TOWARDS A Viable Blue Economy for Sustainable Development: Floating Aquafeed and Allied Advances in Research and Development – The Case of Nigeria

By


Federal University of Technology, Minna – Nigeria

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Held @

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INTRODUCTION

DO-ABILITY CONCEPTS

- Feasibility and Viability are often used to connote the extent of performance/productivity of a task to deliver goods and services.

WITH RESPECT TO PRODUCTIVITY
- Feasibility
- Viability
- Bankability
SUSTAINABILITY CONCEPT

WITH RESPECT TO TYPE
- Technical Sustainability
- Economic Sustainability
- Social Sustainability
- Environmental Sustainability
ECONOMY CONCEPTS

GREEN ECONOMY
- It is an economy that improves human well-being and social equity, while significantly reducing environmental risks and ecological sacrifices (UNEP, 2010),
- and aims at sustainable development without degrading the environment.
- In our context, we limit it to Agricultural Green Economy.

BLUE ECONOMY
- It is the use of ocean resources for economic growth, improved livelihood and jobs, while preserving the ocean ecosystem (World Bank).
- It entails all economic activities of the oceans, seas and coasts.
- In our context, we limit it to Aquaculture and Fisheries.
VIABLE BLUE ECONOMY

• Viable blue economy in this context, aquaculture and fisheries must be compliant with Sustainable Development, Kyoto Strategy and Bangkok Declaration;

• Kyoto Strategy - Modernization of Aquaculture leading to aquaculture revolution. To meet the ever expanding demand (consumption) of aquaculture/fisheries food products viz-a-viz the over-exploitation of wild fishstock world-wide.

• Bangkok Declaration – Increased aquaculture/fish production in a safe environment to ensure sustainable development.

• These are clearly spelt out as Goals of Fisheries and Aquaculture in the Third Millennium (Jiansan et al, 2000 and Pillay, 2000) – as “SUSTAINABLE DEVELOPMENT GOALS (SDGs).
SUSTAINABLE DEVELOPMENT GOALS (SDGs)

WORLD SUSTAINABLE DEVELOPMENT GOALS (SDGs)

i  No Poverty
ii  Zero Hunger
iii  Good Health and Well-being
iv  Quality Education
v  Gender Equality
vi  Clean Water and Sanitation
vii  Affordable and Clean Energy
viii  Decent Work and Economic Growth
ix  Industry, Innovation and Infrastructure
x  Reduced Inequality
xi  Sustainable Cities and Communities
xii  Responsible Consumption and Production
xii  Climate Action
xiv  Life under Water
xv  Life on Land
xvi  Peace, Justice and Strong Institutions
xvii  Partnership for the Goals

SUSTAINABLE DEVELOPMENT GOALS (SDGs)
AQUACULTURE AND FISHERIES

i  Investing in people through training and education
ii  Investing in research and development
iii  Improving information flow and communication
iv  Improving food security and alleviating poverty
v  Improving environmental sustainability
vi  Integrating aquaculture into rural community
vii  Investing in aquaculture development
viii  Strengthening institutional support
ix  Applying innovations in aquaculture
x  Improving culture based fisheries and enhancements
xi  Managing aquatic animal health
xii  Improving nutrition in aquaculture
xiii  Applying genetics to aquaculture
xiv  Applying biotechnology
xv  Improving food quality and safety
xvi  Promoting market development and trade
xvii  Supporting strong regional and inter-regional co-operation
Fig.1: Physical Geography of Africa_
MAP OF NIGERIA

Fig.2: Physical Geography of Nigeria
2.0 Nigerian Economy before Oil
3.0 Nigerian Economy with Oil
3.1 Nigerian Economy before the War (1961-1968)
  3.1.1 First National Development Plan (1962-1968)
3.2 Nigerian Economy after the War (1970-Till Date)
  3.2.1 Second National Development Plan (1970-1974)
  3.2.2 Third National Development Plan (1975-1980)
  3.2.3 Fourth National Development Plan (1981-1985)
  3.2.4 Nigerian Economy beyond Fourth Development Plan
AGRICULTURAL GREEN ECONOMY IN NIGERIA

- Agricultural Economy in Nigeria pre-colonial was subsistence to meet family needs, primarily as food crops.

- Colonial era witnessed a transformation food crop production to cash-crops, producing mainly raw-materials for the agro-allied industries in countries of the colonial masters, e.g cocoa, coffee, ground-nut, cotton, palm-oil, sesame (beniseed), where Nigeria had comparative advantage.

