TRANSFORMING NIGERIAN ECONOMY THROUGH SCIENCE, TECHNOLOGY AND INNOVATION

SPEECH DELIVERED

BY

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AS

GUEST OF HONOUR
AT
THE CONFERENCE ORGANIZED BY FACULTY OF SCIENCE, LAGOS STATE UNIVERSITY

PROTOCOLS

INTRODUCTION

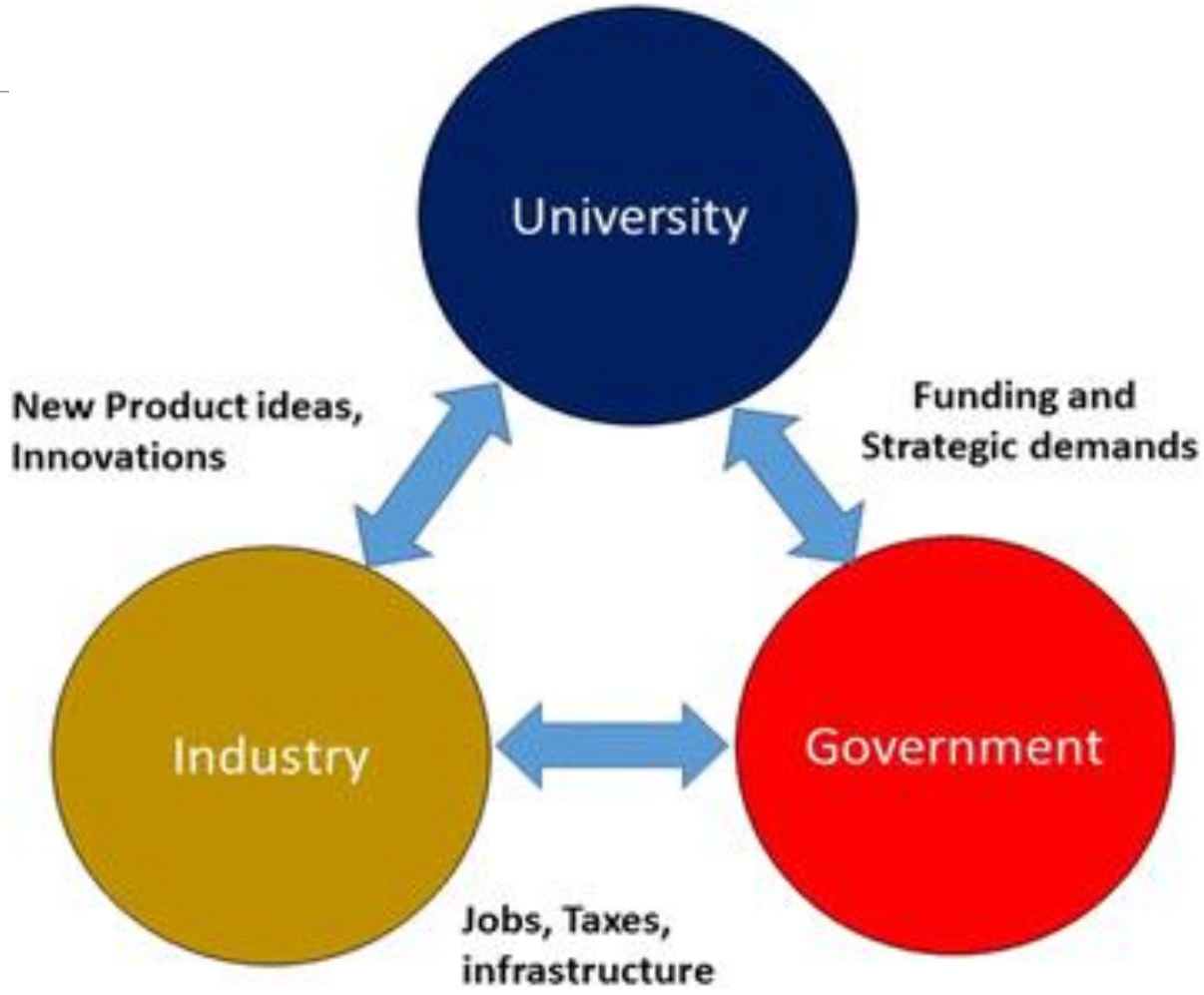
- NIGERIA……

- INNOVATION…….

