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Article

Re-assessment of policy implementation on fish farming in achieving sustainable agribusiness and socio-economic development in southern Nigeria

Raed Bin Sadan, Yusuff Jelili Amuda*

College of Law, Prince Sultan University, P.O.BOX 66833 Riyadh 11586, Saudi Arabia
*** Corresponding author:** Yusuff Jelili Amuda, yusuffja@psu.edu.sa

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Abstract: Agricultural productivity has remained central to the gross domestic product (GDP) in Nigeria for several decades. However, the decline in the agricultural sector after the discovery of oil and gas resources is a serious challenge. The government has initiated several policies to rejuvenate agricultural productivity. Little attention has been given to the exploration of policy implementation for fish farming and aquaculture as an integral part of agribusiness in the country. The World Bank asserts that the yearly demand for fish is 3.4 million metric tons (i.e., 40%) is locally produced and the remaining 60% is supplied through importation of fish. Therefore, the primary objective of this paper is to re-assess policy implementation to explore and expand the potential of fish farming in Nigeria to address abject poverty and high unemployment rates. This can be achieved when a shift of attention is given to small- and medium-scale businesses, and consequentially achieve sustainable agribusiness and socio-economic development in the country. This study used library-based research and content analysis as its methodology, wherein secondary data were used to review different aspects that can foster fish farming in the country. The findings from the content analysis of the study demonstrated that in order to achieve domestic production and stop the importation of fish, there is a need for the establishment of nothing less than 400,000 fish farming across the country. The paper highlighted various types and techniques for breeding, rearing, and harvesting fish by strengthening their effectiveness and efficiency. This study emphasized the vital importance of technology, such as reliable energy facilities, solar energy, and solar irrigation, in reducing the cost of diesel in powering generators to maximize fish investment. The limitations of this study are highlighted, and SWOT analysis (i.e., strengths, weaknesses, opportunities, and threats) in fish farming is elaborated. It is suggested that the implementation of policies to support farmers in general and fish farmers in particular, such as the provision of credit loans and other fish feeds for sustainable agribusiness and socio-economic development, occupies a central climax of this research.

Keywords: policy implementation; fish farming; sustainable agribusiness and socio-economic development

1. Introduction

Most nations of the world, either developed or developing, are trying to expand the economy for sustainable socioeconomic development with specific attention to small-scale agriculture (Apraku et al., 2021). Nigeria is regarded as the most populous African country, and there is a growing population rate, which makes the government have several initiatives to attain self-sufficiency through the enhancement of agricultural productivity for sustainable socioeconomic development. The country has also been responsive to the need for sustainable socio-economic

development, whereby the government has engaged relevant stakeholders in the agricultural sector to build agribusiness (Fanny and Mathilde, 2011). In so doing, the government can diversify the economy with effective strategic agricultural frameworks that will lead to sustainable economic development and fulfill domestic needs as well as gear towards exports of various products (Bassey, 2011; Fanny and Mathilde, 2011; UGA Cooperative Extension, 2022). Thus, the motivation for this study is to explore opportunities for sustainable income, creation of jobs for most unemployed youths, and a drastic reduction in poverty in society when initiatives on food security through fish farming. Despite the fact that, there is a growing concern by the agricultural stakeholders in achieving agribusiness, there is need to intensify more efforts through strengthening of agricultural productivity.

Undoubtedly, agricultural investment is a backbone of socioeconomic development in various parts of Nigeria, including the south. Before and after independence, agricultural cultivation occupies an important place for socio-economic development and political stability in the country (Arthur, 2009). More importantly, the role of smallholder farmers in the cultivation of cocoa, palm trees, and cassava cannot be underestimated in agricultural investment in the country. The literature contends that 80% of farmers are regarded as smallholders in Nigeria, who are owners of small plots of land where they cultivate crops (Buba et al., 2017). The roles and contributions of the agricultural sector to economic development cannot be underestimated. Hence, the smallholder farmers contribute immensely in the improvement of gross domestic product (GDP) in the country (Dan-Azumi, 2011; Buba et al., 2017). Most smallholder farmers only utilize resources or equipment available to them, and there is a need for modern technological facilities for farming and agribusiness in Nigeria (Federal Ministry of Agriculture and Rural Development, 2016).

It is therefore paramount to stress that, for efficient agricultural production through the incorporation of technological equipment in farming, there is a need to strengthen agricultural policy in the utilization of fundamental production of available resources to essentially contribute to national economic development (Bassey, 2011). Thus, the government has different policies to boost agricultural productivity because the country is endowed with various natural resources, and more importantly, it has fertile or productive land for the cultivation of different crops such as cocoa, palm trees, and cassava (Fanny and Mathilde, 2011). Nonetheless, there is a need for proper reorientation of farmers in order to reposition the agricultural sector for efficient and abundant productivity of agribusiness in general and fish farming, particularly for sustainable economic development (Azevedo-Santos et al., 2011; FAO, 2022a; Fish Farming in Nigeria, 2021). Effective policies and utilization of technology for agricultural culture in general and fish farming in particular can be helpful to smallholder farmers. This can serve as a practical solution for maximizing agricultural products, which can be instrumental in making agriculture more sustainable for boosting socioeconomic development in the country (Bassey, 2011).

