

The Evolution of the Bio-Economy in Nigeria: A Review of Trends and Events.

Chimdiya Julian Onyeka, M.Sc.

Greenwich School of Management, Royal Hill, London, SE10 8RD.

E-mail: conyeka@greenwich-college.ac.uk

ABSTRACT

The Nigerian economy has been through different phases of evolution since independence in 1960. The country currently relies excessively on oil revenues and the biotechnology and agricultural sectors of the economy have had varied responses to the different phases of the nation's economic evolution. This article examines the overall economic evolution with interest in the biotechnology and agricultural sectors. Suggestions are made for policy makers regarding ways of encouraging biotechnology research as an alternative revenue source.

(Keywords: Nigerian, biotechnology, commercialization, emerging economies, bio-economy, oil revenue alternatives)

INTRODUCTION

End of British Colonial Rule – Formation of The Federal Republic (1960-1966)

Shortly after independence from British colonial rule, the Nigerian economy was characterized by falling terms of trade and the emergence of the oil economy (Bevan, *et al.*, 1999). The value of agricultural exports fell notwithstanding an increase in the volume of export. By 1962, stagnation in production had set in as prices fell as a result of increasing volumes. Interestingly, by 1966 oil production had peaked at over 400,000 barrels daily as against a mere 17,000 barrels following independence in 1960. By 1967, oil was responsible for 17% of all government revenue and 20% of Nigeria's total exports (Kilby, 1969).

Nigeria was at the time, viewed as an emerging but vibrant economy in a state of constant flux. Sacred British manufacturing institutions from the colonial era suddenly found that they were no longer untouchable and their positions were constantly being threatened by their newly

emboldened, indigenous rivals. Inevitably, some of their businesses were transferred to local companies with companies like the United African Company becoming established and diversifying its ventures to include vehicle assembly, plywood, textiles, and brewing. This however had little impact on the domestic economy as most of the products had significant foreign constituent parts (Kilby, 1969).

Between 1960 and 1966, Nigerian economic growth was rapid, averaging 5% per year. While the oil and educational sectors of the economy grew, the biotechnology and agricultural sectors were flat and often in decline. By the end of 1968, Nigeria had considered the idea of a National Development Plan which was proposed to be a comprehensive and integrated plan of set national targets in: investment rates (11% to 15% increase in GDP) and aggregate growth rate (4% per annum). The plan was to allocate 13.6% of the national budget to primary production (Bevan, *et al.*, 1999).

Biafran Civil War – Emergence of the Oil Economy (1970-1979)

In 1966, Nigeria experienced its first military coup and by July 1967, the country was in a full blown civil war; one which lasted till January of 1970. At the end of the war, an oil price in the international market was unprecedented and Nigeria quite naturally cashed in on the oil boom. This was however, at the further detriment of biotechnology and agricultural research and production. By the end of 1973, oil accounted for over 83% of Nigeria's total export while biotechnology and agriculture accounted for less than 1% and 3% respectively (Forrest, 1993).

Government fiscal policy was greatly influenced by the windfall in oil revenue. Productive resources were diverted away from biotechnology and towards activities that had

more direct relevance to the oil industry. There was no pressure to improve university research labs, property or farm incomes as it was widely believed that oil revenue would always lead to surplus. Non-oil taxes were neglected and government felt it could expand itself into handling every sector of the economy without recourse to the private sector.

The educational sector blossomed in 1975 when 19% of the national expenditure was dedicated to the sector. The federal government of Nigeria established seven additional universities (bringing the total number of universities in the country to eleven), student numbers rose to 53,000 in 1978 from just 14,000 in 1970, and the Nigerian Universities Commission (NUC) was established. The focus was however on the study of the petroleum-related engineering courses and where educational research funds were awarded, they were not for biotechnology or agricultural research; they were for research in oil and gas studies.

While the term “technology transfer” was being incorporated into various government speeches and program of events, there was no concrete evidence of any successful sustained transfer routine. Adubifa (1990) reports that government policy woefully failed in achieving the desired technology transfer in the petrochemical industry of the Nigerian nation.

The Era of Austerity (1979-1986)

Enter Nigeria’s second republic in 1979 and the educational sector tumbles. The government becomes repeatedly engaged with the Academic Staff Union of Universities (ASUU) and long drawn industrial actions become the norm with the attendant negative effects on university biotechnology research.