NATIONAL SYSTEM OF INNOVATION

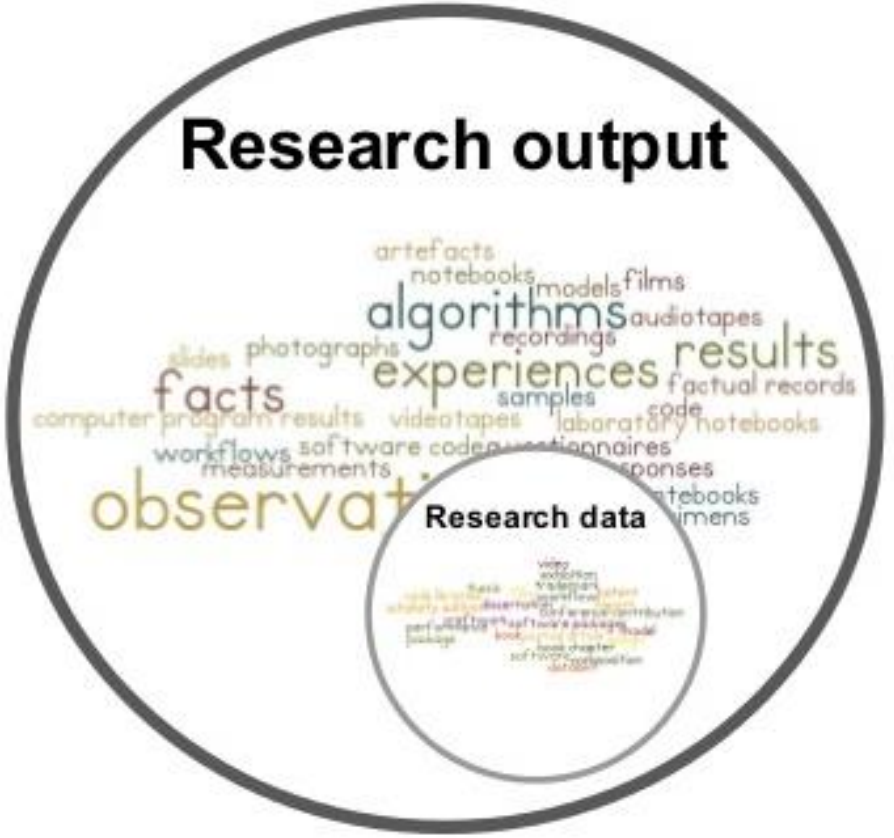
……provides platform for inclusive, multi-sectorial and multi-dimensional system for generating, modifying and diffusing technologies in a nation.

The Triple Helix model…

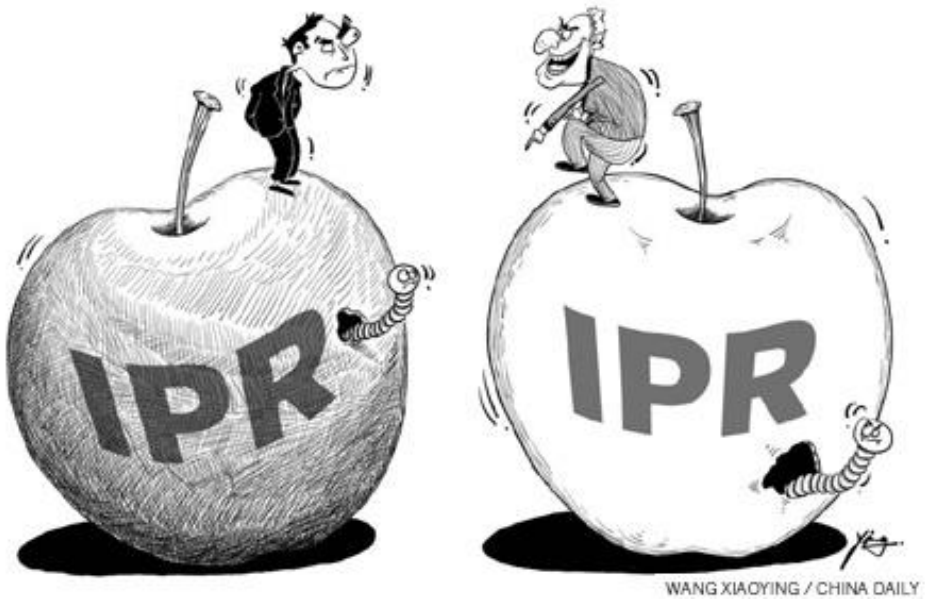


CHALLENGES CONFRONTING THIS LINKAGE

- Research output and need of industries



- Fear over patents, loss or ownership of property rights and sharing of benefits



