THE BIOTECHNOLOGY OF HORTICULTURE IN NIGERIA: A FUNDAMENTAL APPROACH TO POVERTY ALLEVIATION AND FOOD SECURITY.

BEING

A KEYNOTE PAPER BY

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PROTOCOL

Its gives me a great pleasure and privilege to give the Keynote Speech at this epoch making Event-The 36th Annual Conference of the Horticultural Society of Nigeria with the Theme: "**Horticulture for Improved Food Security, Sustainable Environment and National Economic Growth"** . This theme of course is very apt at this time when Nigeria is taking measures to diversify her economy-moving away from the oil-based(mono-economy) economy to non-oil based with Mineral resources and Agriculture being on the top list of Mr. President. As laudable as diversification of the economy into Agriculture seems, let me also remind you that the challenges of today's world have brought many pressures to bear on agriculture: population growth, insects and pests infestation of crops, weed invasiveness, soil infertility, salinity, the impact of climate change (drought and rise in temperature), the need to reduce greenhouse gas emissions, water and energy shortages. This scenario heightens the critical role of innovation to make agriculture a business, more competitive and sustainable. The world's population is estimated to be at about 9.7 billion by 2050 and Nigeria is estimated to be 389 million by 2050. Our agricultural productivity at the moment is 1%. This cuts across all crops including Horticultural crops. If agricultural yields stay the same, we would need to

cultivate more than double the present amount of land to feed that population. That's 82% of our total land area on earth.

Horticulture is the science and arts of growing fruits, vegetables, flowers or ornamental plants. The challenges of keeping horticultural production at pace with the escalating population is becoming a concern in Nigeria and the world at large. For example, Mohandas (2018) has reported a proportional increase in the requirement of fruits and vegetables due to the increasing population in Nigeria. Despite the considerable progress made by conventional plant breeding techniques in the development of improved varieties, they are not sufficient to keep pace with the increasing demand for vegetables and fruits in developing countries. Therefore, the need to integrate modern technologies like biotechnology to speed up crop improvement programs is pressing (Mohandas, 2018). The Technology Information Forecasting and Assessment Council (TIFAC) (2018) has defined Biotechnology as any technique that uses live organisms viz. yeast, viruses, bacteria, fungi, animal cells, plant cells etc. to make or modify products, improve plants or animals or engineer micro-organisms for specific uses.

Modern biotechnology holds considerable promise that can meet the challenges in horticulture (TIFAC, 2018) and transform the entire crop improvement programmes by reducing the use of pesticides and chemical fertilizers, new strains of plants and supply of planting material (Mohandas, 2018). In developed countries, many genetically modified fruits and vegetables are already in the market (Mohandas, 2018). Major biotechnological areas which can be adopted for development of horticultural crops are: Tissue Culture, Genetic Engineering, Molecular diagnostics and Molecular markers, Gene editing, Gene splicing etc.

Okunlola *et al.* (2016) has reported that horticulture is not formally recognized or promoted as a feasible means of improving urban green space, aesthetics or increasing employment opportunities of urban agriculturalists (Okunlola *et al.*, 2016). The neglect of environmental beautification planning across the nation, which, many ornamental plants can inherently be utilized, has resulted in continuous environmental degradation which could be attributed to population pressure (Okunlola *et al.*, 2016). This Keynote paper therefore seeks to review how the application of biotechnology in horticulture can lead to national development in Nigeria.

The Link between Biotechnology, Horticulture, Food Security and Poverty Alleviation

Poverty is the principal cause of hunger (World Hunger Education Service, 2013) and a major problem in many developing countries in the world, including Nigeria. It has been described as a vicious cycle, causing hunger and malnutrition. The roots of poverty have been linked to food insecurity, adverse development of international schemes, world economic recession

, foreign debt burden, and a series of economic reform (Okuneye, 2001). Friedman (2008) has projected that food issues may become as politically weakening after 2050 as energy issues are today in Nigeria. Currently, Nigeria is facing food crisis, with the population, especially the poor, having inadequate access to quality food (Akinyele, 2010). Sustainable agriculture is a fundamental way by which food insecurity can be addressed (Troeh and Donahue, 2003).

The International Society for Horticultural Science (ISHS) (2012), has reported that high-value horticultural crops can play a key-role in helping to feed the world with nutritionally healthy food. Horticulture, as part of the specialty crops, represents 50% of the farm-gate value of all crops produced in the US, and, unlike cotton, corn, rice, soybean, and other staple crops, they receive little government subsidy (Davies and Bowman, 2016). While staple cereal crops are needed for their starch and calories, they do not supply the vitamins and minerals found in fruits and vegetables (Davies and Bowman, 2016). There are opportunities for increased vegetables and fruits production and consumption to ensure a diet rich in vitamins and micronutrients (Bowman, 2013).

Then there is the economics of scale: a smallholder farmer can be commercially successful growing high-value horticulture crops under small acreage in rural, peri-urban or urban environments, while hectares are required to farm cereals commercially (Davies and Bowman, 2016). A greater emphasis is needed on high-value vegetables, fruits, and ornamental plants that create jobs and economic opportunities for rural communities, enable more profitable, intensive farming of small tracts of land in urban areas, and employ smallholder entrepreneurs, especially women (Davies, 2014; Konuma, 2013).