Furthermore, it should be emphasized that there are three out of six geo-political zones in Nigeria belonging to the southern part of the country: South-South, South-East, and South-West. There are six states in each of South-South and South-West,

and only South-East has five states, making 17 states of the entire southern part of the country. Fish farming is promoted in the southern region compared to the northern part of the country. However, there is a gap in exploring the implementation of agricultural policies with a specific focus on fish farming. Thus, the justification for re-assessing the vital importance of agricultural policy implementation is the fact that, a high rate of inflation needs urgent attention, which is born out of poverty among different households and a high rate of unemployment among teaming youths. Little focus is given to fish farming in solving the problem of inadequate implementation of agribusiness in fostering sustainable investment and socio-economic development. Therefore, there is a need to solve the problem of prevailing challenges within society by promoting fish farming in order to expand socio-economic development as the basis for strategic plans for overall economic viability in the country. This is necessary because a number of vulnerable individuals fall below USD 1 per day as a result of poverty and unemployment, need to be assisted. It can be achieved by enhancing technical and efficient productivity, as reported in the literature (Okonkwo and Madueke, 2016). In so doing, fish farming can be instrumental in diversifying the incomes of some individuals and households with many dependents whose income is not sufficient to take care of their daily needs (UGA Cooperative Extension, 2022). The positive consequences of fish farming investment, especially with small-scale enterprises, would serve as an integral part of economic diversification, which would enable farmers to fulfill their basic needs, especially by taking care of their healthcare and sending their children to schools they can afford (Bassey, 2011; Dan-Azumi, 2011). Similarly, large-scale fish farming can contribute to domestic and foreign consumption. Nonetheless, less attention has been given to the emphasis on reaffirming agricultural policy implementation towards strengthening the potential of fish farming in achieving the aforementioned advantage of fish farming in particular and socio-economic development in general. There are several studies on agriculture for socioeconomic development, but there is a gap concerning the policy implementation in the aspect of fish farming as an important contributor to the overall socioeconomic development in the country which the study tires to fill in the existing body of knowledge. The stakeholders in the agribusiness such as Ministry of Agriculture have not effectively design monitoring mechanism for efficient implementation of agricultural policy for actualizing maximum production of the sector in order to achieve sustainable agribusiness and socioeconomic development in the country.

2. Materials and methods

Content analysis was used to review and re-assess the policy implementation on fish farming in achieving sustainable agribusiness and socio-economic development in southern Nigeria. The data for the review and content analysis were accessed through various sources using visualization of similarities (VOS) and of such sources were: Journals, core collection of Web of Science (WOS), agricultural policy documents, library source etc. four major themes are identified according to the review namely: an overview of fish farming and aquaculture for agribusiness in Nigeria; re-assessing and promoting policy for agricultural technology for fish

farming and aquaculture. A total of 33 articles as secondary data were reviewed in this study which elaborately explained various themes of the study. Hence, synchronization of agricultural and aquaculture policies for effectiveness and efficiency of the industry for socio-economic development are highlighted. In so doing, the paper provides a substantial contribution for future empirical research in order to enhance sustainable agricultural policy implementation for efficient fish farming in the country.

3. Results and discussion

This part specifically presents various components of results of the study as follows: Agricultural investment for socio-economic development in Nigeria; agriculture for socio-economic development in Nigeria; an overview of fish farming and aquaculture for agribusiness in Nigeria; re-assessing and promoting policy for agricultural technology for fish farming and aquaculture are highlighted. Each of these is explicitly elucidated in subsequent subheadings.

3.1. Agriculture for socio-economic development in Nigeria

There is an advocacy for rapid economic growth by the government, and in order to achieve realistic socio-economic development, a lot of effort is required from agricultural stakeholders. Thus, the evolution of agricultural intervention for socioeconomic development was recognized before independence in 1960 (Okonkwo and Madueke, 2016; Mukaila et al., 2023). In other words, there was noticeable intervention by the government in the agricultural sector in the provision of several guidelines and plans for development of the sector. Fundamentally, National Development Plans (NDPs) were remarkable in improving agricultural productivity, and various states were supported by the Federal Government for using agriculture for socioeconomic development (Mukaila et al. 2023). Indeed, the NPDs were given priority by the government to foster domestic production, especially cash crops such as cocoa, palm tree, and cassava, as well as non-crop products such as fishing. Reiteratively, it was due to the commitment and support given to the farmers that made the country a top producer of rubber, groundnuts, and palm oil and the second largest producer of cocoa worldwide (Mukaila et al., 2023).

Nonetheless, the discovery and exploitation of petroleum affected further development of the agricultural sector, and there was a shift in focus in the government's policy from agriculture to the oil, gas, and petroleum sector (Mukaila et al., 2023). Thus, this shift of attention to petroleum eventually led to a decline in agricultural productivity, and there was consequently over-dependency on imported foodstuffs as a result of the underutilization of fertile land (Dan-Azumi, 2011). The emanation of insufficient food production and national crisis led to different programmes and initiatives by the federal government, such as Operation Feed the nation (1976–1979) the Green Revolution (1979–1983) among others (Dan-Azumi, 2011). The prime focus of the aforementioned programmes was to strengthen agricultural production by largely giving or providing subsidized inputs to farmers as well as providing access to credit by the farmers (Fanny and Mathilde, 2011). The literature contends that these policies were deficient as a result of the inadequate and

transparent frameworks to make a structure for implementation of the government's initiatives, and it is unfortunate that the country usually lacks continuity by successive governments (Fanny and Mathilde, 2011).

Nevertheless, the government initiated the Land Use Act (LUC) 1978, which is considered a remarkable turning point for the management of land use for agricultural cultivation (Federal Ministry of Agriculture and Rural Development, 2016). It should be reiterated that another remarkable step was taken by the government in 1987 with the introduction of Structural Adjustment Programmes (SAPs), which aimed to drastically reduce the over-dependency on oil and petroleum and redirection of the national economy by enhancing the agricultural sector for national development and overall economic growth (UGA Cooperative Extension, 2022). Despite several programmes and initiatives by the government, corruption in the oil and petroleum sector inhibits giving adequate attention to strengthening the agricultural sector of the economy. This is a serious challenge and in spite of this, the government shows a serious dedication specifically in 1998 when there was re-emphasis on the importance of agriculture to the socio-economic development (UGA Cooperative Extension, 2022). The agricultural policy undoubtedly focuses on the attainment of food security to the citizens with an emphasis on the development of local production.

