RESEARCH PROJECT PROPOSAL

STUDENT NAME

RESEARCH AREA

PROJECT DURATION

PEOJECT TITLE

BIOTECHNOLOGY AND FOOD SECURITY IN AFRICA

# Keywords

# ABSTRACT

Biotechnology as a proponent in agricultural systems has been used to advance life changing economies in some of the states of Africa. Wheraes studys around this area emanate from the ealy periods of the 20th century, research scsinetots have continually gone agead to provide in depth analyses, findings and prcatises to farmers and nations on some of the best solutions to startvation and hunger pandemics across the globe. Since many of the traditional food retention mecannisms have been overcome with time, modern science is now shifting this attention to the more resitant and adaptative methods in the plant ecosystem. Litraure reviews around this area indicate several reaaecrh procudeures are currently underway with massive tests being done on plant orgganisms. Develping nations in Africa are still faced with rapid food shortages are in need of beetr scientific reaecrh tools and metrics atht will help them produce more and healthier food forgenerations to come.The challenge with most of the agriculturaly productive countries in Adica are the ever changinging werher and climatic conditions, mutating pesta and diseases and tlack of a ready market or preservation meachanisms for most of the food products these contries produce. This paper outlines that in order to precent itself from falling into the brink of hunger and starvation, post modern innovations areound adaptive smart agricultrural systems have to be imolemented.Hence therefore this paper establishes the link required to help African nations achive maximum food security using the different agricultural products that she produces.The datza obtained here are from secondary literature reviews and reports by diffenrt scglars and governmet finding.

INTRODUCTION

Of the 55states in Africa, only close to half have arable land that can produce agricultural products. A quarter of these states rely on animal farming whereas close to a third dominate fishing and marine life as their sourec of the livelihood. Consequently, a number of agricultural products prodiud=ced by these states are for human consulption and very less is exported or even ssent over to industrial factories for food processing and later reconsmption. Some of the major crops grown in Africa include vegetables, maize, rice ,potates and wheat, and the animals on the other hand reared in include cattles, sheep, pigs and chicken. However there are Africa countries that have been predominantly known to produce certain agricultural products, these countries are ginats at their own game, they produce more than they can consume and as a result they even export it to their neighbours. For instance, Kenya is produces tea and coffee in Large scale, some of the coffee is consumed localaaly under the mandate of the Kenyan Tea Development Agency (KTDA). Coffee is widely profuced in Ethiopia. West Aftica leads in the highest production of rice wgereas Nigeria, Egypt and South Africa lead in maize farming. Tanzania, Kenya and South Africa lead in the gighest production of animal products like milk, beef and skin.Countries along the coastal line like Morocco, Namibi, South Africa and Egypt lead in the production and farming of fish.According to the Food and Agriculture Organizsation (FAO), despite the tonnes of production of food by these dominant countries, Africa can barerely fill her granieries, leave alone store it for the future, actialluy, it is suprpising enough that African states still import food from other countries. The results of which if not handled, dimples these states into hunger and starvaetion.

Theer are avarious challenges that have forced these developing states not just to have enough for theur stores. They include ever-changing weather conditions with linadequete rainfall to favour crop production, frequent petsts and diseases that kill many if the animals and then finnaly inadequate mechanization to maximize on production of food from the crops and animals. It is in this regard therefore that the need for scinentific involvement in the production of food for Africa should be incroptared to help farmers maximize production. This can be achieved through Biotechnology.

Biotechnology

Biotechnology is defined as the application of the princles of biological science to the raw materials of biological origin. This may include gene mutation, propagation or total transformation. These changes are usually applied at cell level. Microbiologists, Biologists, Geneticians and Rasearch Scientits work hand in hand doin reasecrh everyday to establish the connections and improvements for the food industry across states. Biotech has been used over the years to build envornmentally stronger food crops and modify the nutriotional contents of certain food crops across nations. Most developing nations in Africa are currently not able to exploit the full potential and benefits of technology since they do not have enough tools and reaecrh scinetists to conduct local studyis on how they can improve their current agrivuktural products so these states rely on the reaesrch and studies done by other countries, some of which may not confirm to what these developing countries are actually going through so a lot of financial resources are laid to waste away.

