CHAPTER 5

Food Safety and Value Addition: A Panacea to Food Security and Wealth Creation in Emerging Countries of Sub-Sahara Africa (SSA) – Nigeria in Focus

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Abstract

Value addition and food safety are critical engines that drive sustainable agribusiness especially in sub-Saharan Africa where export of agricultural produce is highly desired. Unemployment among youths, food insecurity, poverty and recently, insecurity which are its products are stirring the face of many Nigerians, yet we are sitting on billions of dollars of untapped or ill tapped agricultural resources, especially food. This is due to poor performance and low level of Applied Science and Technology Education. This paper discusses the issues involved and implication of food safety. Value addition, a process of changing or transforming agricultural food products from their original state to a more valuable state, and the challenges in meeting export requirements for the valuable products are discussed. The procedures involved in export of agricultural produces for wealth creation as well as the list of the micro, small and medium (MSMEs) enterprises approved for registration were stated. The information provided may be the 'tonic' required by the teaming unemployed youths to produce foods of export quality and create wealth.
Keywords: Food safety; **v**alue addition; wealth creation; micro, small and medium enterprises

Introduction

Sub-Sahara Africa (SSA) has consistently faced different food problems which varied slightly from country to country. Over the years, the problems of food insecurity have been linked but not limited to, high population growth rates, low productivity of agricultural resources, political instability and civil strife. According to Organization for Economic Co-operation and Development (OECD-FAO), agricultural outlook for 2016-2025 which focused on SSA, the varying problems have only been slowly tackled. Records showed that SSA consistently record high population growth which is approximately 13% of the global population, with projection to increase to almost 22% by 2050 (Berkum *et al*., 2017). This is a significant percentage of the entire world population. Nigeria is a typical emerging country in value addition for food security and wealth creation in sub-Sahara Africa, hence, this lecture is focused on Nigeria.

Each year we struggle to increase agricultural production, but the more we produce the higher the post-harvest losses and poor remuneration for farmers and the poorer and disincentive our farmers become.

In the 1960s, Nigeria had over 60 % of global palm oil exports, 30 % of global ground exports, and 15 % of global cocoa exports (CBN, 2013). By the 2000s, Nigeria global share of exports of each of these crops was 5% or less. Today, the country is a net importer of agricultural produce, with imports totaling NGN 630 billion (CBN, 2013). The Large import food products include wheat (NGN 165 billion), fish (NGN 105 billion), rice (NGN 75 billion), and sugar (NGN 60 billion). Total food imports bill of USD 4.2 billion.

Today, we are faced with the reality of inadequate application of Science and Technology for food production and processing for high value addition to ensure sustainable food security and wealth creation. This paper will provide information on guide lines for export of agricultural food crops after value addition in order to create wealth among the key players.

Food safety and its implications

Every day in every country people fall ill from the food they have eaten. These foods borne illnesses are caused by dangerous micro-organisms and/or toxic chemicals. Food safety is a scientific discipline describing handling, preparation and storage of food in ways that can prevent food borne illness. This includes a number of routine that should be followed to avoid potentially severe health hazards.

Food safety, as it relays to both domestic and industrial levels are still areas of burden in SSA. Food borne disease result mostly from biological hazards consequential from consumption of fresh and perishable foods sold in local markets. Uyttendaele *et al*. (2015) reported the limited evidence on operative, sustainable and scalable interventions to improve food safety in domestic markets. The report does show that training of farmers on input use and good practices often benefits those farmers trained, however, it has not been scalable or sustainable, except where good practices are linked to eligibility for export.

Reasons for the sudden interest in food safety include:

- ✓ the growing number of operators who intervene in the food chain between the primary producer and the consumer;
- ✓ inadequate hygiene controls at various steps of production and distribution, as well as in the consumer's own kitchen;
- ✓ a change in the way food is prepared and consumed: shorter cooking times, more consumption of raw products either for taste or to save time, less canning and more freezing, more fermented products, cold-smoked fish, and so on;
- ✓ more consumption outside the home in restaurants, canteens, etc.;
- ✓ more preparation of food, ready-to-cook or ready to eat;
- ✓ greater sensitivity of products to spoilage (e.g.: less salt or sugar used);
- ✓ increased demand for meat or fish, which are more prone to contamination;
- ✓ longer food preservation periods due to the complexity of the food chain and greater distance between the field and the consumer's table;

