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Good Agricultural Practices in Catfish Farming Among Commercial Fish Farmers in Yenagoa Local Government Area, Bayelsa State, Nigeria

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This study was on Good Agricultural Practices (GAPs) in catfish farming among commercial fish farmers in Yenagoa Local Government Area (YELGA), Bayelsa state, Nigeria. The objectives were to; ascertain the awareness of GAPs among commercial fish farmers in YELGA, identify GAPs aware of by YELGA commercial fish farmers and determine the GAPs use by commercial fish farmers in catfish farming. A total of 77 fish farmers; randomly chosen from list obtained from Ministry of Trade and Industry, formed the sample size; whom structured questionnaire was administered on. Data were analysed descriptively with percentage and ranking. Findings were that; YELGA fish farmers' percentage level of awareness of GAPs was incredible; with all the commercial fish farmers (100%) aware of GAPs, and all identified GAPs (100%) aware of by varying percentages of the commercial fish farmers. Similarly, GAPs implementation/use in catfish farming among fish farmers in YELGA was awe with high percentages of above 50% recorded for approximately 94% of GAPs identified. The study concludes that YELGA fish farmers are compliant to the global GAPs standard; being highly aware of GAPs and use/implement GAPs in catfish farming, thus are producing catfishes that will pass global standard tests and stand competition at global market places. Intensified advocacy and farmer engagement by state actors such as extension agency, and policy directive from the government for credit to farmers was recommended to ensure GAPs compliance; for fish welfare, staff/human safety and overall sustenance of GAPs among commercial farmers in the state.

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1. INTRODUCTION

Fisheries sector is one area that has witnessed tremendous growth in a couple of years past; thanks to shift from dependence on artisanal fisheries to aquaculture fisheries. Aquaculture involves the production of seed and the on-growing of fingerlings/juveniles to table size fish whether for personal consumption or for commercial purpose. These can take place in different culture systems such as earthen pond system, concrete pond system and mobile ponds such as tarpaulin, plastic, fibre glass tanks and floating cages among others. One of the fish species that has thrived under the aquaculture system is the catfish. Its farming in Nigeria seems leading due to its seeming sociological and physiological qualities. For example, its fast growth rate, resistance to disease and ability to withstand adverse environmental conditions as adduced by Miller and Atanda, (2011); Nwachi and Toritseju (2014) makes it the most cultured specie in Nigeria. Also, its wide acceptance and demand in the market; evidenced in its availability in nearly all markets across the country both in dry, fresh and live forms accords it high economic and market value. Water for fish farming; which can be sourced via underground seepage, rainfall, borehole, reservoir or natural water bodies depending on the culture system in use remains a resource of import. These profoundly abound in Nigeria and Bayelsa State in particular.

According to Adegwu (2023), Nigeria holds the position of the highest producer of African catfish (Clarias gariepinus) with an estimated annual production output of one million tonnes; worth around $2.6 billion in 2021. This is to say that Nigeria's African catfish production could translate into trillions of Naira. According to Food and Agricultural Organization (FAO) (2023), the population of catfish producers in Nigeria is about 285,000, representing about 0.1 percent of Nigeria's population; of which small-scale farmers represent over 60 percent; translating to 171,000 fish farmers. Although small to large scale farms seem spread across

the country, the south-south region; with abundant natural water bodies and good soils with higher water holding capacities; suitable for fish farming using the floating cage and earthen pond remain at a comparative advantage to dominate the sub sector.

Generally, pond preparation involves liming, fertilizing and detoxifying in concrete ponds before they are ready for stocking with Catfish fingerlings/juveniles. Subsequently, they are fed appropriate pellet size and composition until they reach the desired size. These production practices in catfish farming nonetheless come with a number of challenges which may in one way or the other reduce the expected output of fish by farmers. Challenges during production may include high mortality, stunted growth, disease outbreaks among other factors. Modern technologies to overcome or minimize these could be available also. The implementation of good agricultural practices while intensifying modern technologies among catfish producers therefore remains a point of concern.