Furthermore, the government reiterated the prime importance of the agricultural sector, provide strategic and policy frameworks for fostering the national economy. It has been considered a sector that can boost the economy and drastically reduce poverty and unemployment in the country. This assertion led to the introduction of the National Economic Empowerment and Development Strategy (NEEDS) between 2008 and 2011 respectively (Fanny and Mathilde, 2011). The programme specifically emphasizes socio-economic development. In addition, in 2008, the government initiated the National Food Security Programme (NFSP), (NFSP). Similarly, the government adopted 7-point agenda in 2007 which was specifically aimed at providing a framework for guiding economic reform as well as to achieve Sustainable Development Goals for 2015 and the country's 2020 Vision (Fanny and Mathilde, 2011). The foregoing programmes or initiatives on agricultural investment or agribusiness were meant for enhancing and achieving socio-economic development in the country. Nonetheless, the limitations of the programmes emanated from lack of effective implementation and lack of political will by succeeding governments to proceed with the initiated programme. Nonetheless, with recent programme of Agriculture Promotion Policy (APP) (2016–2021) by the government can adequately improve socio-economic development in the country.

3.2. An overview of fish farming and aquaculture for agribusiness in Nigeria

Fish framing and aquaculture are elaborated in the new Agriculture Promotion Policy (APP) (2016–2021) as part of the government's efforts to achieve the growth of agribusiness (Federal Ministry of Agriculture and Rural Development, 2016). However, there is a need to provide an implementation strategy to enhance investment in fish farming in particular and foster agribusiness in general (FAO,

2022a). In other words, efficient agribusiness with a specific focus on fish farming will bring about sustainable investment and socio-economic development (FAO, 2022b). With the new agriculture, it is specifically mentioned that the demand for tons of fish is estimated at 2.7 million while the supply is estimated at 0.8 million (Fish Farming in Nigeria, 2021). There is a problem associated with this that falls off in ocean catch, and there is also a kind of weakness with respect to aquaculture yields as a result of the cost of fish feed, which is an inevitable constraint for the growth of supply at the domestic market, as the literature explains (FAO, 2022a; FAO, 2022b).

Further, there was a decline in fish farming prior to 2008, and subsequently, there was a global demand for fish production, which recorded a total of 33.0 million metric tons worth USD 60 billion. At the international level, there are practices of fish farming, and only China supplies 62% of fish production. Undeniably, more than three decades, aquaculture has been regarded as a prime factor in the proliferation of fisheries, which recorded a significant increase of 82.1 million tons in 2018 (Dan-Azumi, 2011; Fanny and Mathilde, 2011). According to the World Bank (2018), Nigeria is regarded as the third largest producer of fish in Africa with 1169, 478 metric tons, after Egypt and Morocco with 1934,743 and 1,387,815 metric tons, respectively (Federal Ministry of Agriculture and Rural Development (2016). Contrarily, Literature contends that Nigeria is the second country in Africa with largest aquaculture production with 261,621 t-valued of USD 600.7 million in the year 2020. With the current population of 200 million in the country, it has a biggest demand in the context of Africa. Hence, literature contends that fish farming production contributes 4.5% to the country's GDP (Okonkwo and Madueke, 2016). In spite of the aforementioned rank of the country in Africa, the average consumption of fish based on households is considered to be 20.3 kg per capita on a yearly basis, while in the context of Nigeria, it is 13.3 kg a year (Federal Ministry of Agriculture and Rural Development, 2016; Fish Farming in Nigeria, 2021). This indicates that household consumption of fish in the country is low when compared with the average benchmark in the world. Onwards, it is not deniable to posit that the fish farming sector contributes significantly to the country's gross development product (GDP) with 3.24%, according to the data on GDP that was released by the National Bureau of Statistics (NBS) in 2021. This indicates that fish farming and aquaculture positively contribute to the socio-economic development of the country when compared to the sector's contribution of 0.26% in the year 2020, as the literature explicates.

More so, with the position of Nigeria in African fish production, it can be emphatically stressed that fish farming has been growing beyond traditionally known fishing in rivers, lakes, streams, etc. by casting nets. Nonetheless, it is not disputable that this method is still commonly used in many parts of northern Nigeria (Fanny and Mathilde, 2011). Contrarily, fish farming in the southern part of the country is being done using ponds or water, even within one's compound, without necessarily using the traditional methods of fishing in rivers, lakes, streams etc. Many investors focus their attention on fish farming because it is considered an important part of food in the country (Fish Farming in Nigeria, 2021). For instance, in virtually all markets, either in the north or south, various types of fish are found, such as catfish, frozen

fish, roasted fish, dried fish, smoke fish, and many others. It is, however, not disagreeable to posit that, in the south, most households, especially the elites, consume fish when compared to the northern part of the country (Buba et al., 2017). As a result of this, it can be said that there is great potential for investment in fish farming in the country.

Furthermore, it should be reiterated that there is a huge potential market or investment opportunity in fish farming in the context of Nigeria. For example, the World Bank (2018) contends that the annual demand for fish in the country is approximately 3.4 million metric tons, accounting for 40%, and the remaining 60% of fish demand is fulfilled through importation (FAO, 2022a; FAO, 2022b). It is therefore essential that government policy strengthen domestic production of fish through the empowerment of fish farmers in order to boost the potential of fish farmers. Literature contends that there is an assertion by an expert in aquaculture that the country needs to establish nothing less than 400,000 fish farms in the country's aquaculture industry in order to be responsive to the demand for domestic production of fish.

Moreover, in spite of advocating for expanding fish farming, the Nigerian aquaculture sector is committed to breeding, rearing, and harvesting fish. Over a period of 25 years, the sector has recorded significant growth; nevertheless, there is still a need to do more in this regard. More importantly, catfish is a common species being reared, which is said to account for more than half of the total production of fish in the sector (Fish Farming in Nigeria, 2021). For example, the President of the Catfish Association of Nigeria (CAFAN) emphatically stressed that the country produces over 370,000 metric tons of catfish (Fish Farming in Nigeria, 2021). However, other species also need to be given focus in order to maximize fish production.

