Science and Technology and Indigenous Farming in Ikwerre, Rivers State, Nigeria

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Abstract: Today, science and technology pervade an indispensable component of our world, especially agriculture. This is because scientific and technological advancement in agriculture has benefited farmers in the industrialized world by driving agricultural production. However, farmers in Nigeria are yet to substantially gain from this advancement. This paper therefore, discusses the role of science and technology in the improvement of indigenous farming in Ikwerre, Rivers State, Nigeria. It explores the traditional agricultural practices and the challenges faced by indigenous Ikwerre farmers. For the purposes of this research, data were collected through qualitative method with focus groups and individual interviews. Findings revealed that there is the need for farmers to advance in the technological know-how of the modern farming equipment and it is recommended that government should deploy the benefits of Science and Technology in the improvement of indigenous farming in Nigeria by way of extension services.

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1. Introduction

Development in Science and Technology is fundamental in the change it offers in the general economic growth especially in agricultural and industrial sectors as well as the improvement of the quality of life of the society. The word science is from the Latin "*scientia,*" meaning knowledge. *Webster's New Collegiate Dictionary*, defines science as knowledge attained through study or practice, or knowledge covering general truths of the operation of general laws, especially as obtained and tested through scientific method [and] concerned with the physical world.

The practical application of science gives rise to technology which is aimed at developing products and processes for the use of man. Technology is associated with the Greek term *tecnikon,* which means that which belongs to *techne*. The word *techne* according to Heidegger (1977) in Elechi, (2016), refers to the activities and skills as well as the arts of the mind and the fine arts, a set of principles involved in the production of an object. Furthermore, *techne* pertains to acts of making and doing things. For David Wood, technology is the use of scientific knowledge for practical purposes and application, whether in industry or in our everyday life.

He posits that it involves a specific piece of equipment, but that equipment can be incredibly simple or dazzlingly complex. It can be anything from the discovery of the wheel all way up to complicated MP3 players. Similarly, Hornby (2002) posits that technology is a scientific knowledge, used in practical ways, especially in the designing of new machines, machineries and equipment. According to Labe (2008), in Ibitoye (2011), technology is all the modifications humans have made in the natural environment for their own purposes. Rowell (2002) in Ibitoye (2011), agrees with Labe and Hornby's definitions as he posits that technology can be used to refer to a collection of techniques which is the state of humanity's knowledge of how to combine resources to produce desired products to solve problems, fulfil needs or satisfy wants. It includes technical methods, skills, processes, techniques, tools and raw materials. In the same vein, Derefaka (2002), contend that technology is concerned with the developing and utilizing processes of production to solve material problems; it is so fundamental that it affects and is affected by most aspects of indigenous knowledge.

He further posits that the development of technology started with the making of relatively simple tools and appliances for the solution of basic problems of living such as the satisfaction of hunger, provision of shelter, light, and means of communication and procurement of storage. In the light of the above, science explains the natural world as it refers to systematic methodology used to gather accurate information about shared reality while technology develops and explains the human-made world which involves development, processing and

management. In essence, this paper seeks to know how this has affected the Ikwerre farmers in Rivers State, Nigeria.

Without doubt, Ikwerre farmers like their counterparts elsewhere in Africa, had an exceptional understanding and interpretation of their environment. They are natural scientists that are able to determine specific farming method and exact crop that was good for the area. They practically, knew what to do to maintain the fertility of their soil as to have good yield. Therefore, it is not in doubt that the Ikwerre farmers have been able to manipulate their agricultural environment. However, they are challenged with increase in population and the need to improve their farm implements to meet modern day challenges. The above provide the context for these questions. Who are the Ikwerre and what is their indigenous farming system? Which implements were used for cropping? What products where produced? How have the Ikwerre farmers been able to utilize the modern technological and farming equipment? If not, why? What suggestions can be made to improve the farmers yield so that the contemporary Ikwerre farmer can enjoy maximum yield in his or her farm?

1.2 The Ikwerre

The Ikwerre is an ethnic group who have been the indigenous inhabitants of present-day Emohua, Ikwerre, Obio/Akpor and Port Harcourt Local Government Areas. They constitute a major ethnic group of Rivers State in the Niger Delta, Nigeria. the area stretches from Rebisi (Port Harcourt City) through Obio and Akpor in the South East to the International Airport communities of Omagwa, Ipo, Omademe, Ozuaha and Igwuruta in the East. It extends to Ubima, Omuanwa, Omudioga, Egbeda, Ubimini, Apani and Omerelu in the North, being the boundary towns between Rivers State and Imo State. It runs through to Elele-Alimini, Rumuekpe, Itu, Akpabu and Rundele in the West and down to Ogbakiri, Emohua and Uvuawhu coastal communities in the South. Among the Ikwerre, land is the most important requirement for agriculture and is regarded as the basic frame of existence.