- The above dominated the economy pre-independence till the discovery of crude oil at Oloibiri in 1956 – the Black Gold.

- Up-till 1970, post-civil war, 65% of Nigerian were engaged in the Green Economy. The oil boom of early 70s shifted the equilibrium of the oil economy as exemplified by the Udoji Award of 1976.
This marked the beginning of over-dependence on oil, as Nigerian economy became a *mono-commodity economy* such that participation in agriculture dropped to 25%.

It is realization of this that Government came with severeral *intervention schemes, projects and programmes* to revamp the economy such as;

- The **Operation Feed the Nation (OFN)** to take agriculture to the grass-root by creating agricultural schemes to take the youth Back to Land, up to the Local Government Area.

- The **Green Revolution of 1980** by the Second Republic aimed at towards agricultural mechanization, scaling up agriculture to plantation and large-scale (industrial) agriculture, with the involvement of **twelve (12) River Basins Development Authorities, the 16 Agricultural Research Institutes and Agricultural Development Projects (ADPs)** in research and developmental activities.
- The National Agricultural Research Project of 1997 was to revamp the economy after an “interphase” of early 90s – a World Bank assisted project.

- The National Special Programme for Food Security (NSPFS), was the intervention project of the fourth republic with five annexes, one of which is Aquaculture and Inland Fisheries Project (AIFP).

- The Agricultural Transformation Agenda (ATA) on 2010, introducing Value Chain concept into Agricultural Productivity.

- The Green Alternative launched in 2015, as placing agriculture as alternative to the oil economy.

- This became with the advent of Economic Recession induced by the global oil glut and attendant drop in fuel price per barrel, dropping from over a hundred dollar ($100) per barrel in 2010 to as low as thirty dollar ($30) per barrel in 2015.
FRESHWATER RESOURCES OF NIGERIA

- Nigeria is endowed with about 14 million ha of inland water mass, with 12 River Basin Development Authorities, 63 Irrigation Schemes, (Sadiku, 2016), most of which are suitable for aquaculture.

- The river banks are characterized by secondary vegetation as a result of anthropogenic activity of man, mainly agriculture and aquaculture.

- Survey of inventory of reservoirs/lakes in Nigeria indicates almost 1,000 reservoirs/lakes/dams, prominent amongst which are Kainji dam, Shiroro dam, Tagwai dam etc (NPFS, 2004).

Plate. 1: River Kaduna at Wuya bridge

Plate. 2: Shiroro Lake on River Kaduna
Plate. 3: Shiroro Dam on River Kaduna

Plate. 4: River Kaduna upstream

Plate. 5: River Kaduna downstream

Fig. 3: Tagwai Dam on River Chanchaga-a tributary of River Kaduna
This is made of the lentic and lotic aquatic ecosystems.

The lentic freshwater potential of each of the six geo-political and eco-climatic zones of Nigeria shows that the northern zones have more of the reservoirs/dams/lakes than the southern zones for obvious reasons - being arid and semi-arid.

**Fig. 4 : Distribution of reservoirs and lakes in Nigeria**
BRACKISH AND MARINE RESOURCES OF NIGERIA

- Nigeria is blessed with 853km coastline, 200 nautical miles of Economic Exclusive Zone with 37,934 km² Continental Shelf (Omotayo, 2007), with a lagoon – Lagos Lagoon, bays and fjords suitable for mariculture.

- Part of the coastline is sheltered from wave action from the high sea by vegetation, compared to countries with larger coastline exposed.

- It is characterized by mangrove vegetation (black mangrove, white mangrove and red mangrove) and in some places the Nypa palm vegetation for shore protection.

Fig.5 : Map of Lagos Lagoon, Nigeria
Plate 6: White mangrove (*Avicenia germanis*) at Ebute Eko, Lagos, Nigeria.

Plate 7: Red mangrove (*Rhizophora Racemosa*) at Ebute Eko, Lagos, Nigeria.

Plate 8: Black mangrove (*Laguncularia Racemosa*) at Ebute Eko, Lagos, Nigeria.

Plate 9: Nypa palm (*Nypa fruticans*, Lagos, Nigeria.)
AQUACULTURE AND FISHERIES DEVELOPMENT IN NIGERIA

- The Operation Feed the Nation of 1976, gave little attention to Fisheries and Aquaculture, as attention was more on importation of seafood.