Onwards, fish are considered aquatic animals such as mollusks and crustaceans that grow in natural water environments, and the quality of the water flow can undoubtedly determine both the health and growth of the fish, as the literature contends. There is agricultural engagement in the commercial rearing of fish, which is mostly done in either fish ponds or tanks (Benson, 2011). In various parts of the world, including Nigeria, there are different types of fish species that are usually bred in fish farming, examples of which are tilapia, catfish, carp, and salmon (Benson, 2011; Dan-Azumi, 2011; Fanny and Mathilde, 2011; Buba et al., 2017). It should be noted that the literature posits that salmon is considered a carnivorous fish that is normally fed with fishmeal and fish oil, whereby its extraction is normally from forage fish (Benson, 2011; Martinez-Rubio et al., 2014; Buba et al., 2017). It is through fish farming that there is the evolution of fish colonies, which are nurtured through sufficient provision of feeds that allow sustainable yields of wield fish. Hence, for the wellbeing of fish in the breeding process, the service of a veterinarian is required in order to ensure that they are free from different diseases, as the literature suggests (Edwards, 2022). In addition, it is essential to address all factors such as diseases hindering the exploration and fulfilment of market demand in the exploration fish market respectively. Literature posits that the mortality rate as a result of encountering of catfish farms with disease ranges from 1.86% to 19.73% which was regarded as the value of USD 192.79 to USD 2056.38 per production

cycle. Consequently, the outbreak of disease in fish farming could affect the economic performance of small-scale fish farming. It is thereby reiterated the government should provide a helping hand in training the fish farmers towards curtailing and preventing aquaculture disease that maximizing profit in the sector (Okonkwo and Madueke, 2016).

For the growth and development of fish species, they need three prime things for their survival: fresh water, sufficient oxygen, and food. Thus, purification of water is an integral part of the fish farming system, and the water level as well as recycling for the fish should be made adequate in order to avoid stress on them, which may eventually result in their death. For the purification of water, there is a need for harmonization of hydroponic horticulture and water treatment supplements, of which the experts said that they must contain up to 60% of the protein necessary for most aquatic animals, like fish, which is different from cattle feed (Fisheries News, 2014; Fisheries Department Haryana, 2017). The kilogram of food taken by the fish is regarded as the feed conversion ratio (FCR), and for instance, the salmon type of fish has an FCR of approximately 1.1kg per fish, whereas the FCR for chickens is 2.5 kg of feed (Fisheries News, 2014; Fisheries Department Haryana, 2017). Nonetheless, most fish farmers face the challenge of the high cost of fish feed and capital for breeding or rearing fish, which consequently affects the production of fish that will meet domestic and international demands (Manci, 2022).

It is further reiterated that fish generally are in need of oxygen, and however; catfish are special in the sense that they have a high level of survival even in pollutant conditions when compared with salmon species that cannot withstand the pollutant conditions (Fisheries News, 2014; Fisheries Department Haryana, 2017; Manci, 2022). It is undeniable to say that in fish farming, just like animal husbandry, fish are also subject to the risk of infections such as ammonia, nitrite, fish lice, fungi, intestinal worms, and protozoa, among others (Edwards, 2022). There is a need for different supplements for the treatment of the aforementioned diseases in fish in order to maximally boost this aspect of agribusiness. Hence, it should be noted that there is a need for technical support, such as the provision of technological facilities for offering solutions to problems of fish farming and consequently boosting fish farming in the country (Edwards, 2022; Manci, 2022). Thus, anybody engaging in fish farming should acquire expertise in the field, especially since monitoring mechanisms are required for the smooth running of the enterprises. Literature contends that producers of fish in some countries, like Germany, the UK, and Israel, are utilizing different modern facilities for fish farming operations (Martins et al., 2010; Sarker, 2016; Shore, 2022). Thereby, Nigerian fish farmers can also learn from international expertise regarding the use of available facilities for growing of fish farming. Nevertheless, as far as the agriculture sector in Nigeria is concerned, there is poor financial risk management. Inferably, this means that the sector in general and fish farming in particular have poor accessibility to sufficient financial services that will enable farmers to have quality ponds as well as subsidized feeders for the fish (Manci, 2022). It is essential to provide financial services to the fish farmers in order to enable them to have access to input suppliers, processors, and storage for the maximization of profit after harvesting fish products.

In fish farming, several techniques for rearing are used. For instance, a cage system, otherwise called off-shore cultivation, is used in lakes, rivers, ponds, and oceans to guard the fish until the period of harvest (Fisheries News, 2014; Fisheries Department Haryana, 2017). On one hand, the cage system is appreciable in the sense that the aforementioned different types of water are considered an advantage, and it is gaining popularity among fish farmers (Krkošek, et al., 2007; Just Economics, 2021). On the other hand, failure in the use of cages, which provide an escape route for the fish, especially when using open-water cage systems, may consequently affect the boost of commercial fisheries in the southern part of the country (Krkošek et al., 2007; Fisheries News, 2014).

Furthermore, literature contends that pond systems, otherwise known as irrigation ditch systems, are a common method for breeding fish. Through the ditch or pond method, water is retained, through which fish are fed feed or fish food, and consequently, their waste products can be used as fertilizer for other agricultural cultivations or fields (Martins et al., 2010; Sarker, 2016; Molteni, 2017). Depending on the size of the fish investment, some utilize small ponds, while others use larger ponds for the investment in the fish farming enterprises. It can be said that by taking care of water with necessary supplements to alleviate electrolyte stress that may hinder fish from growing, necessary measures should be put in place in order to substantially increase the yields or harvest of fish (Suberu et al., 2015). Contrarily, literature posits that there may be low yields if there is electrolyte stress and eutrophication is not prevented, and a high level of oxygen can also affect them (UGA Cooperative Extension, 2022).