The Ikwerre hold sentimental attachment to land because their livelihood depends almost entirely on land. Symbolically, land is revered and it is the fountain of their morality. In fact, Ikwerre arch-divinity (*Eli*) is associated with land, which is revered and appeased. As such, incursions into the people's land for whatever economic endeavour by government means nothing but robbing them of their most revered natural endowment. In an oral interview Gbule (12/4/2014) attests that land in Ikwerre is deeply revered and it is owned by all the members of the community or family groups, including the ancestors and the unborn generation. It is the foundation, and symbol of continuity of community life.

He further states that land defines the customary relationships among the individuals, groups and society concerning rights and duties in its use. In Ikwerre, land is tenured and inherited. Land is communal and its usage and inheritance is regulated by the oldest man (*nyenwe-eli*) in the community. It is regarded as being transferred from one generation to another by the ancestors. It is a system that ensures that every family unit has land in one form or another, while the whole community or ethnic group defend collectively the boundary of their land. Writing on the economy of Africa, Rodney (1973), notes those centuries before contact with Europeans, agriculture was the dormant activity in Africa. That Africans observe the peculiarities of their environment and found techniques for dealing with it. They were involved in farming, hunting, and fishing among others. These various forms of economic activities were geared towards their livelihood. The Ikwerre like other Africans engaged in the mentioned agricultural activities and simple implements such as cutlass *(amanko),* hoes *(esa),* and sharpened stick *(mbazi)* were used for purposes of carrying out these activities.

Farming was basically subsistence as the family depended on the farm produce for food and the left over was sold to make some financial gains. Little wonder Ake (1981:1), agrees that the most fundamental need of man is the economic need. Man must eat before he can do anything else. He needs to survive before he can worship, pursue culture or achieve whatever he can. However, farming system has evolved from the period of gathering to the present stage of modern farming with improved technology in agriculture. This modern technology which includes the use of tractors, sprinklers, seed planters, fertilizers would increase the amount of agricultural produce, ease stress for the farmer and boost man's life expectancy. However, the Ikwerre are predominantly farmers, an activity carried out by males and females. Nevertheless, the task of farming is not made any easier with farm implements such as matches (*amanko)* and hoes (*esa)* used in tilling the farmland for farming.

Other farm implements are sharpened sticks (*mbazi),* local basket *(ekperi)* used to convey seedlings and farm produce, calabash or earthen pots (*ndudurisa)* used to store drinking water. Consequently, with the advancement in modern agricultural technology in production, these farm implements used for indigenous farming can hardly provide much in the ever-increasing population. What this mean is that the Ikwerre farmers would need to access the modern tools needed to be successful in crop management products, fertilizers, post-harvest losses, improved

seedlings, as well as access to information and extension services. Through these media and much greater investment in agriculture the Ikwerre farmers can move towards sustainable economy.

1.3 The Ikwerre Indigenous Farming System

The farming season is from October to January. Before this, the elders perform certain rituals to the earth goddess (*eli*) where a goat is sacrificed (*ewuovuuzor)* to the earth goddess and the blood sprinkled on the farmland to ensure productive farming, protection of their crops against drought, flood, pests and crop diseases and guidance of the farmers to live to the harvest time (Ndidi Gbule and Sam Eke, oral interview, 12/3/2015). With the sacrifices completed, and portions of land shared, individual families were now free to clear their portions of land, and prepare the land for cultivation. The Ikwerre engage in bush fallow system which allows for 7-10years fallow before re-cultivation in order to restore the fertility of the soil. This long period of fallow was feasible during the pre-colonial times because the Ikwerre population was relatively few.

However, this practice is hardly obtainable in contemporary times because of the increase in population and government acquisition of land for development purposes. Also, the discovery of crude oil in commercial quantity has even undermined the land as a result; much of the land has been acquired by multinationals, individuals, as well as other organizations for development projects. So, the quest for land is very critical. The other practice of farming is mixed cropping also known as intercropping. This allows the farmer to grow two or more crops simultaneously on the same portion of land. For instance, cassava is planted- in-between yams. The yams are usually harvested first and cassava harvested later (Wahua, 1993:134, Chinda, 2015). This practice maintains soil fertility, creates biodiversity which attracts a variety of beneficial and predatory insects to minimize pests, control diseases, erosion, and suppress weed growth.