Good Agricultural Practices (GAPs) is a collection of guidelines for on-farm production and post-production processes, aimed at delivering safe and healthy food production while taking into account; economic, social and environmental sustainability (FAO, 2010, Lefebvre, et. al., 2015; Sennuga, et. al., 2020; Nnadi, 2024). GAPs in catfish production according to Sennuga et. al. (2020) cover a range of areas including; farm structure and maintenance, farming and packaging practices, fish health management, farm environment and human health and safety. Others are management activities such as proper documentation of all farm activities as well as the fish species in culture, culture period, stocking size and density, source of foundation stock, feeding regime and record of fish stock; fish stock management principles such as ensuring new fish stocks are in good health and from known origin(s)/hatchery sources, proper documentation and labeling of fish stocks in the various net cages, and the recording of fish movement between nets. These guidelines also cover the principles for use of chemo-therapeutics such as the proper use of antibiotics, drug and chemicals in the right manner, sourcing of antibiotics/drugs/chemicals from licensed dealers, following of manufacturer's recommendation on the use of drugs and antibiotics, proper disposal of unused portions of antibiotics, drugs and chemicals residues and strict observation of withdrawal periods of the respective antibiotics, drugs and chemicals prior to harvesting (Sennuga, et, al., 2020).

Good Agricultural Practices (GAPs) as enshrined in global standards of FAO, is crucial in agricultural activities such as fish production, crop production, animal rearing and marketing of agricultural produces in order to guide the production systems towards; an ecologically safe and sustainable agriculture and harmless products of higher quality that contributes effectively to food security, generating income through access to markets and upsurge on the working conditions of farming families. The principles and guidelines of GAPs provides in-depth knowledge about the production of catfish in a safe and healthy manner while contributing to the safety of consumers and the environment at large. Therefore, the extent to which farmers are aware of, and implementing the GAPs guidelines remain a course to pursue. Works on good agricultural practices exist. Examples include; Adoption of Good Agronomic practices among smallholder rice farmers in Nigeria agricultural transformation agenda (Omolehin, et al., 2019), Utilization of good agricultural practices and technologies among tomato Farmers in Oriire Local Government Area of Oyo State, Nigeria (Anifiwose, et al., 2020), Poultry farmers' awareness and performance in good agricultural practices implementation in broiler production in Yenagoa Local Government Area, Byelsa State (Nnadi, 2024) among others. These studies however, did not cover analysis of good agricultural practices in catfish production among commercial fish farmers in Yenagoa Local Government Area (YELGA), Bayelsa state. It was on this note that this study was embarked on to add to the body of existing literature and close knowledge gap in GAPs use in catfish farming by fish farmers in YELGA, Bayelsa State with specific objectives of to; ascertain the awareness of GAPs among commercial fish farmers as well as determine the GAPs use by commercial fish farmers in catfish production.

2. METHODOLOGY

This study was in YELGA; home to the capital/seat of power of Bayelsa state, Nigeria. YELGA is located within coordinates of 4° 55´ 29´´N and 6° 15´ 51´´ E, has a total land area of 706km², a population of 524,400 and a population density of 742/km² (WorldWeatherOnline.Com, 2023). It shares boundaries with Mbiama communities of Rivers State on the North and East, Kolokuma/Opokuma LGA on the North-West, Ogbia LGA on the South East and Southern-Ijaw on the South-West. The general language spoken in the area is English language/*pidge* English. However, Epie-Atissa and Ijaw are the indigenous languages/dialects of the people. Vast part of YELGA is surrounded by water bodies and mangroves/swampy rain forest. The area is mostly affected by annual flooding due to the high level of rain fall and low land. In Yenagoa, the wet season is warm and overcast, dry season is hot and mostly cloudy nearly all the year round. Over the course of the year, the temperature typically varies from 22°C to 31°C and is rarely below 17°C or above 32°C (WorldWeatherOnline.Com, 2023). The major occupations of the people are fishing, farming and trading. Other means of livelihood include hunting, lumbering, distillation of palm wine, boat carving, palm oil milling, building, and making of local fishing gears (Alagoa, 1999). A simple random sampling technique was used to select a total of 77 (about 30%) fish farmers drawn from a list of 257 registered fish farmers obtained from the Ministry of Trade and Industry, Bayelsa State, Nigeria and a well-structured questionnaire augmented with interview schedule administered on them. Also, secondary information were obtained from already existing literature and endorsed officials such as Journals, Textbooks among others. Data obtained were analyzed using descriptive statistics of, percentage and rank.

3. RESULTS

3.1 Awareness of GAPs in catfish production

Table 1 Distribution of YELGA Commercial Fish Farmers by Awareness of GAPs

ITEM	**Frequency**	**Percentage**
Aware	77	100.00
Not aware	0	0.00
Total	**77**	100

Source: Field Survey Data, 2024.

The result in Table 1 above, shows the awareness of GAPs among YELGA Commercial fish farmers. The result shows that all (100%) of the farmers were aware of GAPs.

3.2 GAPs in Catfish Farming aware of by YELGA commercial fish farmers

Table 2. Distribution of YELGA Commercial Fish Farmers by GAPs Aware of in Catfish Farming.

