PRELIMINARY INVESTIGATION OF FISH FEED PELLETIZING EQUIPMENT FOR THE THREE AGRO-ECOLOGICAL ZONES THAT ARE IN NORTHERN, CENTRAL AND SOUTHERN WITHIN THE ADAMAWA STATE, NIGERIA

Kadafa, M.K.*, Kabri, H.U., Tashiwa, Y.I. and Ta'awu, K.G.

Department of Agricultural and Environmental Engineering, Modibbo Adama University Yola, Adamawa State, Nigeria

*Corresponding email: kkadafa@gmail.com

ABSTRACT

The fish feed pelletizing equipment is crucial for producing high-quality fish feed, enhancing the efficiency and sustainability of fish farming practices. The high cost of imported fish feed and processing is a significant challenge for small and medium-sized fish farmers in Adamawa State This study aims to investigate the availability, functionality and uses of fish feed pelletizing equipment of three (3) agro-ecological zones within the Adamawa State, Nigeria. The study employed a mixed-methods approach, combining surveys, field observations, and expert interviews. The results revealed that limited availability of local fabricated pelletizing equipment about 13.33%, frequent equipment breakdowns about 60% are bad, inadequate equipment or don't use equipment about 70%. and maintenance practices very poor. The further research is needed to develop and optimize the performance of fish feed pelletizing equipment.

Keywords: *Preliminary Investigation, Fish Feed, Pelletizing Equipment*

1 INTRODUCTION

Aquaculture is a vital component of Nigeria's agricultural sector, providing a significant source of protein and employment opportunities. Fishes have always been an important species to man and an important source of animal proteins. Earliest form of fish culture appears to be of the common carp (*Cyprinus carpio*), native to China, and the cultivation of *Tilapia mossamblaca*to Vietnam. Fish farming contributes about 50% of the consumed by humans globally. It produces about 35% of the world's animal protein. Fish contains 15-30% of protein; a higher percentage than the flesh of usual domestic animals reared for meat, egg, milk and beef [1]. Global food fish consumption per capita grew from 9.0 kg (live weight equivalent) in 1961 to 20.5kg in 2018, by about 1.5 percent per year. This Global food fish consumption increased at an average annual rate of 3.1 percent from 1961 to 2017, a rate almost twice that of annual world population growth (1.6 percent) for the same period, and higher than that of all other animal protein foods (meat, dairy, milk, etc.), which increased by 2.1 percent per year [2]. Farmers use cheap and locally sourced raw ingredients to produce feeds that are badly formulated, poorly made and misguidedly used due to a lack of technical expertise and inadequate manufacturing equipment in their on-farm feed manufacture despite the availability of the feed ingredients [3, 4]. Fish feed pelletizing equipment is essential for producing nutritious and durable fish feed. Research by Oladele et al [5], highlights the challenges facing fish feed production in Nigeria. The study reveals that inadequate infrastructure, poor quality control, and limited access to raw

materials hinder the production of high-quality fish feed. Similarly, Adeyemo et al [6] emphasize the need for improved fish feed pelletizing equipment to enhance the efficiency and sustainability of aquaculture practices. However, the availability and functionality of fish feed pelletizing equipment in Adamawa State are unclear. This preliminary investigation aims to assess the current state of fish feed pelletizing equipment in Adamawa State, identifying challenges, opportunities, and areas for improvement.

2 MATERIALS AND METHODS

The field experiment aspect of the study involved the collection of data on-farm, which includes; the fish feed equipments, cost of obtaining the equipments and the locally formulated feed available in the study area. The main field studies were done in real fish farmer environments in Adamawa agro-ecological zones that are north, central and south within the Adamawa State. Adamawa State is located in the North- Eastern part of Nigeria. It lies between latitude 7^0 and 11^0 N of the equator and between longitude 11^0 and 14^0E of the Greenwich meridian. The area is an agrarian tropical environment marked by dry season (November-March) and wet season (May-October). The Mean annual rainfall usually ranges from 700mm to 1,050mm [7]. The soils type in the area is reported to be predominantly of sandy clay loam textures [8, 9].