It maximizes the use of labour, supply of balanced and varied nutritional proteins, carbohydrates and vitamins. It reduces the risks associated with single crop failure. Central to this, is that Ikwerre farmers start farming after the first rains because, it enables the soil absorb enough water to support crop growth. Several crops such as, yam *(Iji)* cocoyam (*ede),* cassava (*mblaka/odongoro),* maize (*ikpa),* vegetable (*okwukwowiri),* pepper *(isewere),* three leave yam (*ona),* amongst others are cultivated by the Ikwerre and the crops are in varieties. Yam is regarded as the king of the crops and the male occupation because it is tedious and more strenuous so women are less likely to engage in the laborious planting of yam. Yam has many varieties and they differ in size, appearance and flavour.

The species of yam are the white yam (*Dioscorearotundata)*, yellow yam (*D, cayenesis*), the water yam (*D. alata*) and trifoliate yam (*D. dumetorum*). The most dominant is the *D. rotundata* with about ten district ecotypes which in order of importance are *jiaga*, *(ogbologbo), awhuwanyi, abu, egampurisi, wada–Ocha, wongolobi, okwuaragbo, ogoja, akpaya*and*ekipikiti, ijiagwu*and*ijiwodogora. Ijiabi* is used for sacrifices in the case of any misfortune (Wahua 1993: 124; Chinda, 2006: 29). The men cut the sticks and stake the yam tendrils while the women and children cultivate others crops such as cassava, okro, maize and so on (Gbule, 2014. Chinda 2015). Yam mature between eight and ten months and are ready for harvest. The men harvest the yam tubers but it is the responsibility of the women and children to clean wash and carry the tubers with their basket *(ekperi)* to the barns *(obha)* where the men stake the yam. The *obha* could be at home and at the farmland. The *obha* is made of cut straight sticks sunk firmly into the ground, and bamboos crossed in horizontal position and tied together with (*eririapara/ ejijere*) rope from the raffia palm. They are producedin racks where the yams could be stored. On each stake, about twenty to thirty tubers are tied. The ones at home are majorly for eating and sales while the yams (Plate 1) at the farm are for re-cropping.

Plate 1: Yam barn – *obha.* Source: Chinda (2016)

The tedium, in farming drives the narrative for more farm hands. This explains why most men marry more than one wife in other to have more children to help on the farm. There is also assistance from

extended family members, in-laws; age-group. *Ngweta* was a source of labour supply in which the members agree to work on one another's farm land in alternate days with no financial benefit. This practice ensured the continuity of kin group. Also, o*gbaebheerhu* - client-age was another source of labour in which debtors pledge labour service, usually farm work for their creditors until such time when they defrayed the debt. Younger ones could also voluntarily work for elders all these contribute to the traditional Ikwerre economy. Work force also comes from hired labour as well as slaves. All these are geared towards making farm work less stressful. Regrettably, the roads to the farms are not motorable and the distance from the farm makes it difficult to transport produce to the point of sale. This has led to loss of farm produce since there are no adequate storage facilities and it has seriously impacted on the economic lives of the farmers.

1.4 Science, Technology and Indigenous Farming

Undoubtedly, access to new and modern agricultural equipment enhance steady improvement in living conditions of the people. This is because agriculture does not only provide our nourishment for our daily intake but also serves as a source of income for the farmers. Our forebears began in the early times by tilling the ground and establishing food crops and grain as a main source of food. Thus, they have already engaged in some form of agricultural technology used in planting, collecting or even gathering. Though these were simple, they served the purpose for the period until modern centuries. It is important to state that most industrialized nations of the world today, began with the improvement in agricultural revolution in their crop production, by inventing their first hoes.

Later, the creation of machines enabled farmers to work larger fields with less people/labour and in shorter amount of time. The use of machines by farmers is called mechanization. Machines are of different types and can be used to clear and prepare the land, to plant crops, apply fertilizers, and to harvest, handle, and process crops. It can be helpful in deep, flat, and loamy soils, and more useful in savanna regions for such crops as maize and guinea corn. On the other hand, machines can disturb the physical structure of the soil (*African Encyclopaedia*, 1974: 504). Equipment such as tractors can pull or push other machines. As Kumar (2018), posits tractors are used for clearing the land- pushing up bushes by the roots, tearing out hedges, pulling stumps, grubbing, pulling stones, preparing seed bed and seeding, harvesting, ditch digging, manure spreading among others. He further states that good ploughing retains moisture in the soil until the growing crop can make good use of it.