- ✓ a larger quantity of food involved as a result of industrialization of the agri-food chain and centralization of distribution systems;
- ✓ more international trade, more transport and storage, which offers fewer guarantees that the cold chain has been maintained;
- ✓ better detection of bacterial contamination (more cases are reported);
- ✓ more exotic products in the diet;
- ✓ less respect for growing seasons

Sources of food contamination

Biological: occurs when food becomes contaminated by microorganisms found in: air, food, water, soil, animals, and human body. Many microorganisms are helpful and necessary for life itself. However, given the right conditions, some microorganisms may cause a food borne illness. Those actually associated with food borne illness include bacteria (*Salmonella, E. coli; Staphylococcus; Listeria, Clostridium botulinum),* viruses (Hepatitis, Norwalk virus), Fungi (moulds and yeast) and parasites (Amoeba, protozoa, tapeworms, algae, liver flukes)

Chemical: Can occur at any point during harvesting. When toxic chemicals used for clearing, pest control or for cleaning and sanitizing food contact surfaces and food preparation equipment come into contact with food, the food may be contaminated by those chemicals. However, there are also added chemicals which may or may not be beneficial for human consumption. These chemicals are known as additives. Common groups of chemical additives include: Antibiotics, hormones, dips, drenches cleaning, pest control, maintenance chemicals food ingredients (preservatives, emulsifiers).

Physical: This usually results from accidental contamination and poor food handling practices. These include: shivers of glass, human hair, nails, nail polish, pieces of jewellery, metal fragments from worn/chipped utensils and containers dirt, stones, frilled toothpick.

The main implication of unsafe food apart from ill health is rejection especially if it is exported forcing farmers to sell locally with poor remuneration especially during glut (see Table 1).

Value addition

Value-addition products are defined as follows: A change in the physical state or form of the product (such as milling wheat into flour or making strawberries into jam). The production of a product in a manner that enhances its value, as demonstrated through a business plan (such as organically produced products).

A broad definition of value addition is to economically add value to a product by changing its current place, time and from one set of characteristics to other characteristics that are more preferred in the market place. As a specific example, a narrower definition would be to economically add value to an agricultural product (such as wheat) by processing it into a product (such as flour) desired by customers (such as bread bakers). Producers involved in adding value should think of themselves as members of a food company that processes and markets products

Table 1: Excerpt from export rejection analysis April 2017

Date of case	Notifying Country	Subject	Product category	Risk decision
04/04/2017	United Kingdom	Aflatoxin (B1= 133µg/kg ppb in groundnut kernels for bird feed from India	Feed material	Serious
04/04/2017	United Kingdom	Attempt to illegally import dried beans from Nigeria	Fruits and Vegetables	Serious
05/04/2017	United Kingdom	Attempt to illegally import dried beans from Nigeria	Fruits and Vegetables	Serious
06/04/2017	Czech Republic	Attempt to illegally import dried fish from Nigeria	Fish and fish products	Not Serious
07/04/2017	Cyprus	Aflatoxin (B1= 3.7; Total 4.4µg/kg ppb in pea nut butter from USA	Fruits and Vegetables	Serious
07/04/2017	Spain	Presence of Lactoprotein 449 mg/kg in coconut drink from China	Fruits and Vegetables	Serious
07/04/2017	Italy	Presence of Mercury (1.2 mg/kg) in frozen blue shark	Fish producs	Serious
07/04/2017	United Kingdom	Aflatoxin (B1= 43.4 µg/kg ppb in groundnut kernels for bird feed from India	Feed material	Serious
10/04/2017	Netherlands	Salmonella presence /25g of marin		
10/04/2017	Bulgaria	Prochloraz 1.439 mg/kg and Acetamiprid (0.116 mg/kg		Serious
12/04/2017	Netherlands	Unauthorized colour Sudan 4 (81µg/kg) in Palm oil from Nigeria		Undecide

Source: Uzomah (2017)

to consumers. Often, this involves building processing plants in the producers' geographical regions to process locally produced crops or animals. In general, adding value is the process of changing or transforming a product from its original state to a more valuable state.

