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Agricultural Science and Technology Research to Support Food Security

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Abstract
This paper review machinery and equipment developed for the future farmers. The purpose is to expose students and lecturers to the level of education required to produce higher quality crops to feed the growing population. The study significantly encourages the adoption of urban farming as a way of using technology to produce more food by city dwellers. The paper recognized the activities of smallholder farmers who are the main food producers of Nigeria and absence of large scale farmers who are raw materials producers for factories. The paper placed emphasis on the role of modern technology in increasing farm product by small scale farmers and the benefit from the innovations that will enabled farmers solve some of the world's biggest challenges. The introduction of aeroponics for the production of healthy yam seeds and the use of mobile technology and social media for farming purposes prove technology as a welcome tool that students must understand to apply. The potential impact of this work is in the awareness it will create for the youth who are future farmers that farming can be made easy and profitable if technology is applied. This paper concluded that food security of the future can be sustained if agricultural scientist embraces and teach the farmers the right technology at the right environment to solve the world food need.

Keywords: aeroponic, education, food insecurity, technology, world food

INTRODUCTION

Food security can be defined as access by all people at all times to safe, nutritious and affordable food for active healthy and productive life (Agbetoye, 2016). This means teaching and educating the society of the need for adequate food production, better postharvest system, availability of money by households and individuals.

Challenges to Food Security

Challenges faced to meet food security includes under nutrition and overconsumption, rising food prices, population growth, threat to agricultural production, rapid diet transitions, inefficient production practices and climate change.

Food insecurity afflicts communities throughout the world and this affects human health and welfare, as well as economic and political stability of nations (Samuel, 2013).

Food and Population

The global population is currently about 7.3 billion. The United Nations (UN) estimated that by 2050 the number will grow to 9.7 billion, and by 2100, 11.2 billion people will be on the Earth's surface (Becker, 2015). How will the estimated 2.4 billion extra people feed (Connor, 2011)? The need to grow more food four times of what the world produces in the past 8,000 years is here with us. One consideration by the scientist in nutritional area is feeding on small amount of food that can give all nutrients (CNN, 2016) or the use of tools and agronomic practices to produce more food with fewer inputs. Children and youth do not know how farms look like any more, Agricultural science teachers have a lot of work to do in schools without land for agricultural practice. They are established in the cities and more people will be living in the urban areas this will be more by 2050. The need to know how to farm and adapt to climate change and increasing weather volatility is here demanding new adaptions.

Agricultural Science and Education

Agriculture science experts are searching for solutions and teachers of Agriculture are seeking the new science to teach the students in order to overcome food security challenges. The students want science and technology information to transformation Agriculture.

Limitations of the work: National research centres are not well funded to prepare students and teachers for this future and the transformation. The views of the authors are limited.

Statement of the Problem

Agricultural engineers were able to solve many problems concerning farm power and machinery in the last century, the introduction and use of irrigation facilities as well as the storage and processing of agricultural products. The tractors were introduced, high-yielding varieties of crops were adopted, and the use of infrastructure help doubled food production. If farmers adopts these technologies as done in the past, will this result increased profitably and incomes? Are these still the key to long-term food security? The

objective of this paper is to find out technological approach to teach and explain the new development in Agricultural science.

METHODOLOGY

To find answers to these questions, a visit was made to International Institute of Tropical Agriculture Ibadan (IITA). Literatures on scientific knowledge for the transformation of African Agriculture were examined. The role of technologist and devices with more accurate measurement were examined, interviews were conducted using one to one approach.

RESULT

The visit made the authors to appreciate the biological functions and the study of climatic changes. Bioinformatics facilitating biological research with improving ability to accurately manipulate and visualize data. The food production and accessibility benefits applied, the emerging technologies such as high-pressure processing (HPP) that can increase shelf life of farm produce, and more recently technologies in used that can change the properties of foods, to give an improved and novel product.

Information and Communications Technology (ICT) in Farming

This was found focusing on the enhancement of agricultural and rural development through improved information processes. Innovative ways of using information and tele-communication technologies (IT) in a domain on agriculture. Mobile telephones have changed the way cassava farmers in rural areas do things at all levels. It has assisted the farm incomes and promotes better natural resource management.