Food Security

Background Study

According to FAO, naturally cultivated food is “weak” and tends not endure over a given period of time under certain conditions.The reason why this happens is due to a number of the below issues:

Most of the countries around the Sahel region experience very harsh climatic conditions with very little or no rainfall across the year.So instead iof crop farming, such regiosns have also shifted to animal oroduction wich does not seem to do well. This happens since inadequate raianfal around the Sahel region does not favour optimal vebegation growth and water points for pastroralists around these regions. A futher look at some of the soil conditions of the regios around Africa indicate that fertility has been overused by overoloughing certaijn lands until such lands lose their fertility levels and butrinets. On the contrary though, overuse if artifila fertilisers in the cultivation of certain crops like rice and maize have lead to such soils being dominated by certain levels of soil nutrient capacitoes, hindering the establishment and growth of other crops that could have potenstailly grown on such areas. Encraochement by forest fires across farming lands have also drained away the soil compnents such as soil turning organisms, superficial fertility and PH level consitensce. Small scale farmers who cannot afford to buy or prepare top dressing manure to reclaim such lands end up with no or limited soil producctity at all. In some regions pests and desaeses massively lower crop production both at small and large scale, during harvetst time, the yieile cannot contain a projection of a few yeaers ahead.

On the other hand, animal production across developing states in the continent has had its own share of pain as well. Some of the challenges to animal production have span across pests and diseass, inadeuwate or poor grazing lands and persistent droights across farm lands. Cuurently, barely can the patsotalsts and framers I production feed themselves let alone ecport whatever they have to other countires. Cases have risen where dailry products redueced in yield and the beef products were not sufficient enough for induttrial manufcaturng and canning. The same has happened to paultry, where the eggs produced by the birds were lightweight and nutrient defficent.

Population in most of the African cstates have been rising siginfivantly. Curently, Nigeria, Ethipoia, DR Congo, Egypt and South Africa are the leading their population statitsics, with Nigeria topping at a population number of 206 million persons. Majoiryt of the population in thes Africa countries are the youth between the ages of 18 and 35. Due to the higher rising numbers , developing states in Africa may not have enough food to feed these people and so as a result , hunger sets in.There have also been reported cases of hunger and starvation caused deaths in most of the developing states.

Another factor leading to the vurrent food insecuty in the developing Afriacan states is due un-implementaion of policies that can foster food security in these states. Well polocies might be there, but they are not well structured in a way that can help put up the right production mechanisms to facilitate the production andfeeding programs for these regions. Even currents that have got rich arable lands still strunggle with these. Most astounding is the fact that in countries that dominate masisve production of the agricultural products, corruption malparactice still curtail eficent production and storage of such. Indiculas are willing to cutail and hoard the locally produced products at the expense importing these porducts from other countries at the cost of the government funds, upon whoch they get their cuts.

In leaiu of these, there have been proposals by govenrmnet agencies across the African states to invest in research and development, nonotechnology and biotechnology as a key tool towards boosting food security in Africa. Most of the staple food consumed among African states include rice, wheat, maize, beef, eggs, chicken and milk. Currently consultations, partnerships and governimnet projects are shifting focus into Biotech scoence as one of the key prpropenents to establishings effiievnt production in the African food market.

This paper shall dischss in detail how African states and countries should use Biotechnolgy in the Agricultural sector t o ensure that the African states feed themselves for now and in the future.

**PROBLEM STATEMENT**

African as we know it, does not currently have anough food to feed her children.Most of the countries are ither at the brink of starvation, or are currently starving. The UNDP estimates that approximately 10 oout of the the 54 sttaes in Africa cannot complteley feed their citizines and as a sresult have to rely on donations from other NGOs , the United Nations Deevlopment Program UNDP AND THE United Nations High Commission for Refugees UNHCR. Majority who are affcetd are the war torn countries like Somalia, South Sudan, Chad, Northern Nigeria and some parts of Congo.This has led to anumber of refugees currently fleeing and leaving their countirs to search for fresh food and water and peace in neigghbouring states, but the bigger elephant in the room remains hunger and starvation, especially from their children and women and the old generations tagging along. The greater prpblem remaning the inability of the Afrcan sattes beung unable to produce heakthy, sufficient food for her continent, both for the current and future generattions. Since its inceptions , African developemnet Bank AFDB program together with its counterpart, the United Nations Science and Cultural Organization has tried to patner with these African states to develop reaerch centetrs across the development nations in order to train , engage , innovate and research oncurrent problem solutions to the food crisis in their specific countries so as to be able t o produce agriculturally and diet viable food for the continent.The patner orgainsations have managed to come in to fund some of these projects by either givng loans or grants to the individual states so as to achieve this mandate. Some of the specific reaerch areas along this field include:

Soil fertility study and appraisal.Research has gone into the specific identification of the cuurent and future soils states, how to improve the soild composition, and nutrient content, over alonger period of time so as to support farmers tyrimng to grow a scertain crop within their states. Reasecth sceintists haeve spent days and nights trying to come up with soultions on the soil viabity for rice farmers in Nigeria and South Africa, maize production in Kenya and Nigeria and banana cultivation in Somali and Uganda.

Biotechnoligy scientists are also lstudiny plant cell compositions, DNA strands and genome viability.The primary goal here include the potential ability of having to modfy plant cell DNA and genome status so as to develop a match stronger species. Examples under this catergory have been witnessed in Esaterm Kenya, where theer was development of the ‘katumani’ maize species that was drought resistant and matured within a very short period of time regardless of the harsh wether and climatic conditions of the regions.

Further highliggting , there is need to address the following reaerch questions that arise from the problem statement dsisvusess above and they are:

1. What is the the current connection between Food security and Biotechnolgy in Africa?
2. What measure are the African States currently taking to acahive sutatinable food security in Africa for the current and future geneartions?
3. How can Bitechenolgyy be used to achive food security in the African States?
4. What are some of the limitations of Bitechnology as a psoosible solution to food security in Africa?
5. Where does Bitechnology stand as a science of the future in improving food security in Africa?

As a result of this research, governnet states, organisatikns and sceinetists will be able to provide possible solutions to their current member states on how they can utilize Biotech to acheieve food security among themselves.

**PROJECT AIMS AND OBJECTIVES**

From the above reraeerch questions that have arisen, we can therefore formulate the following project aims and objectives:

The project aims to achieve the following:

1. To establish the connection between food security and biotechnology
2. To establish current processes being undertaken to achieve food security in Africa
3. To establish how biotechnology can be used to achieve sustainable agricultaraual production
4. To determine the limitations of Biotechnology as a psosble soltions to Food secuiut in Africa
5. To determine the future stance of Biotechnology in food production in Africa

**Preliminary Literature Review**

According to Tonukar et al (2010), research has already started spanning out among Biophramaceutical industries, Biochemicla engineers and Biologists in bid to unravel the food insecuiry status in Africa.Their studies also show that despite the upcoming support and numerous inovationns that have been dicovred across the continent, there is still very little to show for this work and as a sresult, the African states are still languishing in hunger and starvation occasioned by poor crop and animal yields. Further research by Abah et al (2010) indicate that the African population has benn increasing evry year yet the amount of Arable land is still the same, as a sreult, many of the Africans states can no longer feed their people, morevover, most of the African states are yet to reap the benefits of the currently ongoing biotechnology reaech and innovations being enjoyed by developed nations or in their own developing states. However, as the use in plant biotechnology rises, African states are yet to recognize that there cluld be harmful effects predisposed by the use of and modicfication of plant metablims, genome structure and biolchmestry, these could also affect the ecological stance of the plant l=envirinent as highlighted by Sawicka et al (2020).

Seid et al (2021), there is need to address climatic changes in line with Bitotechnolgy Engineering and Bitechbolgy modifications. Bitechnolgy Engineering will focus on the reaerch scientist coming up with new solutions to green Biotechnology that go against averse climate changes across the African continent. Biotechnological modifications change the current plant DNA codes to adapatave climatic conditions. Adenle et al (2019), food securuti must be achived through a technological approach. African states must be in the front line advocating for tech approaches in the fight against hunger and starvation, by making the right polocies and implemntiing these policies will help development of sutatinable food in agruclture. According to Muhzinji and Ntuli (2019), there is need to embrace Genetically modified organisnms GMO as the missing opportunity in addressing food security in Africa and that the Catregena Protcol on Biosafety states that GMOs are have apotentail I uplifting small cale farmers across the continent to sustanbile agriulltural yields.

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