By the end of 1981, oil revenue had plummeted resulting in high deficit financing. This in turn drained the external reserves and increased the nation’s foreign debt profile. Emergency stabilization measures included 40% public expenditure cuts across the board without priority, advance deposits for imports, increase in import duties, upward review of excise duties and increase in the price of petroleum products (Forrest, 1993). The era of austerity had arrived.

Naturally, these changes strained all sectors of the economy. The relatively neglected biotechnology and agricultural sectors felt the pinch even more as their possible exports became highly constrained by an over-valued Naira. As a result, production levels fell even more.

Crops such as palm oil, cotton, cocoa and rubber which were previously limited in production as a result of high costs of labor faced new challenges in the form of rising export prices and high opportunity costs of non-farm employment. Plant closures become common place especially in the textile industry as they suffered the effects and losses resulting from smuggling activities. Production fell by 26% in 1983. Fashoyin, *et al.* (1994) report a 35.1% drop in average capacity utilization between 1981 and 1986. The government remained largely unable to effectively control foreign exchange and import license allocation

Structural Adjustment Program and Introduction of the Free Market (1986-1999)

In July 1986, the Structural Adjustment Program (SAP) was introduced as yet another desperate attempt at reforming Nigeria’s weak domestic economy. SAP was a recommendation of the World Bank and International Monetary Fund (IMF) and its adoption by the then government of Nigeria was the subject of several debates and arguments. This divide ranged from advocates of economic liberalization in support of more private enterprises on the one hand, and supporters of a government led market oriented growth strategy on the other.

Effectively, SAP was a collection of mid-term strategic policies targeted at reviving an ailing economy by means of inspiring investment and commitments to strategic growth. SAP comprised mainly of the IMF stabilization and structural adjustment policies of the World Bank. The central purpose was the reduction of short term budget deficits, inflation and balance of payment deficits through a redirection of economic structures towards greater medium term efficiency (Adeoti, 1993).

In reality, being a World Bank concept, SAP was not achievable without the already existing IMF routine. It was viewed as common practice in Nigeria for IMF programs to be set as pre-

conditions for World Bank intervention. When it came to SAP, the IMF and World Bank demanded a market based economy as prerequisite for economic development (Hansohm, 1993; Ihonvbere, 1993). Ultimately, the following became the defining features of SAP:

- Significant currency devaluation of the Nigerian currency (the Naira)
- Redirection of government attention towards agriculture and biotechnology
- Greater taxation on consumer goods
- Minimized institutional control on pricing
- Privatization of government assets
- Major increase in nominal producer prices for agricultural cash crops in order to restrict decline.

According to Adeoti (1993) the key objective of SAP was the strategic utilization of policy instruments in restoring an ailing economy to sustainable growth, rather than merely meeting the basic needs of a desperate population. This proved beneficial to the agricultural, biotechnology and production sectors of the Nigerian economy.

Jega (1993) divided the SAP era into the following stages:

- i) Introduction of price reforms, by removing existing regulatory mechanisms and incentives;
- ii) The introduction of trade liberalization, by removing barriers, providing incentives to export, and deregulating exchange rates;
- iii) Reduction of public sector involvement in the economy through commercialization and privatization.

By mid-September 1986, the Second-Tier Foreign Exchange Market (SFEM) had been introduced as another recommendation of the IMF for progression of the Structural Adjustment Program. This set the devaluation of the naira as priority and local industries had to find ways of coping with the new regime in addition to a collapse in effective demand. This change however, was good news for industries that were less dependent on imports and had a steady demand.

There were new investments in industries which relied on local raw materials such as palm kernel, maize milling, cotton seeds, vegetable oil processing, soya milk processing, hides and skin tanning and sorghum malting.

The Nigerian brewing industry began substituting imported barley malt for malted sorghum. Flour mills, breweries and textile firms invested in agro-biotechnological enterprises to secure local supply of raw materials. It was boom time for agriculture and biotechnology production research in Nigeria. Cocoa exports rose significantly as producer prices rose from ₦3000 in 1986 to ₦15000 in 1989.

There were also exports of textiles, beer, tiles, perfumes and carpets. Adeoti, (1993) suggests that increase in import costs and pressure by government had led to a deliberate shift to local raw material sourcing by industry with a 12% increase between 1985 and 1988.