- In 1980, a hooping sum of =N=360 million (=N=1.00 to $1.25 then) was expended on importation of 900,000MT of fish, the popular Norwegian stockfish was a household commodity. This trend was projected to hit 1.4 mMT, costing =N=560 million in 1985, which was made impossible by the economic recession of 1983 (Sadiku, 1988).

- In 2010, about =N=97 billion (=N=132.00 to $1.00 then) was expended on fish importation (Sadiku, 2016).

- In 2015, our fish demand stood at 3.5mMT/yr, with a domestic production of 1.027mMT, leaving a demand and supply gap of approximately 2.5 mMT.

- These prompted the redirection of government priority to domestic production. Programmes, schemes and projects were rolled out, viz;
AQUACULTURE AND FISHERIES DEVELOPMENT IN NIGERIA CONT’D

- The National Accelerated Fish Production Project, to bring modern fishing technology to the artisanal fishermen.

- The Inshore Fishing Project to replace small canoes with medium sized inshore fishing vessels and supply fishing and fish pond construction equipment at 50% subsidy.

- The Fish Seed Multiplication Scheme to produce quality fish seeds for distribution to farmers,

- The Homestead Fish Farming Programme aimed at domesticating fish farming, producing fingerlings for farmers at homestead.

- Not much was done in the 90s, save for the National Agricultural Research Project of 1997 with a component on fisheries and aquaculture.

- The Aquaculture and Inland Fisheries Project component of the National Special Programme for Food Security in 2002 provided the much needed catalyst for Aquaculture revolution in Nigeria, as production technology of quality catfish seeds was established.
AQUACULTURE AND FISHERIES DEVELOPMENT IN NIGERIA CONT’D

- The National Aquaculture Development Strategy was launched in 2008 as a policy document to consolidate the revolution, from production to marketing.

- Introduction of Aquaculture Value Chain as a component of the Agriculture Transformation Agenda in 2011 to adopt an all-embracing stakeholders approach to food production using Value Chain Methodology.

- The West African Agricultural Productivity Programme of 2014 promoted the development of Centres of Excellence in the research institutes to enhance aquaculture production.

- The launching of the Green Alternative of 2015 was aimed at repositioning agriculture as the viable alternative to an oil-dependent Nigerian economy.
Fig. 6: Value of Fish Import (Fin-fish) and Export (Shell-fish) Value
STATUS OF BLUE ECONOMY IN NIGERIA – FISH PRODUCTION

Fig. 7: Total Fish Supply (Metric Tonnes)
STATUS OF BLUE ECONOMY IN NIGERIA – FISH PRODUCTION BY COASTAL STATES

Fig. 8: Fish Production by Coastal States (Metric Tonnes)
AQUACULTURE IN NIGERIA

• Traditional aquaculture antedates recorded history, as old as man started the art of domestication of wildlife, about 2500 B.C. in Egypt.

• Modern aquaculture started by the effort of the regional governments in the early 50s, with Panyam Fish Farm in the North in 1954.

Plate 10 : Modern fish farms in Nigeria

Plate 11 : Ultra-modern fish hatery at Tagwai Dam, Niger State, Nigeria.
AQUACULTURE IN NIGERIA

- Presently, there are over 2000 fish farms in Nigeria. Zonal distribution (Fig. 9) shows South-South as the leading zone in fish farms for obvious reason – being the Niger Delta.

Fig. 9: Distribution of fish farms in Nigeria
CAGE CULTURE IN NIGERIA

- Kainji Dam was constructed on River Niger- Nigeria in 1968/69, primarily to generate electricity to power the economy post civil-war.

- The Kainji Lake formed became a major source of livelihood to local communities around the lake, as fisherfolks.

- Cage culture was introduced in Lake Kainji as an intervention pilot project by FAO when the wild stock dwindled from 28,638 MT in 1971 to 10,905 MT in 1973 (Ita, 1975).

Plate 12: Kainji Dam
Plate 13: Kainji Lake
MARICULTURE IN NIGERIA


- Mariculture in cage culture system as well practised in developed Europe and America is yet to take its strong root in Africa in general and Nigeria in particular.

- Cage-culture of *Clarias gariepinus* in Lagos Lagoon, as well as community-based cage and pen culture of fish at water Front area of Lekki in Lagos are at research level. (NIOMR, 2010)

- Similar experimentation was the cage and pen culture in Ikate Elegushi water front at Lekki –Lagos (NIOMR, 2010).