Apart from that, other equipment includes; Sprayers- they are implements or vehicles used to apply liquid crop chemicals, most often herbicides, and increasingly, fertilizers. Planters also called seed drill or distributors open a seed trench, meter seeds one-at-a-time, drop seeds into the see trench, gently cover the seed- sow seeds at regular intervals in rows and at the same dept. They can also be equipped to apply liquid fertilizers, pesticides, and herbicides during planting. Spreaders- are implements or vehicles used to apply dry crop chemicals, most often fertilizers. They can be mounted on a tractor, pulled by a tractor, self-propelled or mounted on air planes. Tool bars are implements that can use a range of soil, engaging tools typically mounted to a long steel bar of rectangular cross-section. A tool bar equipped with a set of uniformly spaced steel discs can be used to create trenches in the soil into which liquid fertilizer can be applied or gaseous fertilizers (anhydrous ammonia) can be injected (Kumar, 2018). Mowers- reciprocating or rotary is useful in cutting vegetation. Cultivator machines are used to loosen weeds, make ridges, or break up the soil where necessary. With the development of facilities in modern technology, farmers are now using different tractors, grain harvesting machines, gigantic sprinkler systems among others for the purpose of farming.

Different types of hybrid seeds and fertilizers are now available for maximizing production. It is no gain saying that these technological advances have been of great benefit to farmers. Beyond this, Kumar (2018) argues that in underdeveloped countries, per acre yield is low because the farmers are not using the machines and technology in the agricultural operation. He opines that the use of machines like tractor and bulldozers will enable the farmers to bring more areas under cultivation. Those acres of land can be cultivated with tractor in few hours. The use of machinery increases the efficiency of the workers and raises the output per worker. He further noted that mechanization facilitates the multiple cropping and greater intensity of existing land.

Cooker *et al* (2015), agrees with Kumar (2018), as he avers that the problem of achieving sustainable food production in Africa is partially hinged on her mode of production. Cooker further notes that most of Africa still largely adopts the traditional self-sustaining agricultural production with very insignificant number of farmers adopting the modern scientific and technological equipment. With regard to associated challenges and improvement in agricultural technology, the Second National Development Plan (1970-1974) in Nigeria had stated that:

"No realistic change can be expected from the present nature of Nigerian agriculture, due to the drudgery attached to it, until the farmer finds an alternative to the hoe and cutlass technique of production. Unfortunately, there has not been any significant change in this regard. This is because tractors, harvesters and the other sophisticated, though efficient equipment, that could otherwise be used, are either too costly to acquire or too complex for farmers to use and maintain".

Thus, the preparation of land for farming and the various post-planting operations are all processes in which the farmer's present tools can do little for high productivity per acre (Yiljep *et-al*, 1995, in Asoegwu *et-al.,* 2018). Consequently, the UN's International Fund for Agricultural Development (IFAD) notes that at least 80% of the country's food is being produced by small-scale and subsistence farmers, who struggle to increase production. Most live in poverty and do not have the finances to improve farming yields through mechanisation. As a result, they are forced to cultivate the land by hand and battle to move beyond subsistence. As it were, on August 30, 2013, the Minister of Agriculture and Rural Development, Dr Akinwumi Adesina, decried the low level of mechanisation as a major set-back for the attainment of food security in the country, and called for an improvement on the issue.

He noted that the National Centre for Agricultural Mechanization (NCAM), an agency under the Ministry, has the mandate of accelerating the pace of mechanisation in the agricultural sector of the economy, in order to increase the quantity and quality of agricultural products in Nigeria. Earlier in 1982, the United Nations Industrial Development Organization (UNIDO) regional consultation meeting on agricultural machinery industry in Africa, held in Ethiopia agreed that agricultural mechanization in Africa should be based on machines and equipment, designed and manufactured within the region, especially for African farms and farmers (UNIDO, 1982, in Asoegwu *et al.*, 2018).

Interestingly, the first made in Nigeria mini tricycle tractor for small scale farmers has been developed by an automobile designer Olufemi Odeleye of Bespoke Design Concepts Ltd to whom a registered patent was issued in the year 2007 by NOTAP in collaboration with the National Centre for Agricultural Mechanization (NCAM), Ilorin, Kwara State of Nigeria. Odigboh (1988) in Asoegwu, e*t-al* (2018), states that there are other simple farm equipment, designed and fabricated by various Universities, Polytechnics, Research Institutes, Private Individuals and other organizations that have been found to be quite suitable for Nigerian farmers and could be mass-produced locally. In as much as these developments are laudable, the apparent challenge has been how the Ikwerre farmers would be able to access these modern technologies that would improve their farming system and reduce the tedious nature and stress associated with the indigenous system of farming. This is because gone are the days when subsistence farming would provide for all members of the family and the remnant sold.