Items	Frequency	Percentage	Rank
1. Documentation of all farm activities	76	98.70	4th
2. Avoid over feeding	77	100.00	1st
3. Avoid over stocking	77	100.00	1st
4. Proper parameter fencing	76	98.70	4th
5. Strict observance of drug withdrawal period	57	74.03	16th
6. Disinfect all farm equipment before and after use	67	87.01	12th
7. Proper training of personnel on GAP guidelines	63	81.82	15th
8. Routine monitoring and management of water parameters	70	90.91	11th
9. Treatment/preparation of ponds before stocking			
10. Adequate and appropriate personal protective equipment must	76	98.70	4th
be provided to farm staff	62	80.52	14th
11. Clean packaging containers must be used for the packaging of			
fish	72	93.51	10th
12. Incoming fish stocks must be of good health and from known			
origin	77	100.00	1st
13. Adequate quantities of feeds should be provided			
14. All containers and unused portions of antibiotics, drugs and	76	98.70	4th
chemicals must be properly disposed	76	98.70	4th
15. Expired or rancid fish feeds must not be used			
16. All dead or dying fish must be removed from ponds and	66	85.71	13th
disposed of properly	76	98.70	4th

Source: field data, 2024

The result in Table 2 shows the distribution of YELGA commercial fish farmers according to the different GAPs they are aware of in their catfish production business. From the result, the most common GAPs in catfish farming aware of by commercial fish farmers in YELGA are; avoid over feeding, avoid over stocking, and incoming fish must be of good health and from a known origin. These were respectively aware of by all (100%) of the commercial fish farmers and ranked 1st in the list. Again, in the 4th positions were; documentation of all farm activities, proper perimeter fencing, treatment/preparation of ponds before stocking, adequate quantities of feeds should be provided, all containers and chemicals must be properly disposed and all dead or dying fish must be removed from ponds and disposed of properly respectively aware of by 98.70% of the YELGA commercial fish farmers. Next on rank (10th) was clean packaging containers must be used for the packaging of fish; aware of by 93.51% YELGA commercial fish farmers. In the same vain, routine monitoring and management of water parameters (90.91%) and disinfect all farm equipment before and after use (87.01%) respectively were ranked 11th and 12th by YELGA commercial fish farmers as GAPs they are aware of while expired or rancid fish feeds must be removed from ponds and disposed properly and proper training of personnel on GAPs guidelines were respectively ranked 13th and 14th by 85.71% and 81.82% of YELGA commercial fish farmers as GAPs they are aware of respectively. At the bottom of the list are adequate and personal protective equipment must be provided to farm staff and documentation of all farm strict observance of drug withdrawal period that were respectively ranked 15th and 16th by 80.52% and 74.03% of YELGA commercial fish farmers as GAPs they are aware of respectively.

3.3 GAPs use by Fish Farmers in Catfish Production

Table 3. Distribution of GAPs Use by Fish Farmers in Catfish Production.

Items	Frequency	Percentage	Rank
1. Documentation of all farm activities	65	84.42	9th
2. Avoid over feeding	77	100.00	1st
3. Avoid over stocking	70	90.91	6th
4. Proper perimeter fencing	70	90.91	6th
5. Strict observance of drug withdrawal period	55	71.43	12th
6. Disinfect all farm equipment before and after use	46	50.65	15th
7. Proper training of personnel on GAP guidelines	65	59.74	14th
8. Routine monitoring and management of water parameters		84.41	10th
9. Treatment/preparation of ponds before stocking	72		
10. Adequate and appropriate personal protective equipment must be provided to farm staff	33	93.51	4th
		42.86	16th
11. Clean packaging containers must be used for the packaging of fish	68	88.31	8th
12. Incoming fish stocks must be of good health and from known origin	76	98.70	2nd
13. Adequate quantities of feeds should be provided	53	68.83	
14. All containers and unused portions of antibiotics, drugs and chemicals must be properly disposed	71	92.21	13th
			5th
15. Expired or rancid fish feeds must not be used	63	81.82	
16. All dead or dying fish must be removed from ponds and disposed properly	75	97.40	11th
			3rd

Source: Field Survey Data, 2024.