- Commercial cage culture as being promoted by Titon Fishing Co. Ltd for freshwater fish culture can be extended to the brackish and marine ecosystem for the culture of marine fishes, like
Plate 14: Netion trap in brackish pond at Buguma

Plate 15: Floating cage culture at Ikate Elegushi waterfront, Lekki, Lagos

Plate 16: Feeding fishes in cage culture
FEED PRODUCTION IN NIGERIA

For a cost effective aquaculture operation, feed and feeding must be given topmost priority as it accounts for 60% the cost of such operation (Fu, 2005; Sa et al., 2006). Reducing this to barest minimum will greatly enhance the profitability of aquaculture operation and promote a boom of the industry.

There are over 200 feed producers in Nigeria, but less 100 are commercial feed producers, with less than 50 specific to fish feed and less than 5 have capacity for producing floating pellets, as a result of inadequate technology for fishmeal and fish feed production.
FEED PRODUCTION IN NIGERIA

- Zonal distribution (Fig. 10) shows South-West as the leading zone in feed production for obvious reason – being the economic and industrial hub.

- Small scale farmers depend on on-farm farm aqua-feed. Commercial fish farmers use commercial feed from commercial feed producers.

Fig. 10: Distribution of feed producers in Nigeria
CHALLENGES OF FISH FEED PRODUCTION

- Inadequate raw materials for large scale production of fish feed. The global trend of competition for feedstuffs amongst human, livestock and aquaculture nutrition, has been at the detriment of aquaculture.

- Most critical ingredients in aqua-feed production is the fishmeal. Quality fishmeal production is at its lowest ebb in Africa, particularly Nigeria. Globally, fishmeal producers are majorly in Latin America, as Peru and Chile top the chart in the fishmeal production industry.

- Most preferred feed is floating feed because better feed utilization than sinking feed, requiring processing machinery for mechanical expansion, extrusion and pelleting, that is capital intensive. Hence, the massive importation of floating feed particularly “COPPENS” from Holland at high cost.
FLOATING AQUAFEED: UTILIZATION OF LIVE AND ARTIFICIAL AGENTS FOR DEVELOPMENT OF FLOATING FEED

The aforementioned challenges prompted the quest for indigenous on-farm solution, stated thus;

UTILIZATION OF LIVE AND ARTIFICIAL AGENTS FOR DEVELOPMENT OF FLOATING FEED

Floating Agents
- Yeast – *Saccharomyces cerevisiae* (YT)
- Honey Comb (HC)
- Duckweed – *Lemna paucicostata* (LM)

Binding Agents
- Wheat Flour Starch (WFS)
- Cassava Tuber Starch (CTS)
- Maize Grain Starch (MGS)
- Aquatec-11 (Polymethylo-cabarmide)
28 iso-nitrogenous diets were formulated to meet the nutrient requirements of *Clarias gariepinus* and *Oreochromis niloticus*

Constituents were LM, HC and YT as floaters, cooked and uncooked WFS, CTS, MGS and Aquatec-11 as binders, groundnut cake, fishmeal and soybean meal and vegetable oil as feedstuffs, vitamin-mineral premix and salt as minerals.

12 of the diets were successful with floating pellets for reasonable length of time. Diets with LM and HC had longer shelf-life than those with YT.

Falayi, et al. (2005)
FLOATING AQUAFEED: PRODUCTION OF FLOATING PELLETS USING APPROPRIATE METHODS

Floating Agents
- Candle Wax
- Yeast – *Saccharomyces cerevisiae*
- Baking Powder

Ingredients
- fishmeal, soybean meal, maize meal and vitamin-mineral premix

Methods
- 5 diets produced were divided further processed into toasted and untoasted, giving a total of 10 diets
- The odd number diets (toasted) were better in buoyancy than the even number diets (untoasted)

FLOATING AQUAFEED: DEVELOPMENT OF FARM MADE FLOATING FEED FOR AQUACULTURE SPECIES

Catalysts
- Yeast – *Saccharomyces cerevisiae*
- Baking Powder

Ingredients
- soybean and fishmeal

Methods
- Diets with the catalysts at 5% and 10%, using fishmeal as protein supplement floated, while diets with catalysts at 5% and 10%, using soybean as protein supplement did not float at all.