Fimer (2012) has underscored Nutrition, Food Security and sufficient family incomes as the major challenges in many parts of the world. Since hunger and malnutrition have been associated with poverty, availability of economic opportunities through horticultural production will not only help family incomes, but also address food security and nutrition (Filmer, 2012). Training women to produce and market horticultural crops in the developing world like can also help provide much-needed income stream for families with children (Filmer, 2012). The science of agricultural biotechnology has demonstrated the opportunity to reduce pesticide use and reduce soil erosion, thereby reducing cost of production (Herrera *et al.*, 2005). One of the few examples of biotechnology application in horticulture is the Flavr Savr™ tomato with increased shelf life (Sankula and Blumenthal, 2004).

The application of biotechnology for horticultural crop improvement has dawdled significantly behind when compared to agricultural biotechnology products despite the importance of horticultural market and the astounding success of biotechnology in most of the world. The tremendous market penetration numbers of 17 million farmers in 24 countries planting biotech crops in 189.8 million hectares of land reported by James (2017), From 1996 to 2016, economic gains of US$186.1 billion at the farm level were generated globally by biotech crops, due to reduced production costs and substantial yield gains. Biotech crops have reduced the amount of pesticides used by 670 million kilograms. In 2016 alone, fewer insecticide sprays reduced CO2 emissions by 27.1 billion kilograms, equivalent to taking 16.7 million cars off the road for a year. Runge and Ryan (2017), clearly showed that farmers have recognized the benefits of biotechnology. However, these benefits extends beyond value to agriculture.

The Impact of Biotechnology in Horticulture: Case study of developed countries

Twenty years ago, consumers only ate fruit that was "in season." Fruit was not shipped long distances and supply was dependent on local production areas. Demand for year-round, inexpensive produce has led to consolidation of production where temperatures are warm, sunshine is plentiful, and labor is cheap. In most cases, produce is now shipped long distances before being consumed. Tomatoes grown in Mexico are trucked 3,500 miles, bananas grown in Ecuador travel 6,000 miles on a boat, bell peppers from Holland greenhouses are flown 5,000 miles to market. Unfortunately, fruit was not designed to be shipped long distances. In order to make it to market, fruit was picked before it was ripe (and before it has any taste). Despite harvesting immature fruits, post-harvest losses of fruits and vegetables still exceed 25 percent of crop production and the fruit that makes it to market has often been described as tasteless.

Factors Militating against the Progress of Horticultural Biotechnology in Nigeria

Though horticultural crops are of high economic importance, each crop represents only a small segment of a market that consists of hundreds of cultivars representing many different species (Robert *et al*., 2006). In comparison to large acreage field crops like maize and soybean, horticultural crops have limited investment in research for biotech improvements due to their lower economic value (Alston, 2004). While several traits are still untapped due to the lack of effective technology, proven technology exists to develop biotechnology-enhanced products that would have real producer and consumer value. However, the cost to develop a regulatory petition and commercial launch delays are particularly difficult for those trying to develop specialty crops due to smaller market size (Robert *et al*., 2006). Thus, the high cost of biotechnology (Alston, 2004) coupled with limited market returns for individual crops make investing in horticulture biotechnology a more difficult business decision (Robert *et al*., 2006).

The way forward

It is evident that horticultural biotechnology must be adopted if food security and poverty alleviation must be attained in Nigeria. The Government of Nigeria should therefore advance the horticultural sector through consistent policy making and implementation, holistic adaptation strategy and proper funding.
I am hitherto, excited that Horticultural Society is a formidable platform for dialogue on the transformation of Horticulture in Nigeria through quality information dissemination on Horticulture. It is therefore, imperative to let the stakeholders here to learn about the use biotechnology to transform horticultural science. Nigeria cannot be left out in this arena. She needs to use biotechnology to create wealth/jobs, eradicate poverty, improve agricultural productivity and crop yields, and enhance foreign exchange earning potentials.

Agricultural research institutes therefore have an obligation to address forecasted growth in food demand and the need to provide a sustainable, safe and secure food supply for the nation and to assist in creating viable and sustainable agro-food sectors. It is essential that we come to terms with the fact that modern agricultural innovations are part of the solution rather than the problem. This is why public investment in modern agricultural research and innovation is so important. Joint programming Initiatives, and Innovation partnerships, will be instrumental in achieving a better coordination of these efforts.

State Government also need to recognize the need to support all agricultural research institutes and discourage politicizing implementation of agricultural projects. Our efforts to ensure that Agriculture ceases from being treated as a development programme but as the country's business and the only means of survival is one we are not relenting on.

Conclusions

Increased production of horticultural crops provides the opportunity to reduce malnourishment, hunger, and poverty. It also generates employment and niche market opportunities for smallholder farmers on small acreage. In contrast to field crops (e.g., corn, wheat, rice, sorghum), which require larger land availability for economies of scale, horticulture can be profitable under reduced acreage.

Finally, Distinguished Ladies and Gentlemen, the call for diversification of the Nigerian economy should not be seen as government's responsibility alone. We all have a stake in it and must all cooperate and collaborate with the Federal Government and relevant agencies both public and private to make our diversification into agriculture smooth and easy. OFAB Nigeria is also ready to partner with the Society in the area of awareness creation.I stand in favor of using

seeds and products that have a proven track record, special case needs to be made for those who are skeptical. There is a big gap between what the facts are and what the perceptions are. As I look around here this morning, with the impressive array of stakeholders especially eminent scientists, journalists, industrialists, farmers etc, I leave you with one message: biotechnology remains a verified engine of growth!

Wishing you have a successful Conference!!!!!!!

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