The open-net pen system is a method where fish are residing in natural water but are being isolated using a net. This is a common method that is usually used in natural water bodies like lakes, rivers, etc. This inferably means that there used to be a flow of water from natural rivers that was supplied to fish farming using this method. Thus, the location of the water to be used for this method is essential to ensuring that it is secured for fish farming. Literature contends that this kind of method is commonly used in countries like Norway, China, etc. due to its efficiency (Sarker, 2016). It can be deduced that Nigerian fish farmers can also adopt the method in order to maximize profit in fish production. Nonetheless, some other studies posit that the method is considered a high-risk method, especially in the river environment where fish breeding is taking place. It is not doubtful to note that, through the open net system, fish can unnoticeably escape, which can consequently lead to a shortage of the capital invested in the fish farming business by the farmers (Statistical Yearbook, 2020; Statistical Yearbook, 2021).

Notably, copper-alloy nets are also used in aquaculture, which mostly destroys bacteria, fungi, viruses, and other infections or microbes. This system provides a clean environment for their healthier survival and growth (Edwards, 2022). This is commonly used in South America, the USA, and Asia. Thereby, Nigerian fish farmers can also adopt it because of its potential to reduce biofouling and disease and because it serves as an antibiotic for the fish. Additionally, it is useful for the maintenance and circulation of water as well as the oxygen needed for the sustenance of the fish.

It is paramount to assert that the stakeholders in the agricultural sector should emphatically stress utilizing fish farming as an integral part of agribusiness, which should propel the sustainability of socio-economic development in the country. Literature posits that fish farming has the potential to enhance domestic investment and curtail poverty and unemployment in society (Apraku et al., 2021). Similarly, the surplus in fish farming can be used for exportation, which in turn serves as income for investors and consequently creates jobs for teaming youths who are unemployed in the country. Studies have established that endowment can be used in financing agribusiness and enhancement of agricultural policies and programmes can foster sustainable farming in the context of Nigeria (Amuda et al., 2019; Amuda, 2022). This assertion has been further buttressed by an extant literature that agricultural performance and trade facilitation can be improved through an effective policy for sustainable economic development in Sub-Sahara Africa (Ibrahim et al., 2022).

Therefore, it is significant to reiterate that fish farming is commonly found in the south compared to the northern part of Nigeria. In the entire southern part of the country, there are some prominent fish farming industries that are profoundly contributing to agribusiness in various states, such as Lagos, Ogun, Osun, Ondo, Ekiti, Imo, Anambra, Enugu, Rivers, and Bayelsa. **Table 1** shows the names of selected prominent fish industries and locations in the southern states of Nigeria.

Table 1. Names of selected prominent fish industries and locations in southern states of Nigeria (Nigeria Fish Farmers, 2023).

S/N	Names of selected prominent fish industries	Locations in southern states of Nigeria
1.	Honeywell Fisheries Limited	Ikoyi, Lagos State
2.	Irete Farms Limited	Irete Owerri, Imo State
3.	Al-Amin Aqua Integrated Farming Nigeria Limited	Ijebu-Ode, Ogun State
4.	Anu Agro Farms Limited	Iju-Ishagha, Lagos State
5.	Aquaborne Farms	Ibeju-Lekki, Lagos State
6.	Comrade Fish Farm Consultants	Ikeja, Lagos State
7.	Eureka Farms	Ifako Ijaiye, Lagos State
8.	Evabond Farms Limited	Umuaka Uli, Anambra State
9.	FindmeFish	Gbagada, Lagos State
10.	Fishmasters Nigeria	Calabar, Rivers State
11.	Fundara Foods and Fisheries Farms	Agege, Lagos State
12.	His Grace Fisheries Nigeria Limited	Port Harcourt, Rivers State
13.	HR Farms	Ile-Ife, Osun State
14.	Kingdom Aquarium and Fisheries Limited	Oshodi Isolo, Lagos State
15.	Landmark Fisheries	Ado-Ekiti, EKiti State
16.	Mega Farms	Ojo, Lagos State
17.	Midedol Farms International	Ijoka Akure, Ondo State
18.	Okongo Dimowe Enterprises	Ipaja, Lagos State
19.	St. Mosco Feednainn Ltd.	Awknanaw, Enugu State
20.	Waboke Global Services Ltd	Yenagoa, Beyelsa State

3.3. Re-assessing and promoting policies for agricultural technology for fish farming and aquaculture

Nigeria is blessed with enormous potential, ambitious policies and frameworks for addressing multifarious spheres of society. Nonetheless, there is a lack of sufficient and concrete impacts emanating from different facets of human endeavors in society. The agricultural sector, whereby policy implementation remains insufficient to bring a desired result for the socio-economic development needs a drastic action and strategy for improving it (UGA Cooperative Extension, 2022). Undoubtedly, advocacy for self-sufficiency in food production with adequate attention to farming remains a herculean challenge that needs to be addressed in the Nigerian society. With regards to the expansion of fish farming as an integral part of agribusiness, the country needs to utilize policy and a strategic framework for agricultural development. For example, the International Fund for Agricultural Development (IFAD) and the Comprehensive Agricultural Development Programme (CAADP) as a segment of the New Partnership for Africa's Development (NEPAD), as well as the ECOWAS regional agricultural policy and action plan as an integral part of agricultural development, are all efforts to close the gap between the African continent and other parts of the world (FAO, 2022a; FAO, 2022b). It is not disputable to posit that the ECOWAS also tried to plan national agricultural investment programmes (NAIPs) in each country in West Africa as well as regional agricultural investment programmes (RAIPs) (Manci, 2022).

The roles of agricultural stakeholders in the implementation of various policies and strategies cannot be underestimated. Undoubtedly, there is a need to expand investment in agricultural productivity, with a target of 10% of the national budget (Federal Ministry of Agriculture and Rural Development, 2016). Indeed, fish farming and aquaculture are potential foci of attention, with the involvement of investors and partnerships between the federal government and international funding agencies, respectively (Federal Ministry of Agriculture and Rural Development, 2016). Thus, the government needs to provide an evaluative mechanism for policy implementation by giving support to small and medium-sized enterprises in general and fish farming in particular (Kim-Soon et al., 2020). Adequate management of water resources can be instrumental in promoting policy on fish farming investment in the country (Fish Farming in Nigeria, 2021).