FLOATING AQUAFEED: THE EFFECTS OF VARYING INCLUSION LEVELS OF *Saccharomyces cerevisiae* AND INCUBATION PERIODS ON AQUAFEED BOUYANCY

Catalysts
- *Saccharomyces cerevisiae* @ 5%, 7.5%, 10% and 12.5%

Processing
- Incubation for 30, 45 and 60 minutes @ 38oC

Methods
- 95% of Feed with 7.5% catalyst floated for 60 minutes, while 85% of feed containing 5% catalyst floated for 60 minutes (Fig. 1)


![Fig. 11: Effect of incubation time on percentage floatation of diets](image)
FLOATING AQUAFEED: UTILIZATION OF SHEA FRACTIONS (SHEA-NUT AND SHEA-NUT RESIDUE) IN PRACTICAL DIETS OF CLARIAS GARIEPINUS

Ingredients
- Shea-nut Meal
- Shea-nut Residue Meal

Processing
- Full-fat Shea-nut Meal
- Shea-nut Residue Meal

Methods
- 100% Diet containing Full-fat Shea-nut Meal floated for a reasonable length of time, while those containing Shea-nut Residue did not float
- Gimba, A. A., Sadiku, S.O.E. and Orire, A.M. (On-going Research)
FEDERAL REPUBLIC OF NIGERIA
Certificate of Registration of Patent
(Patents and Designs Act; CAP 344 Laws of the Federation of Nigeria 1990)

B2: NG/17/2018/334
Date of Patent: 28/11/2018
Date of Sealing: 28/02/2019

President of the Federal Republic of Nigeria and Commander-in-Chief of the Armed Forces
MUHAMMADU BUHARI, GCFR.

Whereas a request for the grant of a patent has been made by: SULEIMAN OMEZA EKU SADIKU, ABDULLAHI MOHAMMED ORIRE AND FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA, P.M.B. 66, NIGER STATE, NIGERIA, CO NATIONAL OFFICE FOR TECHNOLOGY ACQUISITION AND PROMOTION (NOTAP) OF NO. 4, BLANTYRE STREET, WUSE 11, ABUJA, FEDERAL CAPITAL TERRITORY, NIGERIA.

For the sole use and advantage of an invention for: ON FARM FLOATING FISH FEED.

AND WHEREAS the Federal Government being willing to encourage all inventions which may be for public good, is pleased to accede to the request:

NOW YE THEREFORE, that I do by this Instrument give and grant unto the person(s) above named and any successor(s), executor(s), administrator(s) and assign(s) thereof and any of whom are hereinafter referred to as the patentee(s), by special licence, full power, sole privilege and authority, that the patentee(s) or any agent or licensee of the patentee(s) may subject to the conditions and provisions prescribed by any statute or order for the time being in force at all times hereafter during the term of years herein mentioned, make, use, exercise and vend the said invention throughout the Federal Republic of Nigeria, and that the patentee(s) shall have and enjoy the whole profit and advantage from time to time accruing by reason of the said invention during the term of twenty years from the date first above written on this instrument; AND to the end that the patentee(s) may have and enjoy the sole use and exercise of the full benefit of the said invention, I do by this Instrument strictly command all citizens of the Federal Republic of Nigeria that they do not at any time during the continuance of the said term either directly or indirectly make use of or put in practice the said invention, nor in any wise imitate the same, without the written consent, licence or agreement of the patentee(s), on pain of incurring such penalties as may be justly inflicted on such offenders, and of being answerable to the patentee(s) according to law for damages thereby occasioned.

PROVIDED ALWAYS that this patent shall be revocable on any of the grounds from time to time by law prescribed as grounds for revoking patents granted by me, and the same may be revoked and made void accordingly.

PROVIDED ALSO that nothing herein contained shall prevent the granting of licences in such manner and for such considerations as they may by law be granted.

MADE this 28th Day of FEBRUARY, 2019

STELLA OZO EZENDUKA
Registrar

CERT. No. 010961
ALLIED ADVANCES: G.I.S AND REMOTE SENSING IN AQUACULTURE

- Geographical Information System (G.I.S) has been a very useful tool in assessing suitability of waterbodies for aquaculture and aquatic productivity.

- Practical models (Figs.) have been developed for waterbodies in Central America – Mexico (Monjarez-Aguillar, 1995), Africa – Nigeria (Abba, 2007) and Ibrahim, 2015).