Wireless Technologies

Wireless has simplified closed–circle television camera systems. The use of wireless communications has eliminated the need for the installation of coaxial cables. The use of the Global Positioning System (GPS) provides benefits in fencing map-making and survey. With the use of GPS, famers can produce simple yet highly accurate digitized map without the help of a professional. Geographic information systems (GIS) are extensively in use especially in precision farming, data such as topography and contours are combined with other statistical data for easier analysis of the soil. GIS is used in decision making such as what to plant and where to plant using historical data and sampling. Computer-controlled devices (automated systems) are systems that can milk the dairy cattle without human labour. It eliminates the supervision of the farm. Data gathered by the computer can assist the farmer by analysing the effect of various yield. Each cow may be tracked and examined, and the farmer may be alerted when there are unusual changes that could mean sickness or injuries. Mobile technology enable farmers to increase their yields by connecting them through text messages and help lines to agricultural market information, best practices, and extension services designed to meet their localized needs. Use of Mobile technologies as a tool of intervention in agriculture is increasingly popular. Reach of smart phone even in rural areas extended the ICT services beyond simple voice or text messages. The digital technology offers every farmer the advantages of access to the information. It is an innovative way of spreading knowledge, paired with continued support for research (Nelson et al., 2011).

Food Technology

One of the main contributions of food technologists in the 20th century has been to give the whole processing industry a solid scientific basis, leading to new approaches. An equipment known as Ultra-high pressure hydrostatic processing can improve the quality of product at pressures of 50,000 to 120,000 PSI, vegetative cells of spoilage organisms and pathogens can be destroyed with very little heating of the product. This process can also be extended to heat-sensitive fruits and vegetables. Future applications are likely to include liquid and semi-solid food products, for which rigid texture is a less important attribute and little or no heat for processing is desirable. Others are Ohmic processing, High-intensity light pulses, High electric field pulses, Radio-frequency (RF) heating and Microwave processing. Controlled atmosphere storage and preservation of packaged food products is a widely utilized technology for fresh foods, prepared foods and baked products.

Hybridization

The science of optimizing a plant's genetic makeup to produce desired characteristics, used to develop high-yielding seeds since the early 1900s. Plant breeders' uses agricultural biotechnology as another source of genetic variation to produce superior crops with improved yields, while requiring fewer inputs. These tools enable farmers to produce more crops with less land. The technology help in the development of vitamin A cassava varieties through bio-fortification that is higher in beta carotene, which the body converts to vitamin A, protein, and iron.

Agricultural Mechanization

Beyond improved seeds and crop protection tools, other technologies enable farmers to increase their productivity. Over the years, irrigated land has proven to be twice as productive as rain fed farmland. This will be particularly important in the coming decades given that an estimated 1.8 billion men and women will live in water scarce regions by 2025 (FAO, 2015). The driverless tractor is part of a move to increase automation in farming. Technologies

currently utilized in farming include automatic milking and automatic strawberry pickers. It operates without the presence of a human inside the tractor itself. The tractors have sensors to stop them if they detect objects in their path such as people, animals, vehicles or other large objects. Drones are a solid option for monitoring herds from overhead, tracking the quantity and activity level of animals on one's property. And they are especially helpful for night-time monitoring due to the human eye's inability thus far to evolve to the point of seeing in the dark. These are the current most-common uses we are seeing for drones in precision agriculture. The ability to inspect in-progress crops from on high with Normalized Difference Vegetative Index (NDVI) or near-infrared (NIR) sensors is, thus far possible by the use of drones in farming. A task that traditionally was done by often-reluctant staff walking fields with notepad in hand, drones like Sense Fly'S e Bee Ag now allow for coverage of more hectares, as well as the capturing of data that cannot be seen by the human eye (NDVI).

Aeroponics is a plant-cultivation technique in which the roots hang suspended in the air while nutrient solution is delivered to them in the form of a fine mist and IITA successfully use this technology in the production of yam seeds. Hydroponics is the process of growing plants in sand, gravel, or liquid, with added nutrients but without soil.

Technology that can enable farmers to preserve foods longer, improving food safety will help in securing the food of future. However, through natural and bio-based ingredients, such as enzymes, cultures, plant extracts, and new preservation techniques, farmers can reduce food wastage and spoilage significantly in regions without adequate storage and processing facilities, as well as extend the shelf life of food wasted in the industrialized world.