The application of biotechnology, the engineering of food from raw products to the consumers, as well as the restructuring of the distribution system to and from the producer all provide opportunities for adding value. The value added is a product of the level of application of Science and Technology. All over the world, agricultural systems consist of production, processing, storage, marketing, extension, research and training. While production is a result of the combined factors of land, labour, capital and entrepreneurship, its magnitude and efficiency from farm gate to the consumer depends on handling and preservation as well as process of making the products readily available and affordable to consumers (Okuneye, 1995). Though much emphasis had been laid on production as a veritable tool for food security and 70% of the population engaged in agricultural production, we cannot be said to be food secure.

Efficient production is a function of the combination of research and application of skill which is measured by yield per unit of land per unit of investment. Research especially application of applied Science and Technology which addresses the issue of material, temporal and spatial cost is a function of skill acquisitions which can be obtained through formal and informal training or education and application of applied Science and Technology otherwise will not give the desired result.

Despite the fact that over 90% attention of governmental effort on food security is on production, it is bedevilled with avalanche of problems. Low level of technology due to poor state of applied Science and Technology education often result in poor yield, poor storage and processing techniques that cannot make us food secure. Farmers who go into production because of encouragement from government often become disappointed due to glut, lack of appropriate processing and storage techniques, huge post-harvest losses which are all products of inadequate functional application of the knowledge of Food Science and Technological education to cope with increased production.

Case study of Cassava and Cashew nut value addition

Cassava (*Manihot esculenta* Crantz*)* had been chosen as an indicator of level of value addition because it is a crop in which a lot of research work has been carried out on its processing and utilization. The crop has been with us for a long time. It has been described as Africa's food security crop (IITA, 1982).

Nigeria has been reported to be the highest producer of cassava in the world (Table 2). Improved varieties have been developed by IITA with an average yield of 20-30 tons per hectare in just 12 months. Government also adopted aggressive and positive campaigns to popularize the improve varieties, urging all relevant national institutions to embark on the multiplication and distribution of cassava planting materials in the rural areas. Similarly, some NGOS UNICEF, the international fund for agricultural development (IFAD) became fully involved in the multiplication and distribution programme.

The first surprise I observed in cassava processing in Nigeria is that while we are the world's largest producer, (54.8 Million MT) we disappeared completely in the map of cassava processing into starch.

Table 2: World cassava root production 2005 – 2014

Year	Nigeria	Thailand	Vietnam	Indonesia	China	Brazil	World
2005	41,565,000	16,938,244	6,716,200	19,321,200	4,015,661	25,872,016	206,553,731
2006	45,721,000	22,584,402	7,782,500	19,986,640	4,313,333	26,639,012	223.368,631
2007	43,410,000	26,915,540	8,192,800	19,988,058	4,361,573	26,541,200	227,806,894
2008	44,582,000	25,155,796	9,309,900	21,593,052	4,409,014	26,703,040	231,306,414
2009	36,822,000	30,088,024	8,530,500	22,039,148	4,506,386	24,403,981	235,141,005
2010	42,533.180	22,005,740	8,595,600	23,918,118	4,565,318	24,967,052	240,820,938
2011	46,190,248	21,912,416	9,897,913	24,044,024	4,513,667	25,349,542	253,455,921
2012	50,950,292	29,848,491	9,735,723	24,177,372	4,574,109	23,044,557	257,373,372
2013	47,406,770	30,227,542	9,757,681	23,936,920	4,598,480	21,484,218	261,101,216
2014	54,831,600	30,022,052	10,209,882	23,435,384	4,659,481	23,253,514	268,277,743

Source: FAOSTAT (2016)

The major products of cassava in Nigeria are gari, cassava flour, cassava chips, and recently some cassava starch industries are springing up. The products are best described as extension of raw materials for foreign industries except those consumed directly. Less value is added, hence there is no incentive for sustainable production by farmers.

The production of oxidized starch hydrolysate and derivatives particularly monosodium glutamate/lysine is shown to have prime value addition. MSG/lysine is the highest consumption of native cassava starch in Thailand and they are making over $40 billion USD per annum from it. Thailand produces less cassava than Nigeria (Table 2). One can imagine how much seasoning agent is consumed in Nigeria daily.

Starch acetate is used for production of stabilizer in frozen beverage industries. One tonne of cassava chips is sold for $700, if it is starch, it is about $1,500 but when converted to glucose syrup it costs about $3,000.

The question that comes to mind is that why are we are unable to make products with much added value from cassava and boost the morale of our farmers by making them earn more for

their labour. The simple answer is that we have to revisit our applied science and technology education level in terms of focus, functionality and funding.