Literature acknowledges that the federal government, state government, and funding agencies are responsible for expenditures in the agricultural sector, which targets producer support services in the areas of infrastructure, processing, and financing. For instance, the breakdown of agricultural expenditures demonstrates that the federal government has 57%, the state governments (36 states) also provide 43% of expenditures, and funding agencies provide only 7% of total expenditures (Suberu et al., 2015; FAO, 2022a). It should be reiterated that 774 local governments, as a tier of government, also fund agriculture, but there is no specific data with respect to the percentage of their contribution to the funding of agriculture (Fanny and Mathilde, 2011). There is an increase in the budget allocation to the agriculture sector, but there is also more decentralization, and hence, the state governments committed more budgets to the sector compared to the local government. In spite of

the efforts of different tiers of government in the country, the literature contends that there is a poor evaluation mechanism for the budgetary allocation of the agricultural sector (Fisheries News, 2014).

The country has been experiencing instability with respect to policy implementation and programme continuity. Similarly, there is a lack of coherence in agricultural policy because it is not coordinated properly and the action plan is not also translated into implementable step (Fish Farming in Nigeria, 2021). This undeniably contributes to the high level of turnover with respect to agricultural programmes and, consequently, the implementation of policies for agribusiness investment and socio-economic development, which remain so difficult to curtail poverty and unemployment in developing economies (Uddin et al., 2023). For instance, the administration of former President Jonathan (2011–2014) initiated the Agricultural Transformation Agenda (ATA) without adequately determining its success. Indeed, the Buhari administration (2016–2022) initiated another policy termed the Agricultural Promotion Policy (APP) (Federal Ministry of Agriculture and Rural Development, 2016). Instead of the new policy, the existing policy should have been improved for the betterment of the agricultural sector in the country. This is an example of a lack of continuity in governmental policy.

A number of factors, such as lack of sincerity by the political office holders and stakeholders, lack of accountability, transparency, and rule of law, are considered impediments for adequate implementation of agricultural policy that can promote non-crop investment, such as fish farming investment in the country. With a natural environment for fish farming in particular and general agribusiness, if there is provision for effective and efficient policy, it will motivate investors to invest in the agriculture sector in general and fish farming in particular because there would be trust in a conducive business environment (Fisheries News, 2014). Thereby, there is a need for the transformation of the agricultural sector by decision-makers and stakeholders with specific attention to the formulation and implementation of policies that denote a public-driven goal in order to attain the transformation of agribusiness in the country (UGA Cooperative Extension, 2022). Thus, political will and commitment can be instrumental in the implementation of agricultural policies that can propel fish farming. Without political commitment, the government cannot fulfill the 10% budgetary allocation stipulated by the Maputo Declaration in 2003 (Manci, 2022). Thus, there is a need for reform in the agricultural sector that can encourage small-scale enterprises that will promote involvement in agribusiness, specifically fish farming, in order to empower unemployed citizens in society.

It is paramount to assert that the Nigerian government has been trying to provide the necessary support for agricultural inputs since the 1950s through policies for the efficiency and effectiveness of the agricultural sector (Apraku et al., 2021). For example, such support to be given by both federal and state governments is in the form of subsidies for fertilizers and feeders, and the rate of subsidy is between 10% and 50% (Manci, 2022). In spite of this effort by the government, many farmers, still find it so difficult to get good-quality inputs, especially at an affordable price when they are in need of them. The government is expected to play a vital role in fish production, especially by providing necessary support for the improvement of storage and processing as well as accessibility to the market for agribusiness

(Fisheries News, 2014). It is significant to note that there is a need for the expansion of dam schemes that would enable fish farmers to use a strategic framework for enhancing the farming. In so doing, there would be a boost in the exportation of fish utilizing the provisions of the World Trade Organization (WTO) as well as Economic Partnership Agreements (EPA), especially with the specific agreements of the European Union and Africa-Caribbean-Pacific nations (Sarker, 2016). Hence, with the support and initiative for the expansion of fish farming enterprises, investors can explore the potential market for fresh and smoked fish within the country and neighbouring countries. More importantly, fish farming can have a meaningful impact on society when there is an effort by the government to increase domestic production (Poppick, 2022). Thus, the government should initiate public subsidies for fish feeders and other vitamins for their development and survival. In other words, the government needs to provide an effective regulatory and monitoring mechanism for efficient, quality fish farming through the diversification of agribusiness, with specific attention to fish farming.

It should be significantly noted that the initiative of a community-driven and government partnership program in agricultural policy for rural and urban development in fish farming investment should be taken as a sustainable influence on the living conditions of beneficiaries in the government support of agribusiness (Obirikorang et al., 2020; Apraku et al., 2021). In so doing, the government would understand the areas of support needed for small and medium-sized fish farming investments, especially in the supply of fish feeds and the management of water resources for efficient and effective fish breeding. Thus, it will help the country to be one of the foremost or top producers of fish in the international market, through which the government can make foreign earnings (Dan-Azumi, 2011; Buba et al., 2017). Hence, the living conditions of fish farmers will be improved through the initiative of the government. Hence, giving priority to infrastructural facilities such as roads and the supply of water for fish and aquaculture can be useful for maximizing profit from fish investment. In order to attain this, there is a need for transparency and sustainability of policy in achieving the goals of fish business in the country.

It is not disagreeable to say that, the agricultural sector has an infrastructure challenge, it thus consequentially affects fish farming as well. For instance, motor roads to irrigation dams where fish ponds are located are mostly not in good condition, either in rural or urban areas. This scenario discourages most of the fish farmers and investors; thereby, there is no competition for fish investment in the country compared to some other parts of the world (FAO, 2022b). It is therefore essential to provide good and accessible road networks in order to boost fish farming in the context of Nigeria as well as make it more competitive. In order to achieve this, there is a need for an expansion of marketability surplus and value chain of the accessibility of participants in fish farming to motorable roads. In so doing, it would conveniently take them to dams where fish ponds are situated (Fanny and Mathilde, 2011). Hence, the model for the operation of agribusiness with a specific focus on the provision of fish feeds to fish farmers in particular and other aspects of agriculture in general should be strengthened.