Biotechnology-Specific Government Initiatives

During this period the role of government in biotechnological development and advancement included:

- 1986: The SAP banned the importation of barley, malt, and other cereals, thereby encouraging the adoption of local grains for brewing.
- 1987: Establishment of the National Centre for Genetic Resources and Biotechnology
- 1993: National Committee on Biotechnology to provide a master plan. A National Biotechnology workshop followed closely as an aftermath.
- 1994: Guidelines on Bio-safety for Nigeria
- 1998: Another federal workshop on Biotechnology techniques: Bioreactor Systems were of main focus

The Emergence of the Free Economy (1999 to date)

The return of civilian rule to Nigeria in 1999 ushered in new opportunities for economic

freedom after decades of military dictatorship. Under the military administration, government intervention in market operations for unguided personal purposes was common place. Foreign investors were skeptical of doing business with Nigerian biotechnology ventures largely because of the volatile and unpredictable nature of the administration.

After 1999, there was the freedom of economic debate and negotiation on growth and poverty. University researchers had their interest protected by pressure groups and trade unions. In 2003, there was a clear pattern of economic development and improvement and the National Economic and Empowerment Development Strategy (NEEDS) was established. In 2006, the government approved a \$5 billion science endowment fund for research into biotechnology, agriculture and the physical sciences. It was a whole new era for scientific research in Nigeria. NEEDS policies have been rigorously pursued since 2003 and fundamental components include:

- Diversification of the economy by developing alternative revenue sources to oil,
- Developing international competitiveness in the production sector,
- Tariff liberalization in line with Economic Community of West African States (ECOWAS) standards,
- Reducing Government involvement in the production sector to merely regulation and the security provision,
- Developing policies which increase domestic savings and private investments (NPC 2004).

For the increased success of NEEDS, The National Planning Commission (NPC) suggests that the following long standing Nigerian institutions need to be strengthened:

- Central Bank of Nigeria (CBN), needs more independence to implement monetary policies and supervision of the financial sector. CBN has already achieved the consolidation of banking institutions.
- The Customs and Excise Department is improving infrastructure, particularly in the areas of information and communications

technology. This has enabled better tariff collection and the fight against smuggling.

- Bureau of Public Enterprises has increased the pace of privatization of publicly owned enterprises. As a result, Nigeria is becoming one of the fastest growing telecommunications markets in the world.
- Nigerian Agency for Food, Drug Administration and Control (NAFDAC) succeeded in raising the standard of Nigerian food and drug products to acceptable quality.
- Standards Organization of Nigeria (SON) improved the standardization of industrial products.
- Nigeria Export Promotion Council has improved the awareness rates of manufacturers and implemented incentives for export from Nigeria. (NPC 2007).
- The Nigerian Institute for Social and Economic Research in Ibadan (NISER) reports that the following institutions have been established in support of the above institutions in order to provide support for the achievement of the NEEDS goals.
- Bank of Industry (BOI) created as a merger of Nigeria Development Bank and the Nigerian Bank for Commerce and Industry.
- The Nigeria Agricultural Cooperative and Rural Development Bank created as a merger of the Bank of Agriculture and former Peoples Bank.
- Small and Medium Enterprise Development Agency of Nigeria.
- Small and Medium Enterprises Equity Investment Scheme.
- Nigeria Information and Technology Development Agency (NITDA).
- The Economic and Financial Crimes Commission (EFCC) (NISER, 2006).

As a result of these, Nigeria is today viewed as an emerging economy with a relatively stable exchange rate, impressive growth prospects and predictable economic environment. Nigeria's

Gross Domestic Product grew by 5.4% between 2000 and 2004 and had risen to 6.9% in 2005. This is in sharp contrast to 1.1% in 1999. Biotechnology and agricultural manufacturing grew at an average of 5.3% and 6.1% respectively between 2000 and 2004.

Sector-specific successes have among other things included GDP growth rates of 3.3% in 1999 and 6% in 2004, an 8.3% growth in non-oil sectors between 2004 and 2007, the liberalization of the telecommunications industry and the consolidation of the banking industry.

Today, Nigeria boasts of being one of the fastest growing banking and telecommunication markets in the world, a record 110 privatization transactions between 2000 and 2006 (resulting from the privatization of public owned enterprises) and the country's external reserves have risen from \$4 billion in 1999 to \$43bn in 2007 (NPC, 2007).