- Remote sensing is a tool useful in modern aquaculture in areas of feeding (recall feeding) – Jauncey, 1982), fish stock assessment with the use of fish finder (Ibrahim, 2015)

Plate.17 : Researchers using Fish Finder on Siriroro Lake.

Plate.18 : Researchers using Fish Finder on Siriroro Lake.
Plate 19: G.I.S modeling of primary productivity of Tagwai Dam
Fig. 12: Aquaculture system automation using Artificial Intelligence.

Figure 3.15: Test Bed Design for the Recirculation Aquaculture System

Figure 3.16: Description of the Sensory and Control Unit
A pilot test bed developed to incorporate the basic components of a typical recirculatory aquaculture system to a Mechatronic system.

It controls all pre-set water quality parameters. (Folorunso, et. al. 2019)

Plate 20: Test bed of automated aquaculture system.
CONSTRAINTS MILITATING AGAINST DOMESTIC FISH PRODUCTION

- Lack of clear cut policies of government.
- Lack of enforcement of fishing by-laws.
- Environmental Factors, including climate change.
- Changes in the national economy, limiting availability of capital/credit facilities.
- Shortage of input supply to fisher-folks and fish farmers.
- Lack of adequate post-harvest technology to forestall spoilage.
- Lack of adequate extension and deployment of appropriate technologies
- Non-effective utilization of the nations abundant resources

THE RESULTANT EFFECT OF THESE CONSTRAINTS – WIDENING DEMAND AND SUPPLY GAP IN FISH OF 2.5mMT

Fig. 13: Fish Demand and Supply Projections (2015-2030)
EFFORTS TO ENHANCE FISH PRODUCTION

- Provision of credit facilities through several programmes of government.
- Enforcement of by-laws to guard against obnoxious fishing methods.
- Distribution of inputs to fish farmers and fisher-folks through Fisheries and Aquaculture Growth Enhancement Support Scheme, Fisheries Flood Relief Programme.
- Establishment of model cottage fish processing centers
- Development of fish farm estates and fish seed Multiplication Projects
- Diversification of culturable species to include other local species.
- Development of shrimp culture technology
- Issuing license to companies with deep sea fishing vessels for Deep Sea Fisheries Development.
- Promoting of cage aquaculture development.
- Promoting of shrimp culture development.
- Capacity building along the entire fisheries and aquaculture value chain.
- Establishment of cottage industries
AREAS OF POSSIBLE COLLABORATION

- Identification, characterization and development of floating and artificial live feedstuffs for farm-made floating aqua-feed for aquaculture species.

- Use of multi-factor Geographical Information System for modeling of aquatic productivity and biodiversity.

- Automation of aquaculture and fisheries operation using mechatronics/Artificial Intelligence.

- Artificial mariculture in the hinterland.
CONCLUSION

- Achieving a viable blue economy is a task that all hands must be on deck – Post COVID-19. The collapse of the global oil economy has necessitated diversity in a mono-commodity economy of Nigeria that is over-dependent on oil – only 5% of GDP, but realizing 50% of her revenue and 90% of foreign exchange earnings.

- The Green Alternative and the Blue Economy will provide the needed diversification to guarantee food security, remove hunger and zero poverty.

- At a world economic summit in 2014 attended by African richest man – Alhaji Aliko Dangote, reported at a political town hall meeting in December, 2014, that while Nigeria is still thinking oil, the developed economies are thinking of alternatives to oil. The world is divesting from oil.

- Two prominent Nigerians have voiced their opinions on the subject of “Nigeria without Oil” or “Nigeria beyond Oil”
CONCLUSION CONT’D

- The Vice-President, His Excellency, Yemi Osinbajo while receiving investors in company of Minister of Trade, Industry and Investment was quoted as saying “This country has practically what it takes to run a solid economy that is not dependent on oil, but on business and commerce” http://www.ekekee.com

- Similarly, the governor of Kwara State, His Excellency, Abdulfatah Ahmed has said Nigeria can survive without oil if most Nigerians could transform agricultural practices into agric-business http://www.naij.com.

- With 27 billion barrel of oil and 4 trillion cubic metres of gas reserves (http://www.gamji.com.), it may last for the next 50 years, latest and What next?
YOUNG AQUAPRENEURS IN TRAINING AND THE BLUE ECONOMY
RELEVANT PUBLICATIONS


RELEVANT PUBLICATIONS
