respondents requires support in areas of medical and veterinary services, credit services, training services etc. about 53% of the respondents suggested that government should provide the various services needed, about 24% of the respondents suggested that the research institute should be the one to provide the supportive services. Majority of the farmers are faced with challenges such as high cost of inputs water quality problem, stock quality problem, lack of capital resources for start-up farmers or for expansion for practicing farmers and knowledge on appropriate medication. Opportunities identified in catfish husbandry are its economic advantage and provision of employment.

a. CONCLUSION

The knowledge of the socio-economics of catfish husbandry is of critical importance in establishment of a commercial catfish farm in any area. This study has revealed the socio-cultural, economic and technical factors that must be considered for the establishment of such enterprise to be feasible. From the cost and return analysis of this research work we can see that catfish husbandry is a very good and profitable enterprise and farmers are advised to invest in it. The catfish industry will also perform better when supportive services are provided for the farmers by the government and other private sector or organisation.

b. RECOMMENDATION

Catfish farming has the potential of increasing income of the farmers in the study areas this in turn improve their standard of living. However, the potentials for catfish farming in the study area can be fully maximised and improved if the following recommendations are considered.

1. Micro-finance institutions which can provide farmers with credit facilities especially in cases where they lack access to organised banking system should be made available by the government or by the farmers themselves by coming together.
2. Research institutes around should provide farmers with extension services so as to provide them with technical assistance in terms of adequate information on catfish farming.
3. Inputs which are not always available such as quality water, good and improved fingerlings for farmers should be made available by either the government or other private organisations.
4. Workshops, seminars and field demonstrations should be organised for catfish farmers by the government and research institutes through extension workers.
5. It is also recommended that there should be a greater integration of the younger generation through mass education and extension of credit facilities to attract them into catfish farming.
6. Private investors should come into the enterprise by establishing a processing industry where catfish can be processed into other processed canned products so as to provide a way of absorbing either excesses of production.
7. It is recommended that there should be a well organized and networked market for catfish farmers and processors to advertise their products for sale.
8. There is need for farmers to learn the habit of good record keeping of their farm operation, as it will enable them get accurate estimate of their returns.

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