Cashew nut. Nigeria is the second world's largest producer of cashew nut (Fig 1). However, there is little or no value addition within the country as they are exported unprocessed

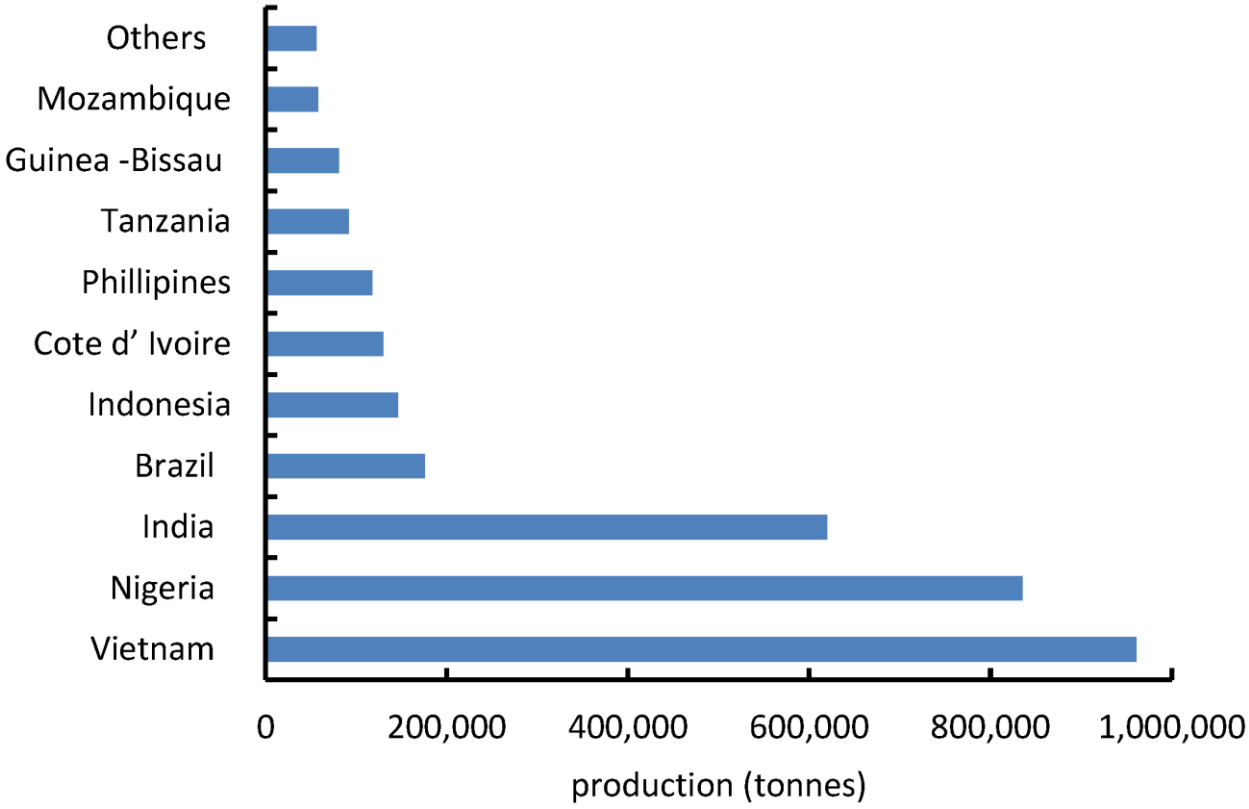

Fig 1: World cashew nut production.
Source: FAOSTAT (2019)

Food security

Food security exits when all people at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their needs and food preferences for an active and healthy life.

Food insecurity

Food insecurity exists when people are undernourished as a result of the unavailability of food, lack of social or economic access to adequate food and or inadequate food utilization.