Technology transfer has also improved. According to the National Office for Technology Acquisition and Promotion (NOTAP), in Nigeria, one thousand two hundred and thirty seven (1237) technology agreements were registered between 1999 and 2010. The Services sector had the highest number of agreements (570), while the Agro-Allied sector was least with 178 agreements. This Solid Mineral and Chemical Sector had 256 agreements and the Engineering sector had 233 agreements (NOTAP, 2011).

Table 1: Number of Technology Agreements Registered Per Industrial Sector (1999 – 2010).

YEAR	AGRO	SMC	ENG	SER	TOTAL
1999	22	17	20	11	70
2000	17	24	13	13	67
2001	14	29	23	21	87
2002	14	18	18	29	79
2003	20	26	13	31	90
2004	9	24	13	37	83
2005	14	29	39	64	146
2006	20	34	24	71	149
2007	19	23	28	100	170
2008	15	16	27	81	139
2009	14	16	15	112	157
Total	178	256	233	570	1237

(Source: NOTAP)

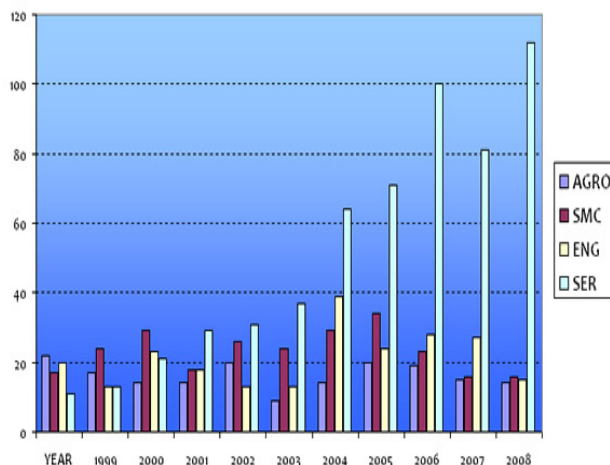


Figure 1: Technology Transfer Activity from January 1999 - December 2009 (Source : NOTAP)

FURTHER BIOTECHNOLOGY-SPECIFIC GOVERNMENT INITIATIVES

Biotechnological development and advancement in Nigeria since the emergence of the new macro economy include:

- 2000: The International Breweries Plc., in collaboration with the Raw Material Research and Development Council (RMRDC) began developing microbial enzymes (amylases). The RMRDC also began commercializing corn starch syrup.
- 2001: The National Biotechnology Development Agency (NABDA) is established.

INVOLVEMENT OF THE PRIVATE SECTOR

The private sector has become more involved with the promotion, utilization and commercialization of local biotechnologies. Although most still rely on imported initiatives, a significant number now rely on local initiatives and these include:

- Nigerian Tobacco Company (NTC) developed improved varieties of tobacco plants.
- Cadbury Plc. commenced the production of “Dawadawa” cubes and modified this with the

addition of soya-beans, with locust beans forming the lot of the condiment.

- Leventis Plc. developed and markets improved and high yielding varieties of crops like pepper and tomatoes.
- NIYAMMCO's production of baker's yeast and alcohol on the basis of a low demand and supply of materials for baker's yeast.
- SAMCO produces yoghurt from imported culture of *Lacto bacillus* via locally derived technologies.

INVOLVEMENT OF NON GOVERNMENTAL ORGANISATIONS (NGO)

These have been involved, mainly as pressure groups for the development of biotechnology in Nigeria. They include:

- Nigeria Gesellschaft fur Biotechnologische Forschung (Nigeria GBF Club) at the Obafemi Awolowo University, Ile Ife concerned with the promotion of biotechnology in the country.
- The Foundation for African Development through International Biotechnology at the Nnamdi Azikiwe University, Awka dedicated to cloning training provision for African biotechnologists.

PERSISTING ECONOMIC CHALLENGES

Since 2000, growth has been higher, averaging over 5% annually between 2000 and 2005, and 6.1% and 6.3% in 2004 and 2005 respectively. Even though the non-oil-sector has also grown (7.4% and 8.2% in 2004 and 2005 respectively) (NNPC 2009) and the Foreign Direct Investments (FDI) and exports in non-oil sectors are increasing, FDI as a key channel for technology transfer in Nigeria has unfortunately been limited to the oil sector. As a result, the quality of FDI remains an issue, the economy is still highly undiversified and excessively dependent on oil, and there's a limited move up the technology ladder as there is a dominance of primary production and manufacturing only contributes 4% of GDP.