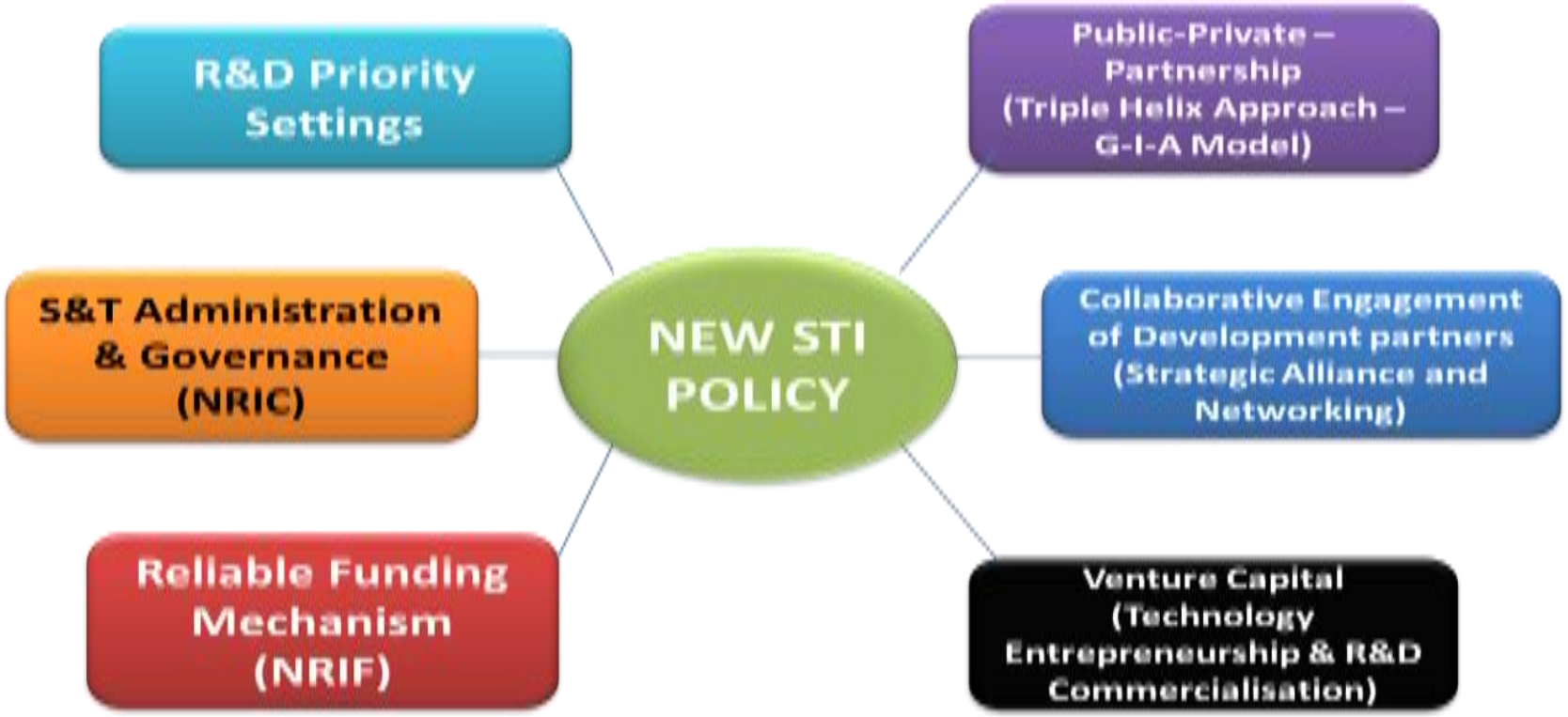
- Work rhythms and ethics

AFTERMATH OF LACK OF SYNERGY ALONG THIS LINKAGE

- Gross unemployment as a result of lack of the right or needed skills for the available jobs
- Poverty rate is high among the populace
- Food insecurity and attendant health challenges
- Poor healthcare services and attendant death rate
- high rate of illiteracy and school drop out
- Insecurity and threats such as terrorism, kidnaping, thefts, armed robbery etc.

HOW TO BRIDGE THE KNOWLEDGE AND INFRASTRUCTURAL GAP

- National Policy on Science, Technology and Innovation



The policy……

- recognizes the need to leverage STI and build a viable research and knowledge-based economy.

- provides an enabling platform for promoting the application of STI results and collaboration of relevant institutions and organizations to ensure that the end users benefit from the innovations and technologies available in the country.
- has features that support effective utilisation of Intellectual Capital and technology within the NIS
- also espoused the application of scientific research and innovation in harnessing the abundant natural resources that the country is endowed with in actualizing developmental goals and objectives.