Sub-Sahara Africa (SSA) is not food secured because of the following factors:

- ✓ In SSA with about 840 million people, 20% of the population were chronically undernourished because of lack of economic or physical access to sufficient food to live a healthy and productive life (FAO, 1996)

- ✓ In SSA, 215 million (38-43%) are said to be a flash-point or locus of hunger
- ✓ Child malnutrition is another indicator of food insecurity. It is estimated that 28 million sub Saharan African children (30%) are under weight.
- ✓ Micro nutrient deficiencies are also wide spread which result in poor health and productivity especially in iron, iodine and vitamin A (FAO, 1996)
- ✓ Insurgency, banditry, 'Bokoharam', ravaging 'herdsmen', leading to internally displaced people in IDP camps have aggravated food insecurity in SSA
- ✓ To be food secured in Nigeria there must be renewed interest in applied science and technology with adequate funding and enabling environment that will enable the growth of MSME industries to improve equipment for food production, processing, preservation and storage of our foods such that everyone will have access to food.

Wealth creation

Wealth creation is the amount of economically relevant private and public assets including physical, financial, human, and "social" capital Abubakar and Bayero (2016). Consequently, the creation of wealth includes the production of public as well as private assets that indicates the important but limited role of the market and price mechanism Wealth creation has a lot to do with technological innovation, but is more than that since the innovation is made feasible and successful in economic and financial terms. Aiming at material improvement for the benefit of human lives, wealth creation includes both a material and a spiritual side and goes beyond the mere acquisition and accumulation of wealth. It is a qualitative transformation of wealth. This is to say that any organization that adopts wealth creation as its watchword, its innovative spirit will revolutionize not only its products and services but also its production process, organizational culture and identity while yielding continuous financial success. It includes flows increasing or decreasing quantities over a certain period of time. Flows such as income per person, a commonly used indicator of the development of a country, express the economic situation of an economic actor.

Micro, small and medium enterprise (MSMES) - the engine that drives sustainable food security

The Federal Ministry of Commerce and Industry defines M**SMEs** as firms with a total investment (excluding cost of land but including capital) of up to N750, 000, and paid employment of up to fifty (50) persons. Potential for setting up of micro, small and medium enterprises / rural village industries in the country, which are agro-based, is huge given the fact that Nigeria is predominantly an agri-based economy (apart from oil) as well as the fact that this potential has not been fully exploited. Avalanche of agricultural products exist in Nigeria which MSMEs can be based. Some of the crops for which MSMEs have been developed are import products which are a challenge to Nigerians. An enabling environment is required for these industries to spring up. The list of food products for which MSMEs can register is stated below.

The categories of products that MSMEs can register are as follows:

1. Bread and bread products.
2. Dry finger foods (chin-chin, popcorn, plantain and potato chips).
3. Locally grown packaged rice and other farm produce.
4. Seasoning and spices.

5. Palm oil.
6. Honey.
7. Dried Fish and fish products.
8. Dried Meat and meat product

Source: https://www.nafdac.gov.ng/wp-content/ 2019

In order to accelerate the development MSMEs, the Federal government had made easier the process of their registration by NAFDAC as stated below:

- ✓ Sharing of facilities for production. Companies with similar products and limited resources can come together to use common facilities provided products are similar.
- ✓ Streamlined the Agency's requirements for product registration, restricted to a group of products (some types of food and cosmetics).
- ✓ Decentralized products registration thereby reducing the timeline: sixty (60) days for Micro, Small and Medium Enterprises and 90/120 days for other companies.
- ✓ Reduced the timeline for issuance of chemical permits to three (3) weeks.
- ✓ 50% reduction in product registration tariffs for MSMEs with not more than five (5) staff.
- ✓ Dedicated a laboratory for the analysis of MSMEs' products

Clients are advised to commence the renewal of products three (3) months before the expiration of their licenses Directors now head Zonal Offices for ease of product registration, especially for MSMEs

Procedure for food export for wealth creation

One of the ways of wealth creation in Agri-business is to add value and make them exportable to earn foreign exchange. Due to the low value of Naira export products will accelerate wealth creation among the Agri-business actors. Presented in Fig. 2 below is the export procedure for agricultural crops especially after value addition.