In Table 3 above, result shows the distribution of YELGA commercial fish farmers' GAPs use in catfish farming. The result shows that all the farmers (100%) endorsed avoidance of over feeding as number (1) GAP they use in catfish farming in YELGA. Closely following this are Incoming fish stocks must be of good health and from known origin (2nd) and All dead or dying fish must be removed from ponds and disposed properly (3rd) as respectively indicated by 98.70% and 97.40% of YELGA commercial fish farmers as GAPs they use in their catfish farming. Other GAPs in use by the YELGA commercial fish farmers in their catfish farming include; Treatment/preparation of ponds before stocking (4th, 93.51%), all containers and unused portions of antibiotics, drugs and chemicals must be properly disposed (5th, 92.21%), avoid over stocking and proper perimeter fencing (6th, 90.91%) respectively, clean packaging containers must be used for the packaging of fish (8th, 88.31%), documentation of all farm activities (9th, 84.42%), routine monitoring and management of water parameters (10th, 84.41%), expired or rancid fish feeds must not be used (11th, 81.82%), strict observance of drug withdrawal period (12th, 71.43%), adequate quantities of feeds should be provided (13th, 68.83%), proper training of personnel on GAPs guidelines (14th, 59.74%), disinfect all farm equipment before and after use (15th, 50.65) and adequate and appropriate personal protective equipment must be provided to farm staff (16th, 42.86%).

4. DISCUSSION

4.1 Awareness of GAPs in fish production

The result on awareness of GAPs in fish production among commercial fish farmers implies that there is high possibility of GAPs usage in catfish farming among commercial fish farmers in YELGA. Awareness remains the first step to adoption. Thus with an overwhelming awareness recorded by YELGA fish farmers – Table 1, a high level of GAPs use/implementation is expected. This result tallies with Nnadi (2024) on GAPs implementation in broiler production among poultry farmers in Yenagoa Local Government Area.

4.2 GAPs in Catfish Farming Aware of by YELGA Commercial Fish Farmers

Significant proportions of commercial fish farmers in YELGA indicated high levels of awareness of various GAPs in catfish farming. The awareness of three (3) out of sixteen (16) identified GAPs guidelines in catfish farming by all (100%) and the remaining thirteen (13) aware of by over 70% of commercial fish farmers in YELGA is incredible and highly commendable. Being aware of all (100%) GAPs identified by YELGA commercial fish farmers could imply high tendency of use/implementation.

4.3 GAPs use by Fish Farmers in Catfish Production

The result on GAPs use/implementation in catfish farming is awe! With high percentages above 50 recorded for approximately 94% of GAPs identified, commercial fish farmers in YELGA to a large extent could be said to be GAPs users in catfish farming. Despite this, there could be more to this outcome! The endorsement of the GAP guideline of; avoiding over feeding by 100% of the fish farmers and ranking 1st in order of use/implementation, may not have been hinged on fish health and welfare. This assertion stemmed from the downward ranking to the 13th position of the GAP guideline of ensuring adequate quantities of feeds be provided; implemented by 69% farmers approximately. Indeed, all things being equal, the later ought to corroborate the former with results probably at par. Many writers and researchers have referred to the African sub-region farmers as resource poor or resource constrained. This could therefore be adduced to the observed variation in the implementation of the seeming identical GAPs. This narrative is poor and needs to change. Commercial farmers are likely to operate with a mind set and consciousness of minimizing and maximizing costs and profits respectively. To this end, activities that promote these objectives would rather be pursued. This could have been the case with YELGA commercial fish farmers: who in their GAPs implementation/use in cat fish farming, identify extensively with such that seem to tilt towards achieving these production objectives. With nearly all the guidelines (15) implemented by well above 50% of farmers, it could therefore be said that YELGA fish farmers are knowledgeable and well informed about GAPs. This trend is good; as YELGA fish farmers could be said to be capable of producing catfishes that will pass global standard tests and also stand competition at global market places. This trend should be improved upon sustained. On a sad note however, it is highly regrettable that fewer (43%) YELGA commercial fish farmers implement the GAP guideline of appropriate personal protective equipment must be provided to farm staff. This tells the health risk factor and vulnerability of farm workers especially in in developing nations. Reverting this would be most desirable as in line with the words of Nnadi (2024), "lessons from recent pandemic of COVID-19, Ebola disease among others, require that adequate protection and safety of frontline workers remain supreme".

5. CONCLUSION AND RECOMMENDATION

This study concludes that YELGA commercial fish farmers though less concerned with adequate and appropriate personal protective equipment provided to farm staff, are compliant to the global GAPs standard; being highly aware, and also use/implement GAPs in catfish farming in producing catfishes that will pass global standard tests, and stand competition at global market places. Intensified advocacy and farmer engagement by state actors such as extension agency, and policy directive from the government for credit to farmers was recommended to ensure GAPs compliance; for fish welfare, staff/human safety and overall sustenance of GAPs among commercial farmers in the state.

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