IITA BIP and Technological Trade

It provides incentives and opportunities for the accelerated commercial development of proven and profitable technologies, in particular those developed within IITA or jointly with collaborators, along the entire agricultural value chain. IITA BIP businesses are relating to seed breeding, aflatoxin bio-control, legume inoculants and agri-services consulting.

The Agripreneurs are promoting agriculture among young people in the through peer education, training, and demonstration on agricultural technology and best practices. All over Africa, many young people are migrating to cities in search of business opportunities, leaving behind an increasingly ageing population. The challenge is to create business opportunities for productive activity in agriculture and non-farm enterprises, for increased food security. We now have access to varieties of nutritious farm products at a very cheap rate but also for combating youth unemployment.

The goal of the BIP aflasafe plant and laboratories are to develop cheaper, more effective formulations and manufacturing methods for a product which is combating the deadly aflatoxins found in major staple crops in Africa.

NoduMax is a legume inoculants for soybean that technology was developed at IITA. Sufficient to inoculate 10 to 20 kg of soybean seeds and lead to increase in the yield up to 40%.

The heart of modern gari/High Quality Cassava Flour (HQCF) processing is another technology developed by IITA to reduce drudgery in the roasting or frying gari and in making HQCF. The Gari roasting component is made of stainless steel and insulated to absorb heat from the fire. It is powered by electric motor that rotates the paddles and continuously turns the mash. It reduces the drudgery and stress in gari production can attract unemployed graduates to gari and flour processing.

Technology and the Future

The basic technology of agricultural machines has changed with the introduction of electronic devises called modules through the last century. With modern transportation, consumers at any location will consume fresh farm product from Africa within the same day.

Cooling facilities are used by farmers to deliver perishable crops and keep them fresh.

Genetically produced plants like potatoes, can resist diseases and pests, which rewards the farmer with good yields and saves them time. These crops grow very fast, they produce healthy yields. They are resistant to most diseases and pests, the farmer will spend less money on pesticides, which in return increases on their return on investment.

Development of animal feeds has solved the problem of hunting for grass to feed animals, now these feeds can be manufactured and consumed by animals. The price of these feed is fair so that a low income farmer can afford them. Most of these manufactured animal feeds have extra nutrition which improves on the animal's health and the output of these animals will also increase.

Genetically produced animals will produce more milk or fur compared to normal animals. This benefits the farmer because their production will be high. Cross breeding is very good in animal and is productive. In dry areas like deserts, farmers have embraced technology to irrigate their crops. Farmers use water pumps to collect water from river to their crops. Most

of these farmers grow rice which needs a lot of water, so they manage to grow this rice using irrigation methods enhanced by advanced technology. Advanced water sprinklers are being used to irrigate big farms and this helps the crops get enough water which is essential in their growth. Some farmers mix nutrients in this water, so also improves on the growth of these crops.

RECOMMENDATION

Technology to keep food edible after harvest such as dryers and crop stores, need more technological development in Africa. Hunger in Africa and malnutrition require the efforts of all stakeholders. If the world is to produce the amount of food necessary to feed more than 9 billion people in a way to meet nutritional needs with scarce resources in the face of global climate change, and still want to improve the livelihoods of farmers globally, then adoption of technological advancements is needed to achieve that goal. Africa must embrace collective innovation to achieve food and nutritional security. Investment in agricultural education is necessary to produce more food with fewer resources and less land and also minimized losses with all efforts and avoid food wastages at all cost.

CONCLUSION

Technology is the application of techniques to control the growth and harvesting of animal and vegetable products in Agriculture. It has changed the way humans operates machines, as computer monitors the systems, GPS locators, and self-steer programs allow the most advanced tractors and implements to be more precise and less wasteful in the use of fuel, seed, or fertilizer. Agriculture may be one of the oldest professions, but with the use of technology, there has been a dramatic drop in the number of people who can be described as farmers, instead of every person having to work to provide food for themselves, less than 2% of the American population today works in agriculture, yet that two percent provides considerably more food for the rest. Agricultural biotechnology has led to reductions in fossil fuel use, soil tillage, water runoff, and pesticides, all of which are critical to sustainable agriculture. Technology has a big role in developing the agricultural industry. Crops are grown now in deserts. Every farmer uses technology now in their own way, to market their products, and in production. No tool will be perfect, but technology in agriculture provides one of the best opportunities and it is address world food security very well for now.

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