2.1 Experimental Design (Field Study)

On-Farm trials were established by selecting at least 30 farmers at random from predominantly fish farmers in the three Adamawa agro-ecological zones. The study area will be divided into number of sub-locations in order to prevent experimental bias. According to Fall [10], the number of sub-locations depends on the total area to be covered and monitored. The trials included the assessment of the use of equipments, cost and wear rates of the existing, also a survey on feed materials for feed production locally and this will give the major stakeholders the opportunity to provide deeper insights into their experiences with various equipments and their expectations for the project. This approach is aimed at long-term sustainability of successful study output. The field experiment aspect of the study involved the collection of data on-farm, which includes; fish farming types, fish feed use, the fish feed equipments, cost of obtaining the equipments, condition of fish feed equipments and the locally formulated feed available in the study area.

2.2 Descriptive statistics

Descriptive statistics was used to represent and explain the pattern of raw data that was gathered logically for easy understanding and interpretation, as well as for organizing, summarizing, and presenting data in a convenient and informative way. This study utilized descriptive statistics techniques such as, frequency and percentage analysis using tables [11].

3 RESULTS AND DISCUSSION

The analysis of the results which includes; Fish farming types, fish feed use, the fish feed equipments, condition of fish feed equipments and the locally formulated feed available in the study area**.** The results revealed that limited availability of local fabricated pelletizing equipment about 13.33%, frequent equipment breakdowns about 60% are bad, inadequate equipment and maintenance practices. In the three (3) agro-ecological zones those are northern, central and southern within the Adamawa State are medium scale farmers with total frequency of 14 out the 30 farms analyzed. The result also shows that the farmers mostly used imported feeds instead of locally formulated and most of the farmers don't use equipment to pelletize locally. Hence, they really on imported feeds which is cost effective. The available equipments are mostly in bad condition and are underutilized. However, it was observed that, despite the availability of local fish feeds, the majority of farmers used imported feeds which are very expensive. Hence, it justified the need for the construction of the automated fish feed pelletizer for local production of fish feeds.

Table 1. Fish farming types

S/NO	Senatorial Zone	Large scale (frequency)	Percentage (%)	Medium scale (frequency)	Percentage (%)	Small scale (frequency)	Percentage (%)
1	Northern	2	6.67	4	13.33	4	13.33
2	Central	1	3.33	5	16.67	4	13.33
3	Southern	1	3.33	5	16.67	4	13.33
4	Total	4	13.33	14	46.67	12	39.99

Source: Field survey 2023

Table 2. Types of Fish feed use

S/NO	Senatorial Zone	Local feed (frequency)	Percentage (%)	Imported feed (frequency)	Percentage (%)	Mixed feed (frequency)	Percentage (%)
1	Northern	1	3.33	6	20.00	3	10.00
2	Central	1	3.33	7	23.33	2	6.67
3	Southern	1	3.33	6	20.00	3	10.00
4	Total	3	9.99	19	63.33	8	26.67

Source: Field survey 2023

Table 3. Fish feed Equipment Analysis

S/NO	Senatorial Zone	Indigenous (frequency)	Percentage (%)	Imported (frequency)	Percentage (%)	Don't use Equipment (frequency)	Percentage (%)
1	Northern	1	3.33	2	6.67	7	23.33
2	Central	1	3.33	2	6.67	7	23.33
3	Southern	2	6.67	1	3.33	7	23.33
4	Total	3	13.33	5	16.67	21	69.99

Source: Field survey 2023

Table 4. Condition of Fish Feed Equipment

S/NO	Senatorial Zone	Good (frequency)	Percentage (%)	Medium (frequency)	Percentage (%)	Bad (frequency)	Percentage (%)
1	Northern	1	3.33	3	10.00	6	20.00
2	Central	1	3.33	2	6.67	7	23.33
3	Southern	3	10.00	2	6.67	5	16.67
4	Total	5	16.67	7	23.34	18	60.00