It is not disputable that technological facilities such as solar energy for agribusiness are still very expensive, and there is a low level of awareness among the fish farmers with regards to available technological equipment such as solar energy for efficient fish farming. The government can raise awareness among the farmers in this regard (Fanny and Mathilde, 2011). There is a need to provide subsidized technological facilities for the farmers because most of them cannot afford to purchase solar technologies for the purpose of agribusiness. It is essential to note that when farmers have access to harvesting equipment and other useful technological facilities for agribusiness, it will help them to maximally increase production of fish. Hence, the use of reliable energy facilities, for example, would help the farmers in the value-added processing, harvesting, and storage of various products. This kind of reliable energy will reduce the cost of diesel to power the generator. Thus, the farmers can engage in the use of solar energy and solar water irrigation systems. It is not deniable to say that the use of solar systems among farmers is still evolving; thus, the government should be involved in the use of solar for agribusiness (Apraku et al., 2021). It is important to enlighten unemployed youths concerning the importance of fish farming, and the government, especially the Ministry of Agriculture, should develop a sustainable fish farming program by providing the necessary support for maximum production and post-harvest storage and processing facilities. In so doing, since fish ponds require water, solar pumping can be used for agricultural efficiency. It is not doubtful to assert that the use of technological facilities can save costs and increase the maximization of profit and promotion of Agro-fishing enterprises in the country.

The aforementioned technological facilities are important for the expansion of fish farming for domestic and global consumption. Hence, the National Agricultural Research System (NARS) has a significant role to play in the commercialization of agricultural technologies that can efficiently fulfill the demands or needs of the domestic market. Literature contends that the National Agricultural Research System (NARS) has important roles to play regarding the provision of improved varieties of breeds of livestock and aquatic species in the country (Fish Farming in Nigeria, 2021). It is not arguable to posit that the poor delivery of proven technologies by the NARS to farmers remains a great challenge in the context of Nigeria. Thereby, it is necessary that the government creates awareness concerning the use of technological facilities for fish farming in particular and other agricultural cultivations in general. In order to attain this level, there is a need for adequate coordination by the government, especially through its agencies such as NARS, by engaging both the private and public sectors concerning the supply of different agricultural inputs for fish farming (Fish Farming in Nigeria, 2021).

Onwards, India has been proactive since more than five decades ago, when the country invested in fish farming using technology developed for fish cultivation, and the method allows different species of fish in one fish pond, either local or imported species (Fish Farming in Nigeria, 2021). However, the species may have different types of food inhabitants, and as a result of this, there used to be selection in order to avoid unnecessary competition for food. Using this system allows for efficiency and optimal conditions for fish farming (Federal Ministry of Agriculture and Rural Development, 2016). Hence, in using this kind of system, Nigerian fish farmers can

also explore this method in order to achieve the effectiveness and efficiency of the fish farming system. Thereby, agricultural policy should promote various methods of fishing.

Further still, the new Agriculture Promotion Policy (APP) (2016–2022) posits that agriculture denotes that non-oil export earnings constitute 75%, and it projects that non-crop investment constitutes 15%, an integral part of agricultural activities or investments, whereby fish farming is also part of this (Federal Ministry of Agriculture and Rural Development, 2016). Undoubtedly, fish farming as part of agribusiness can serve as a broader supply of Nigerian and international industries, which can bring about job creation and wealth creation that will consequently contribute to the gross domestic product (GDP) of the country. In addition, fish farming can foster capacity for earning foreign exchange from exports of fresh and smoked fish. There is a need for engagement between federal and state governments to improve the governance system by providing efficiency in the agricultural sector (Dan-Azumi, 2011). Thus, support for small-scale businesses with specific attention to fish farming and aquaculture is needed in order to create employment and ease sustenance for households that are experiencing poverty.

Thus, most of the fish farmers that engage in small and medium-scale investment need financial support for the adoption of new technological facilities for the improvement of fish rearing as well as to increase resilience for overall economic growth (Buba et al., 2017; Apraku et al., 2021). This is significantly important by engaging financial institutions such as the Bank of Agriculture and the Central Bank of Nigeria, among others, to provide access to low-cost credit or subsidies to the farmers (Fish Farming in Nigeria, 2021). In this kind of scenario, there is a need to intensify innovative financial management for agribusiness in general and fish farming in particular.

Thereby, literature posits that the government should expectedly bring about the transformation of agricultural activities in rural areas where success in agricultural investment, especially fish farming, can be fostered. It is through this that the government can develop the capacity of the fish farmers to boost investment and socio-economic development as an integral part of the public mandate for which the government is responsible (Fisheries News, 2014). If the government can improve agribusiness with a particular focus on fish farming and aquaculture, it will add value to improving the living conditions of poor citizens (Krkošek, 2007). Similarly, it will add to the empowerment effort of the government and create employment opportunities for many unemployed youths, and consequently reducing poverty in society.

Onwards, investment in fish farming is paramount; however, access to fish feeds by most fish farmers or investors is a great challenge in attaining efficient productivity. With an inadequate supply of fish feed to the farmers, there used to be a record of post-harvest losses. Hence, the prime objective of the government's Agricultural Promotion Policy (APP) is to drastically increase the productivity of high-quality fish for both domestic and global markets (Federal Ministry of Agriculture and Rural Development, 2016). The government needs to engage both domestic and foreign companies for the supply of fish feeds in order to critically enhance fish investment. In a nutshell, the foregoing has explained the potential

investment in fish farming and the effective implementation of agricultural policies with a specific focus on fish farming that can address several societal challenges such as poverty and unemployment in society.