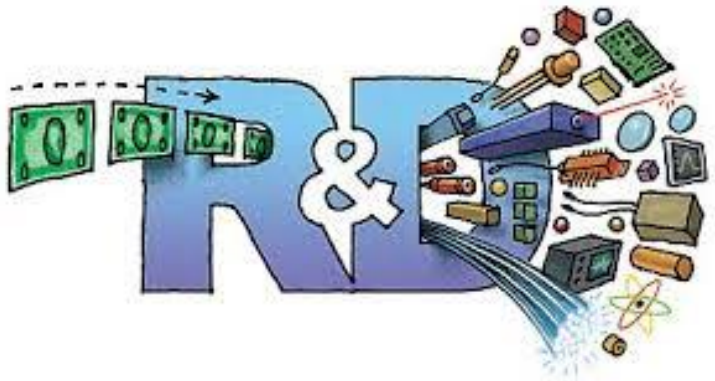
PRESENTATION OF THE NATIONAL ECONOMIC RECOVERY & GROWTH PLAN

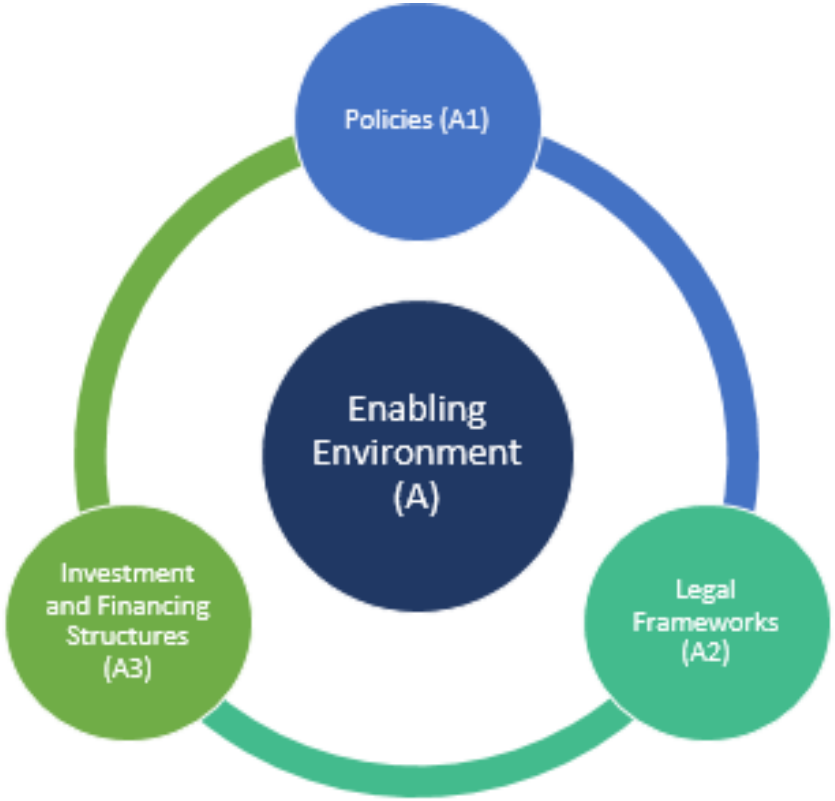
CHALLENGES AND WHY IT HAS NOT WORKED

Looking at how other nations have fared……

- How can Nigeria acquire technological knowledge to advance economic growth and enhance social inclusion?
- How can we bridge the knowledge and infrastructural gap?

- Create an enabling environment for Science, Technology and Innovation



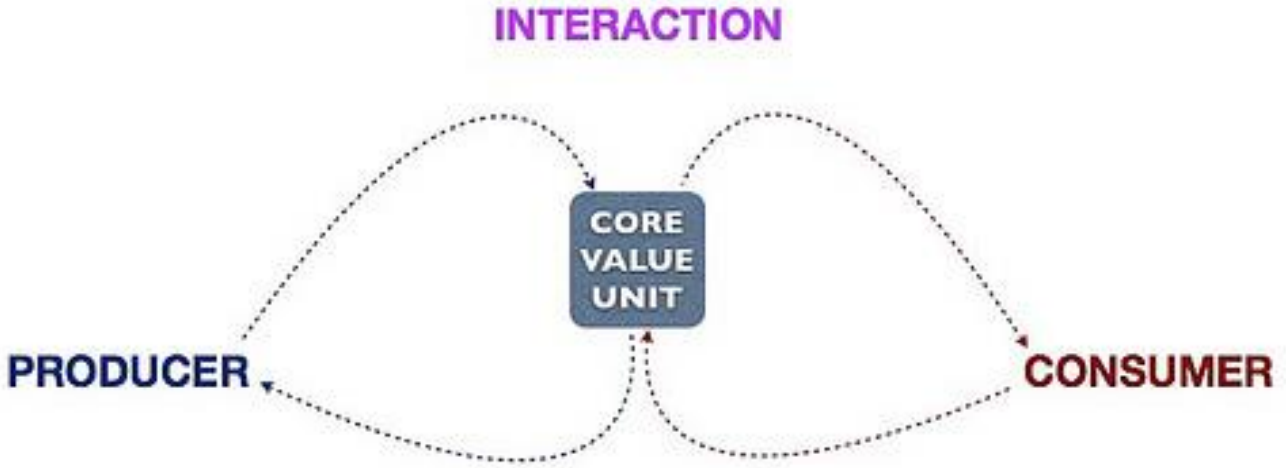


- Invest in education and R&D

	2014	2015	2016
North America	29.1%	28.5%	28.4%
U.S.	26.9%	26.4%	26.4%
Caribbean	0.1%	0.1%	0.1%
All North America	29.2%	28.5%	28.5%
Asia	40.2%	41.2%	41.8%
China	19.1%	19.8%	20.4%
Europe	21.5%	21.3%	21.0%
Russia/CIS	3.1%	2.9%	2.8%
South America	2.8%	2.6%	2.6%
Middle East	2.2%	2.3%	2.3%
Africa	1.0%	1.1%	1.1%
Total	100.0%	100.0%	100.0%