Consequently, Nigeria is in desperate need of productivity improvements in order to spur and

maintain rapid growth. Technology provides an opportunity to do this (potentially offering 10% annual growth rate on a sustained basis (Ogbu, 2006). Considering the significant limitations on external competitiveness, harnessing the large domestic and regional market for the improvement of productivity (via knowledge transfer) and growth becomes very achievable in the short to medium term.

ADVANCES AND PROSPECTS FOR BIOTECHNOLOGY IN NIGERIA

Nigeria's National Veterinary Research Institute (NVRI) located in the Vom Area of Plateau State has been involved in commercialization activities for nearly 20 years (Bello, *et al.*, 2006). In 1999, they had a breakthrough in the development of a vaccine for Typhoid. This was in partnership with the Federal University of Technology, Minna, Nigeria. There have also been a number of advances in other key institutions such as polytechnics, research Institutes, universities and the private sector. Among these are:

- Bio-fertilizers, the works of scientists and engineers being tried at the Lagos State University of Technology (LAUTECH) farm at Ogbomoso with liquid fertilizers.
- DNA recombination via Polymerase Chain Reaction (PCR) at the National Institute of Pharmaceutical Research and Development (NIPRD), Abuja.
- Development of protein sweeteners and corn starch syrup by the Raw Material Research and Development Council (RMRDC).
- Vaccines for cattle, dogs, sheep, cat, goat and humans developed by the National Veterinary Research Institute, Plateau State, Nigeria (10 viral and 10 bacterial vaccines have already been commercialized, 18 are ready for commercialization).
- Local fabrication of a plant for the production of bakers' yeast by the Federal Ministry of Science and Technology, Abuja.
- Plant domestication, selection and breeding, micro-propagation and processing techniques involving the use of micro-organisms at the National Root Crops Research Institute, Umudike, Nigeria.

- Vinegar from palm wine alcohol, biomass from our industrial waste or by-products by the Federal Institute of Industrial Research Oshodi (FIIRO), Lagos State.
- At the International Institute for Tropical Agriculture (IITA), the following have been developed:
 - Natural biocides for the control of microbes (1989), the control of mosquitoes (1991) and the control of ticks (1993). Other plants with insecticide properties have also been reported.
 - Molecular genetics, non-sexual gene transfer technology for somatic embryogenesis and plant generation, gene transformation via DNA flow, *in vitro* germplasm preservation and *in vitro* micro-propagation techniques for yams, plantain and cassava.

Other developments include malting procedures for sorghum which culminated in sorghum malt for beer production in Nigeria, millet fermentation for the production of “*kamu*”, laboratory scale development of cocoa sweeteners from the by-products of cocoa processing, and cassava starch effluent treatment with concomitant single cell protein production (Mark, 2000).

CONCLUSION

The Nigerian nation has experienced several phases of economic evolution and still has a long way to go. However, it is clear that in order to further diversify the economy and nip the present over-dependence on oil revenue, other sectors of the economy need to be encouraged, targeted and sponsored.

The free market phase of national evolution as reviewed recorded some of the most significant successes of the biotechnology and agricultural industry in the Nigeria’s history. Needless to say, funding plays a crucial role in research growth and commercialization success. Government needs to increase funding to universities in order to better empower them to stand on their own and become able to commercialize their biotechnologies.

There is also a need for the modification of policy to accommodate local content in order to create a

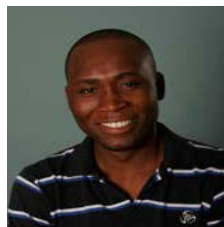
shift in the mindset of the population. A demand for locally made goods creates employment, generates export finance and boosts the local economy. While boosting the domestic economy, an increased rate of manufacturing enhances GDP in addition to addressing the nation’s foreign debt profile and reserves.