Business Registration

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Conclude Sales Contract

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NEPA Export Registration

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Obtain Standard Certificate from SON

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Obtain Certificate of Origin

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Obtain Nigeria Export Form

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Shipping

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Collect Empty Container

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Obtain Custom Approval for Container Loading

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Submission of Declaration

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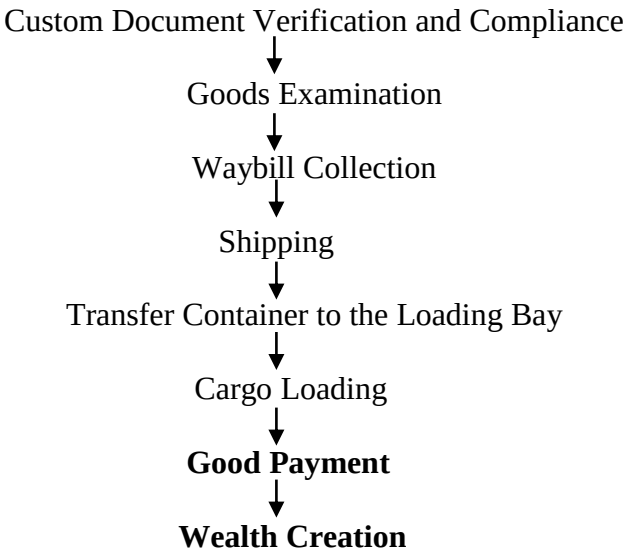

Fig 2: Procedure for food export for wealth creation

Challenges to food value addition for food security and wealth creation

1. *Poor application of science and technology for food production, processing and storage.*
   The importance of Science and Technology in promoting wealth creation through agriculture cannot be over emphasized. This is because the global competitiveness of any economy depends on the level of its Science, Technology and Innovation (STI) capabilities (Adeoti and Adeoti, 2010). Technological capability which is the ability to create new technologies and to develop new products, process is dependent on the level of application of technological education. There is therefore the need to step up science and technology in food production such as mechanized farming, Biotechnology for production (GM foods for high yield).

2. *Infrastructural Facilities*
   Infrastructural facilities that can enhance productivity and reduce food insecurity continue to be in bad shape are listed below:
   - ✓ Epileptic power supply
   - ✓ Poor feeding roads
   - ✓ Poor or lack of adequate storage facilities and its maintenance
   - ✓ Poor rural electrification

3. *Manpower/Skill Development*
   Due to poor application of science and technology and poor funding, there is poor research application hence, disincentive to young able bodied and educated people who had left farming and rural areas for '*okada'* riding.

4. *Poor Agricultural Entrepreneurs*
   Agriculture should be major source of employment, income, and foreign exchange earners which offers opportunities to stimulate economic growth. It should provide

employment and wealth, feed the nation, and provide a veritable source of foreign exchange. Food security farmers should also be entrepreneurs. Therefore, farmers need access to financial services, training, land and machinery to help them grow and create wealth for themselves as well as jobs for others.

Conclusion

Application of Science and Technology in agriculture especially in value addition is one of ways through which sustainable wealth creation can be maintained. Science and Technology education must be repositioned with clear cut focus and adequate funding and incentive to local manufacturers, research and development centres. This will rejuvenate production of locally fabricated equipment stimulate food processing activities to make products with exportable high added values, create wealth and sustain annual food production.

There is need to focus attention on how to develop local fabricated technologies (production and value addition) that could be applied by key players. Collaboration between Universities, Technology incubation centres, financiers, and other stakeholders in order to build a holistic process for Agri-Business Incubation and commercialization process is long overdue.

Recommendations

Repositioning Applied Science and Technology Education
Renewed interest in applied science and technology with adequate funding and infrastructure will encourage MSMEs improve equipment fabrication for food processing, and their adoption will reduce dependence on imported machinery and equipment. This will enable us to process, preserve and store our foods such that everyone will have access to food and create wealth.

Formation of Agric-Business Incubation (ABI)
Practitioners policymakers, academia, researchers and experts should concentrate on the role of Agric-business incubation (ABI) program as an active role in the development of technology to support economic growth and wealth creation. It creates jobs, revitalizes communities, and commercializes new technology, thereby enhancing economic development. ABIs are intended to link technology, resources and know-how to entrepreneurial talent for the purposes of accelerating the development of new companies, and thus speeding up the commercialization of technology.

Pragmatic raw food processing policies
Lack of pragmatic raw food processing policies had resulted into glut in some cases losses, hence producers sell their food commodities at unprofitable low prices. This has led to decrease income, continued poverty, seasonal and chronic food insecurity and disincentive for continued agricultural production. Hence, there is need for pragmatic food policy that will take care of glut and other challenges that can discourage key players in Agri-business.

Extension Services
Graduates of Food Science and Technology should be involved in extension services of ministry of agriculture to demonstrate basic food processing and preservation techniques for farmers.

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