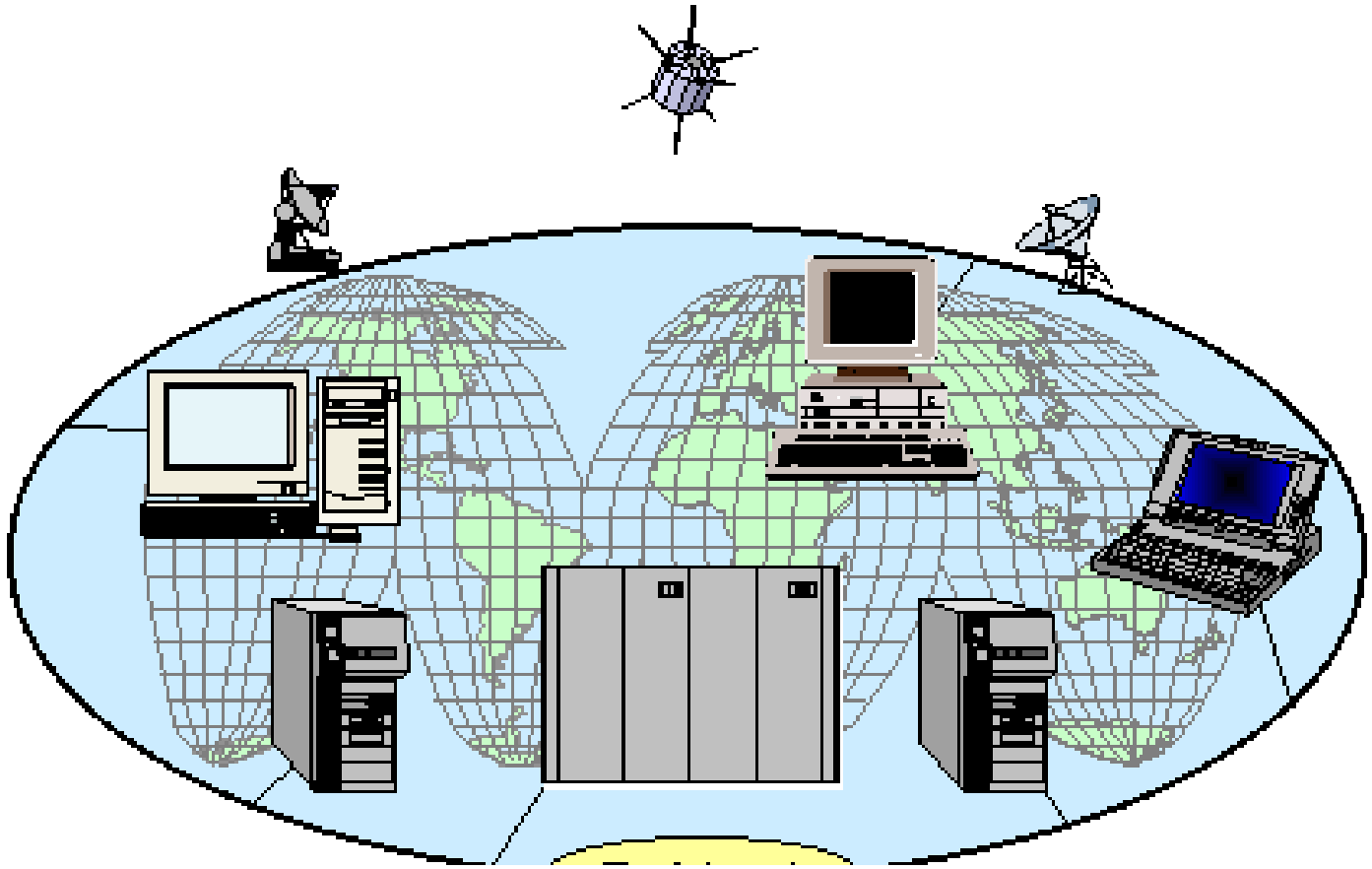
Source: IRI 2016 Global R&D Funding forecast. A supplement to R&D Magazine. Winter 2016

- Creating platforms for interactions



- Collaborating with the MSME sector

- The role of ICT



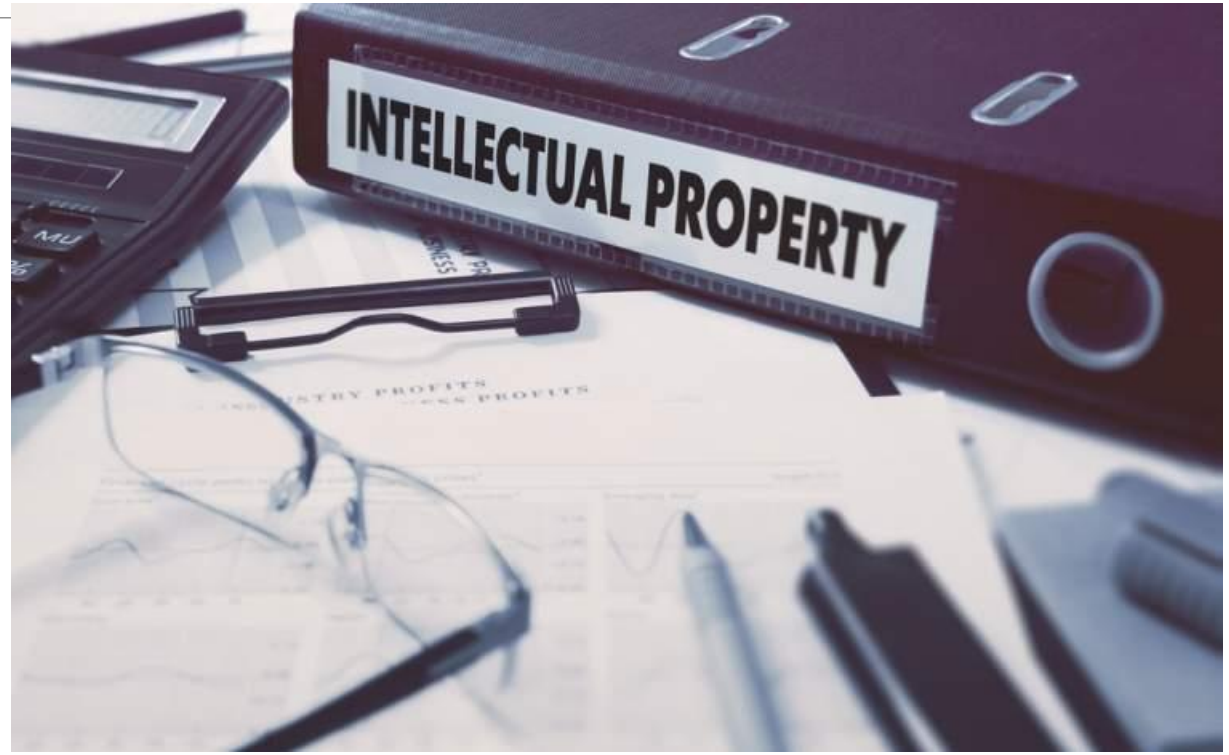
STRATEGIES AND WAY FORWARD

- Role of Government….