REFERENCES

1. Adeoti, J.O. 1993. “Economic Policy Instruments for the Implementation of Structural Adjustment Programmes in Less Developed Countries and their Implications for the Promotion of Small Scale Industries”. A SEPT seminar paper presented at the Department of Development Studies (FB 11), University of Bremen, Bremen, Germany.
2. Adubifa, Akin.1990. *Technology Policy in Nigeria*. Nigerian Institute of Social and Economic Research (NISER): Ibadan, Nigeria.
3. Bello, M.K.. T.M. Joannis, N. Kujul, J. Okpara, D.G. Bwala, M. Ogo, H.G. Ularumu, I.A. Shittu, A.N. Egbuji L.K. Suleiman, T.Y. Woma, S.J. Shaibu, J. Dalis, N. Sati, N.J. Zwandor, I.L. Oyetunde, T.A. Cole, A.A. Makinde, and L.H. Lombin. 2006. “Response and Control Measures Against the Outbreak of the Highly Pathogenic Avian Influenza in Nigeria”. *Vom Journal of Veterinary Sciences (Special Edition): 62-66*.
4. Bevan, D., P. Collier, and J.W. Gunning. 1999. *The Political Economy of Poverty, Equity, and Growth: Nigeria and Indonesia*. The World Bank: Washington, D.C. and Oxford University Press, Oxford, UK.
5. Fashoyin, T., S. Matanmi, and A. Tawose. 1994. “Reform Measures, Employment and Labour Market Processes in the Nigerian Economy: Empirical Findings”. In: T. Fashoyin (ed.). *Economic Reform Policies and the Labour Market in Nigeria*. Friedrich Ebert Foundation: Lagos, Nigeria.
6. Forrest, T. 1993. *Politics and Economic Development in Nigeria*. Westview Press: Oxford, UK.
7. Freeman, C. 1987. *Technology Policy and Economic Performance — Lessons from Japan*. (Pinter, London).
8. Hansohm, D. 1993. *Structural Adjustment Programmes: Contents, Impacts, Alternatives, with Reference to the Labour Market*. ARLAC Training Material Series.

9. Ihonvbere, J.O. 1993. "Economic Crisis, Structural Adjustment and Social Crisis in Nigeria". *World Development*. 21(1):141-153.
10. Jega, A.M. 1993. *Crisis, Adjustment and Poverty in Nigeria: A Critical Assessment*. Friedrich Ebert Foundation in collaboration with African Centre for Development and Strategic Studies: Lagos, Nigeria.
11. Kilby, P. 1969. *Industrialization in an Open Economy: Nigeria, 1945-66*. Cambridge University Press: Cambridge, UK.
12. Mark, A. 2000. "Biotechnology: Advances and Prospects for Sustainability in Nigeria". *The Journal for Food Technology in Africa*. 5(2).
13. National Office for Technology Acquisition and Promotion (NOTAP). 2011. "Technology Transfers" Accessed January 07, 2011: <http://notap.gov.ng/content/technology-transfers>
14. Nigerian National Petroleum Corporation (NNPC). 2009. "Research and Development" Accessed December 21, 2009: <http://www.nnpcgroup.com/NNPCBusiness/DownStream/Researchdevelopment.aspx>
15. NISER. 2006. "Towards a Medium Term Policy Thrust for Nigeria, 2007-2011, Draft Report on Nigeria's Economic Reform Programme". Nigerian Institute of Social and Economic Research: Ibadan, Nigeria.
16. NPC. 2004. *Nigeria: National Economic Empowerment and Development Strategy*. National Planning Commission: Abuja, Nigeria.
17. NPC. 2007. *Nigeria: Draft National Economic Empowerment and Development Strategy-NEEDS2*. National Planning Commission: Abuja, Nigeria.
18. Ogbu, O. 2006. *Technology Practice and Policy in Africa*. International Development Research Centre: Ottawa, Canada.

ABOUT THE AUTHOR



Chimdiya Julian Onyeka, is a Doctoral student at the Greenwich School of Management in London. He has a B.Sc. in Biochemistry and an M.Sc. in Medical Biotechnology from the University of Westminster, London. He is a member of the British Academy of Management and also a member of the

American Oil Chemists Society. He has previously published in *Management Online Review* and also in the *Journal of Commercial Biotechnology*. His research interests are in knowledge/technology transfer with particular interest in the commercialization of academic biotechnologies.

SUGGESTED CITATION

Onyeka C.J. 2012. "The Evolution of the Bio-economy in Nigeria: A Review of Trends and Events". *Pacific Journal of Science and Technology*. 13(2):224-231.



[Pacific Journal of Science and Technology](http://www.pacificjournalofscienceandtechnology.com)