4. Limitations and implications of the study

This paper provided implementation direction for agricultural policy in the southern part of Nigeria, with particular reference to expansion of fish farming, in order to address poverty and unemployment and consequently achieve sustainable investment and socio-economic development in the country. The paper does not extensively address the feasibility of fish business in order to predict the success of investing in fish farming, but it particularly tries to emphatically stress the importance of the implementation of fish farming policy as reflected in the new agricultural promotion policy (APP) in the country. In other words, the study specifically focused on the aspect of implementation of the paramount importance of fish farming as contained in the agricultural promotion policy in the country. Similarly, the future study should include a detailed proposal for capital and detailed aspects of starting up investment in fish farming in Nigeria, which are not discussed in this paper. For a better understanding of the implications of the study, SWOT analysis (i.e., strengths, weaknesses, opportunities, and threats) is used. Hence, the SWOT analysis of policy implementation with respect to fish farming is explicitly explained in the subsequent paragraphs.

First, the strengths of the new agricultural promotion policy emphatically stress small and medium-scale businesses in fish farming by giving necessary support to the farmers, especially in solving the problem of the high cost of fish feeds. There is also an emphasis on the use of technological equipment in order to maximize fish production and fulfill domestic and international demands. Thereby, the fish farmers should explore various investment opportunities attributed to the fish family as a strategy for reducing the high rate of poverty and unemployment in society.

Second, the weakness attributed to fish farming in Nigeria is that most of the farmers do not possess sufficient capital to expand the fish investment. There is a lack of proper awareness or orientation with regards to the availability, accessibility, and actual use or operation of relevant technologies for fish farming in order to explore potential investment in the area.

Third, there are various opportunities for fish farming investment. Thus, due to the growing population of the country and the high rate of abject poverty and unemployment in the country, the exploration of fish farming with a specific focus on small and medium-scale enterprises can be regarded as an opportunity that can be explored to improve sustainable investment and socio-economic development in the country. Hence, when there is a surplus in fish production, the masses would prefer to go for affordable fish rather than expensive meat. Hence, the government is expected to provide incentives and opportunities to fish farmers in particular and farmers of other agricultural cultivations in general in order to make the sector contribute to the gross domestic product (GDP) of the country.

Fourth, the threat to the efficiency and effectiveness of implementing agricultural policy is that the general economic crisis and inflation can hinder the

rapid investment in fish farming, and when people look for other alternative products instead of fish, it can undeniably reduce the sales of fish in the country. Similarly, when fish farmers do not possess their own ponds as prime commercial property, it will reduce the need for them and affect the overall development of fish farming as an integral part of agribusiness. It is expected that the government should support the fish farmers; however, when loans are given and the interest rates are higher, it may discourage most of the potential investors in fish farming enterprises.

To sum up, the limitation of the study does not negate the substantial contributions of the study to the existing body of knowledge regarding the vital importance of the implementation of agricultural policy for boosting fish farming in order to enhance agribusiness investment and sustainable socio-economic development in the country. The research thereby provides a direction for future studies by empirically investigating the importance of fish farming in solving the problems of poverty and unemployment in society.

5. Conclusion and suggestions

The paper has explicitly demonstrated that there is a growing population in the country, and a large percentage of young people and households are experiencing unemployment and poverty, respectively. The paper has explained that effective policy implementation in fostering agribusiness in general and fish farming in particular can bring about sustainable investment and socio-economic development in the southern part of Nigeria. The paper explained that small and medium-scale enterprises in fish farming will address multifarious challenges such as poverty and unemployment in the country. Thereby, the paper pointed out that the government plays a vital role in the judicious use of land, water, and other naturally endowed resources in order to create a vibrant fish farming system aimed at reducing abject poverty and unemployment in society. It is therefore suggested as follows:

1) Whoever wants to be involved in the fish farming business should conduct a survey of market entry, product pricing, sales strategy, and agricultural value chain in order to reduce poverty and the rate of unemployment in particular and to enhance socio-economic development in the country in general.

2) The stakeholders in agribusiness must come together to solve the problem of liquidity and engage the private sector in fish farming investment using an effective and efficient agribusiness policy.

3) There is a need for the government to provide loans to the fish farmers in order to expand investment, especially among small and medium-scale businessmen in society.

4) The government needs to set up operational mechanisms for boosting investment in fish farming and aquaculture by strengthening small and medium-scale enterprises in order to address the prevalence of poverty and unemployment in the country.

5) There is a need for a drastic reduction in post-harvest losses of fish, and in doing so, there would be an expansion of access to domestic and international markets for promoting fish products.

6) Further research on fish farming and aquaculture should promote artificial intelligence for aquaculture and nutritional fish feed development in the country.

7) The essentiality of agricultural policy on fish farming and aquaculture for promoting agribusiness in order to achieve sustainable investment and socio-economic development in the south-western part of Nigeria can be further explored empirically in order to substantiate the thesis of this paper as demonstrated in the proposed conceptual theoretical framework of the study (**Figure 1**).

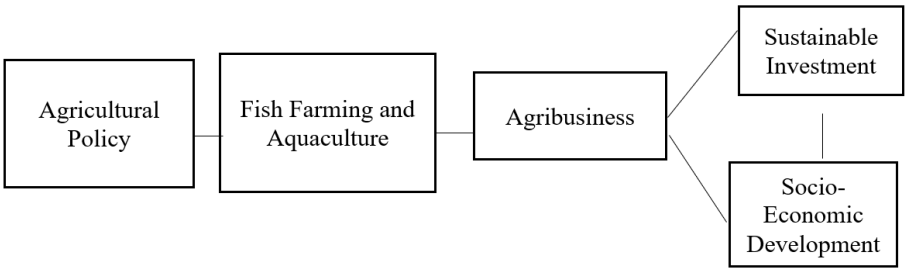

Figure 1. Proposed conceptual theoretical framework of the study.

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