- Launch national education reforms focusing on innovation and entrepreneurship

- Ensure R&D activities are directed towards the development of appropriate technologies

- Ensure adequate intellectual property recognition, promotion and protection of creativities, traditional knowledge, indigenous technology and other intellectual assets

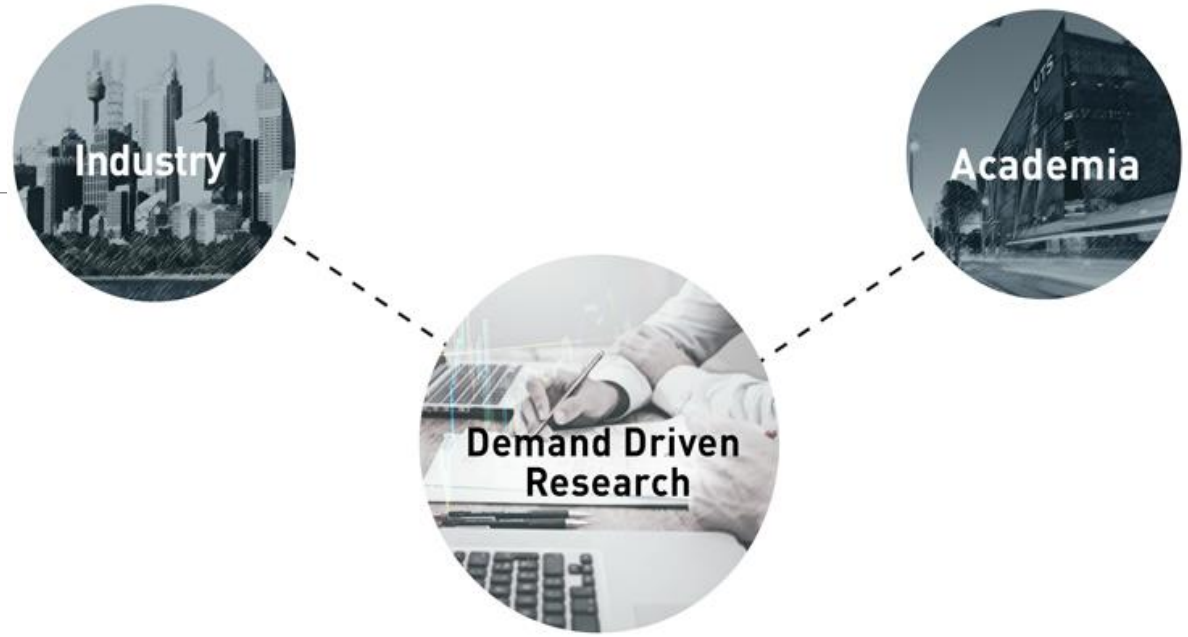


- Establish appropriate departments or structures in the FMST and States' ministries of S&T

- Carry out mandatory periodic evaluation and monitoring of the performance of the national innovation system.

Role of Academia…..

- Embrace demand driven research

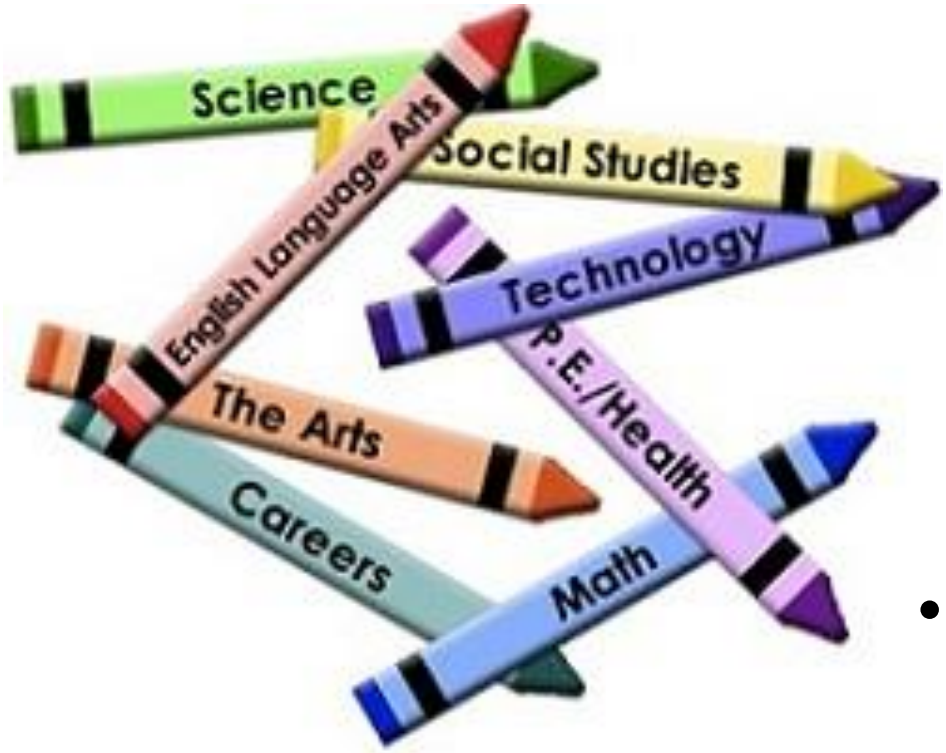


- Encourage collaboration with the constituents of the Triple Helix

- Institutional re-organisation for better performance.

- Institutionalising reward/award system to motivate the hardworking staff.