Source: Field survey 2023

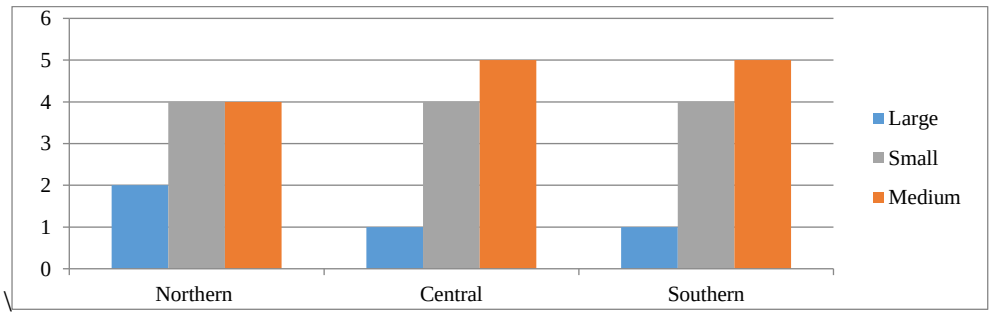

Figure 1. Showing fish farming types

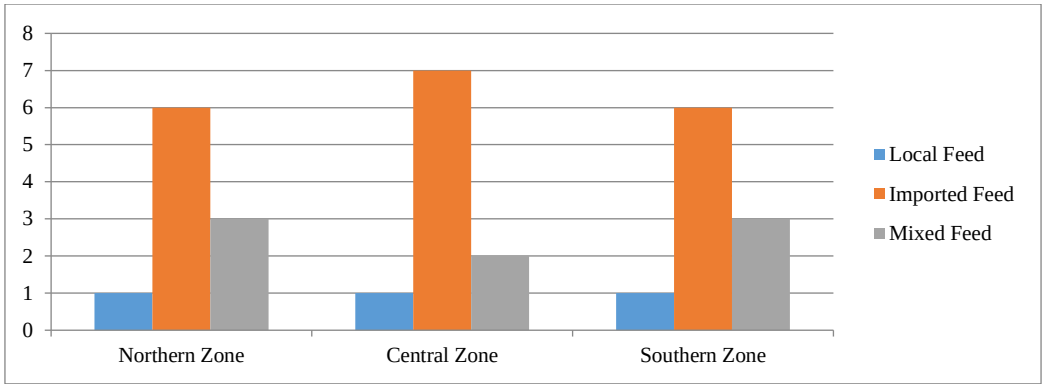

Figure 2. showing fish feed use

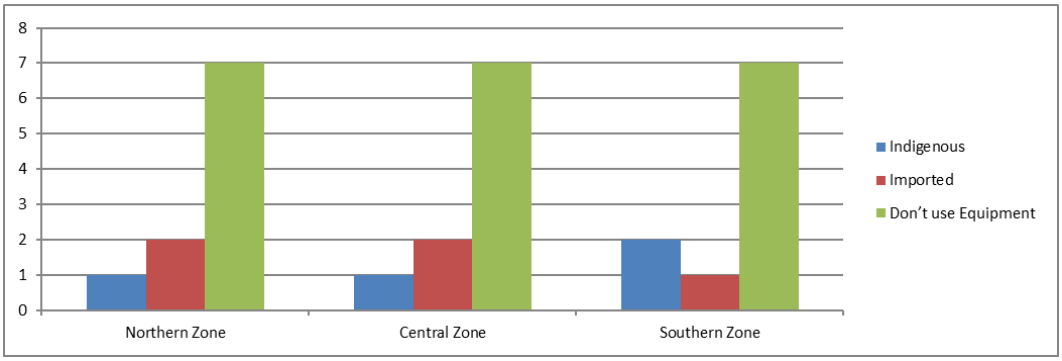

Figure 3. Showing fish feed equipment

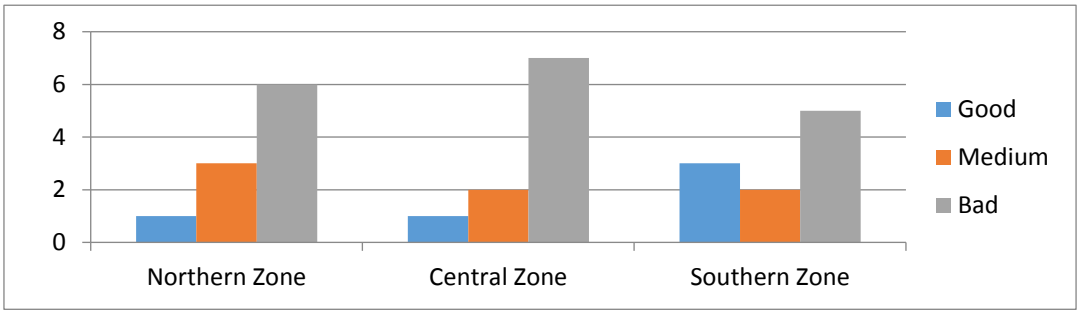

Figure 4. Showing conditions of fish feed equipment

4 CONCLUSIONS

Finally, the availability and functionality of fish feed pelletizing equipment in Adamawa State are unclear. This preliminary investigation aims to assess the current state of fish feed pelletizing equipment in Adamawa State, identifying challenges, opportunities, and areas for improvement. The results revealed that limited availability of local fabricated pelletizing equipment about 13.33%, frequent equipment breakdowns about 60% are bad, inadequate equipment and maintenance practices. The highlights the need for improved access to pelletizing equipment to enhance the sustainability of fish feed production in Adamawa state. This study recommended the development of fish feed pelletizing equipment to improve farmers' access to pelletizing equipment and maintenance services in Adamawa State.

REFERENCES

1. Food and Agricultural Organization (2010). Review of the State of the World Marine Fishery Resources. Species Fact Sheets. *Fisheries and Aquaculture Department*, 197p.

2. Food and Agricultural Organization (2022). Fish Production and Consumption Statistics, 88p.

3. Gabriel, U.U., Akinrotimi O.A., Bekibele D.O., Onunkwo, D.N. and Anyanwu P.E. (2007). Locally Produced Fish Feed: Potentials for Aquaculture. *African Journal of Agricultural Research*, vol. 2, no. 7, pp. 287-295.