Plate 2: First Nigerian mini tractor with its matching implement. Source: http://www.nigerianeye.com/2016/05/the-first-made-in-nigeriatractor-for.html.

1.5 Challenges

A number of challenges facing the indigenous farming system in Ikwerre also stem from the fact that in time past and presently Ikwerre farmers still prepare their farms and or clear their farms with cutlass-*amanko,* hoes-*esa* and wooden sticks-*mbasi.* Also, farm work is still carried out by the knowledge and experience that had been passed onto them from previous generations. Apart from this, the Ikwerre farmer is encapsulated with traditions and limited portion of land. Land is communally owned and only shared to individuals at the commencement of farming season. According to Onu (2018:65), each compound (*Rumundah*) appears before their ancestors through the compound head (*Nyevu-oro*), who also is the custodian of the ancestral cult (*Rukani*). They offer, usually on *Nmakara* day, a goat or fowl, four yams, native gin and palm wine to the ancestors to accord respect and honour for acquiring the farmland for them.

It is also the time to communally for the blessings and protections of the ancestors in the farming year. The allocation of farming plots to individuals is based on leadership and seniority. Again, government policies that is not favourable to the improvement of indigenous farming. Other challenges that the Ikwerre farmers face include; inadequate provision of mechanized farming

equipment by government and farmers lack the required modern technology such as tractors which can facilitate the adoption of automated farming and improve efficiency at large. Most of these farmers are not literate and barely understand the basics of modern agriculture. Not-with-standing, these farmers are willing to tap into modern agriculture practice; however, they are frustrated due to lack of access to financial services.

Here, Elder Gershon & Mrs Gladys Opara (1/4/2015) queried how they would be able to adapt to using the modern technology that they cannot afford to purchase. Another problem is that the farming workforce is ageing, and the government has failed to excite young people with the prospect of farming as a career. Most prefer to head for the cities in the hope of getting rich quick. Farming seem to become a vocation for people with nothing else to do. The Nigerian government has not helped issues due to her excess concentration on the oil sector at the expense of agriculture. It is worth mentioning that these challenges are not limited to Ikwerre farmers only but to African indigenous farmers at large. Therefore, organized conferences and seminars, and position papers have been reached on how to improve the indigenous farming by gaining access into advanced system of farming offered by improved technology. The Ikwerre farmers are yet to substantially benefit from these as it will no doubt enhance their farming and food production.

1.6 Conclusion and Recommendations

The study has demonstrated that the role of science and technology in the improvement of indigenous farming cannot be glossed over. It also identified some challenges and efforts that should be made at curbing such challenges. With regard to this, the use of modern agricultural technology-based tools should be urgently and vigorously pursued by government and all in the field of indigenous farming with a view to establishing an improved agricultural produce that would effectively support economic development in Nigeria. In addition, it would be expedient for the Ikwerre indigenous farming system to be improved upon by gaining access into advanced modern system of farming offered by improved technology.

This portends that with advances in mechanization; farmers can more efficiently tend to their crops and produce more with less man power. Of note, however, is that government policies to invest in improved agricultural infrastructure such as roads, bridges, ports, and railways is also essential for farmers to be successful and for private sector investment. Communities, local governments, and government should invest in agriculture. Following these, further recommendations are made. These include:

i. On the part of government, there is the need for the development, promotion and adoption of improved indigenous technologies that are suitable to our farming system. The technologies have to be efficient and affordable to the generality of farmers. Again, government should encourage and support manufacturers in the mass production of equipment needed in these areas. Not only will this facilitate agricultural production, it will also raise the standards of agriculture and encourage many youths into agriculture as it is a potential source of economic prosperity.

ii. Public and private sector partnership is fundamental to improve farming system, as this would enable Farmers access financial services and facilitate working relationship with farmers and organizations. Farmers should make themselves available to information on modern technology and should be involved in development, implementation and advocacy with regards to farming technology.

iii. Also important is that Research Institutions should facilitate research on improvement on farming, organize professional training schemes to enlighten farmers on the basics of farming and how modern technology can be adopted in enriching their agricultural produces. Equally important is the strengthening of the extension services and encouragement for the formation of farmer groups as well as the feedback on progress achieved, share information on activities, with a view towards enhancing farm produce.

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