- Define research agenda in consonance with national priority



- Promote interdisciplinary research

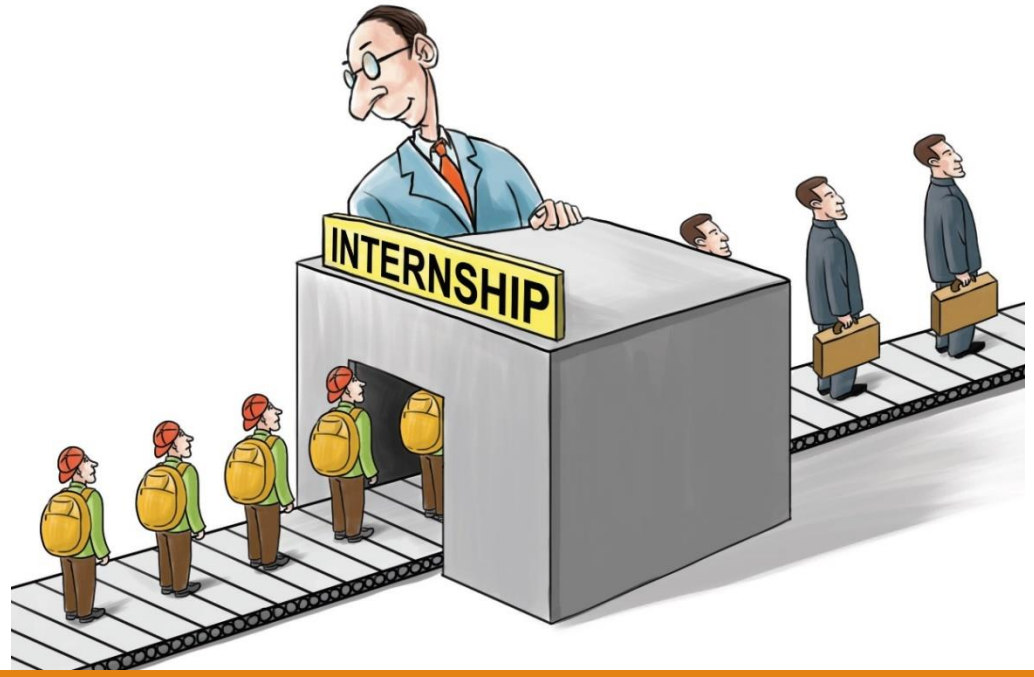
- Create (if non-existed) or strengthen Research Council

#STRENGTHEN

- Devote a certain percentage of its capital allocation to R&D

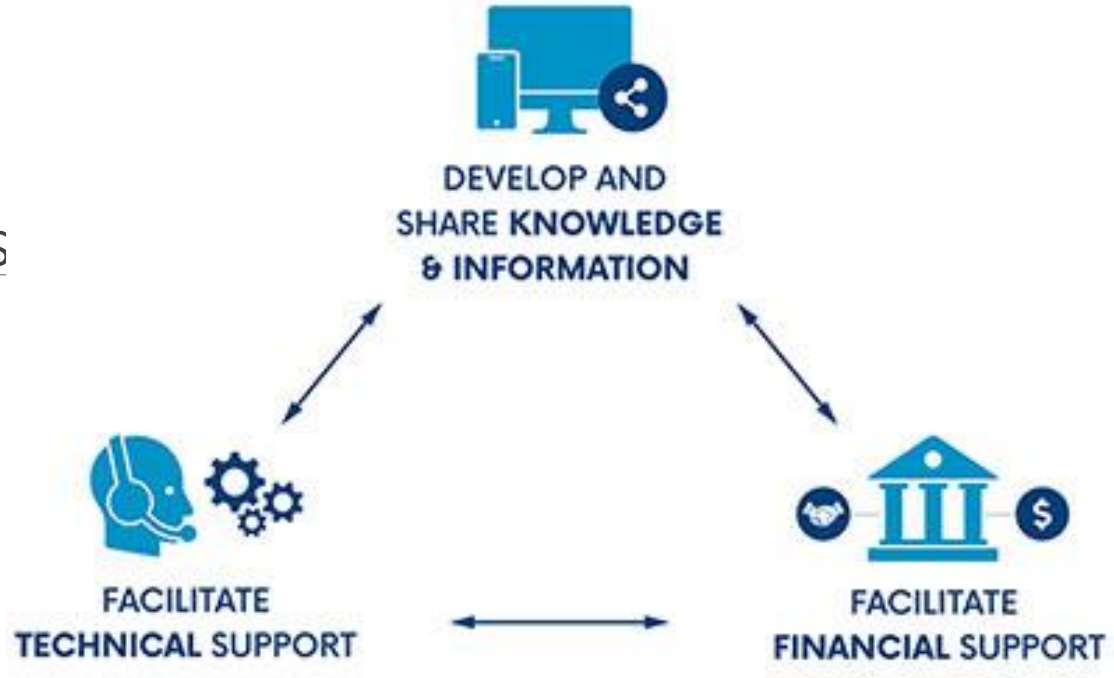
Role of the Industries….