4. Tashiwa, Y.I., Mojeed., K.A., Kabri, H.U. and Jilima, A.A. (2019). Development of a motorized fish feed pelletizing Machine. *Nigeria Journal of Engineering Science and Technology*, vol. 5, no. 2, pp. 96-102.

5. Oladele, O.I., Akande, K.E. and Ogundipe, L.O. (2022). Assessment of Fish Feed Production in Nigeria: A Review. *Journal of Fisheries and Aquatic Science*, vol. 17, no. 2, pp. 1-12.

6. Adeyemo, O.K., Agbabiaka, L.A. and Oyediran, A.O. (2020). Evaluation of Fish Feed Pelletizing Equipment in Nigeria. *Nigerian Journal of Technological Development*, vol. 17, no. 1, pp. 34-43.

7. Adebayo A.A. and Tukur A.L. (1999). Adamawa State in Maps. (1st eds). *Paraclete Publishers, Yola -Nigeria*, pp. 3-26.

8. Abubakar M.S., Tekwa, I.J. and Ahmed, M (2009). Effects of Soil Physical and Mechanical Properties on Field Efficiency of OX-drawn Mouldboard Plough in Yola; Adamawa State; Agricultural Engineering International: *The CIGR EJournal. Manuscript*, pp. 1369-2137.

9. Maiyaki, I. (2010). Performance Evaluation of Animal-Drawn Tillage Implements in Girei Local Government Area of Adamawa State- Nigeria. *Unpublished B.Eng. Project, Department of Agricultural and Environmental Engineering, Federal University of Technology, Yola*, 126p.

10. Fall, A., Pearson, R.A. and Lawrence, P.R. (1997). Nutrition of Draught Animals in Semi-Arid West Africa I. Energy Expenditure by Oxen Working on Soils of Different Consistencies. *Animal Science*, vol. 64, pp. 209-215.

11. Alan, S. and Kelth. K. (2009). Advance Theory of Statistics, volume 1: Distribution theory ordinary 6yh edition, 2009, ISBN 978-0-5334-24312-8.