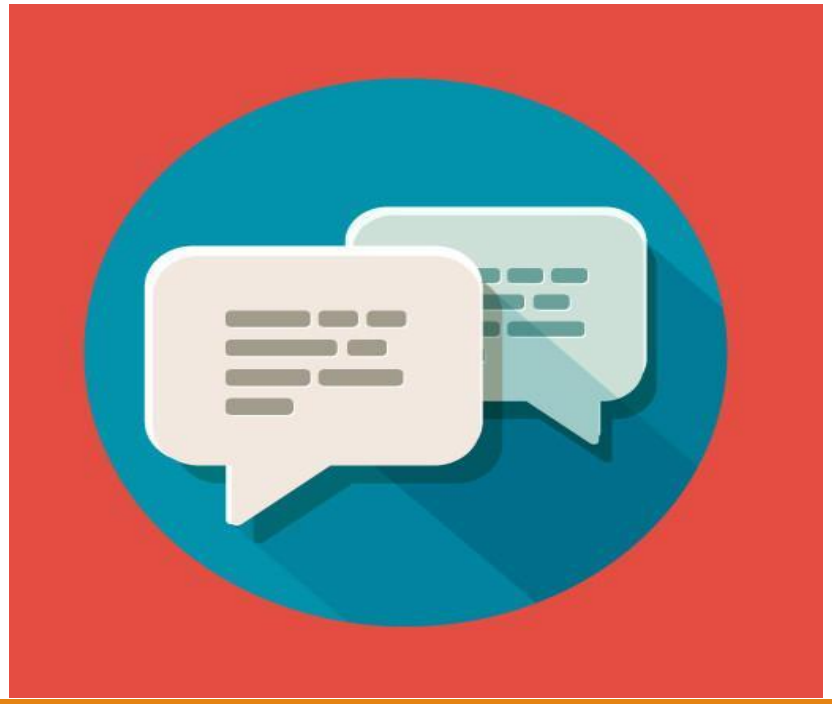
- Fund R&D at the Knowledge Institution



- Provide internship opportunities for students and researchers

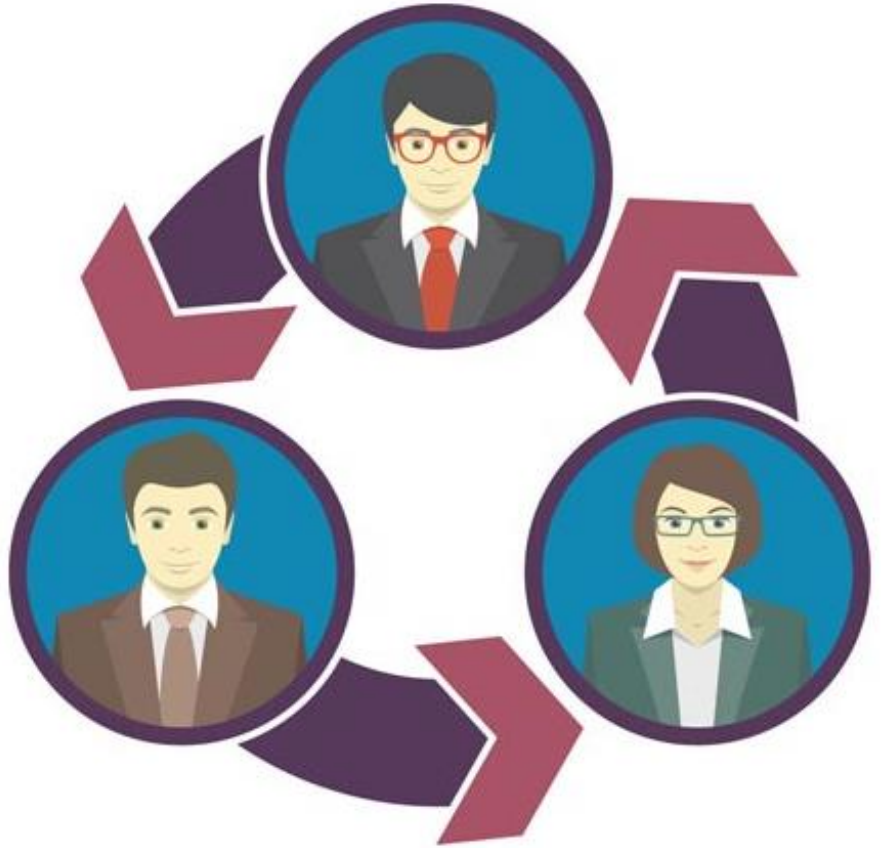
- Facilitate and support R&D in universities and research institutions





- Actively engage in the development of the university R&D agenda

- Support staff exchange programmes between the industry and the univers



- Embrace Industrial Training Scheme and implementation of the triple helix model

THE CONTRIBUTIONS OF FEDERAL INSTITUTE OF INDUSTRIAL RESEARCH, OSHODI (FIIRO) TO SCIENCE, TECHNOLOGY AND INNOVATION

BRIEF ON

Thursday 12th October, 2017 at The Conference Organized By Faculty Of Science, Lagos State University

HISTORICAL BACKGROUND

The Establishment of the Institute is a product of the Recommendation of the Economic Mission sent to Nigeria in 1953 by International Bank for Reconstruction and Development (now World Bank)

The Institute commenced activities in 1956 with a take-off grant of £260,000 (two hundred and sixty thousand pounds sterling) from the Federal Government of Nigeria.

OUR VISION

To be the foremost Centre of Excellence for Industrial Research and Development in the Nation

MISSION STATEMENT

To Conduct and Promote Market - Driven Research and Development for the Industrialization and Socio-economic Development of the Nation

MANDATE

Identify & Characterize local Raw Materials for use in Industries

Identify and Develop Appropriate Technologies; Upgrading Indigenous Technologies in the area of Food and Agro-allied Processing and in various non-food uses

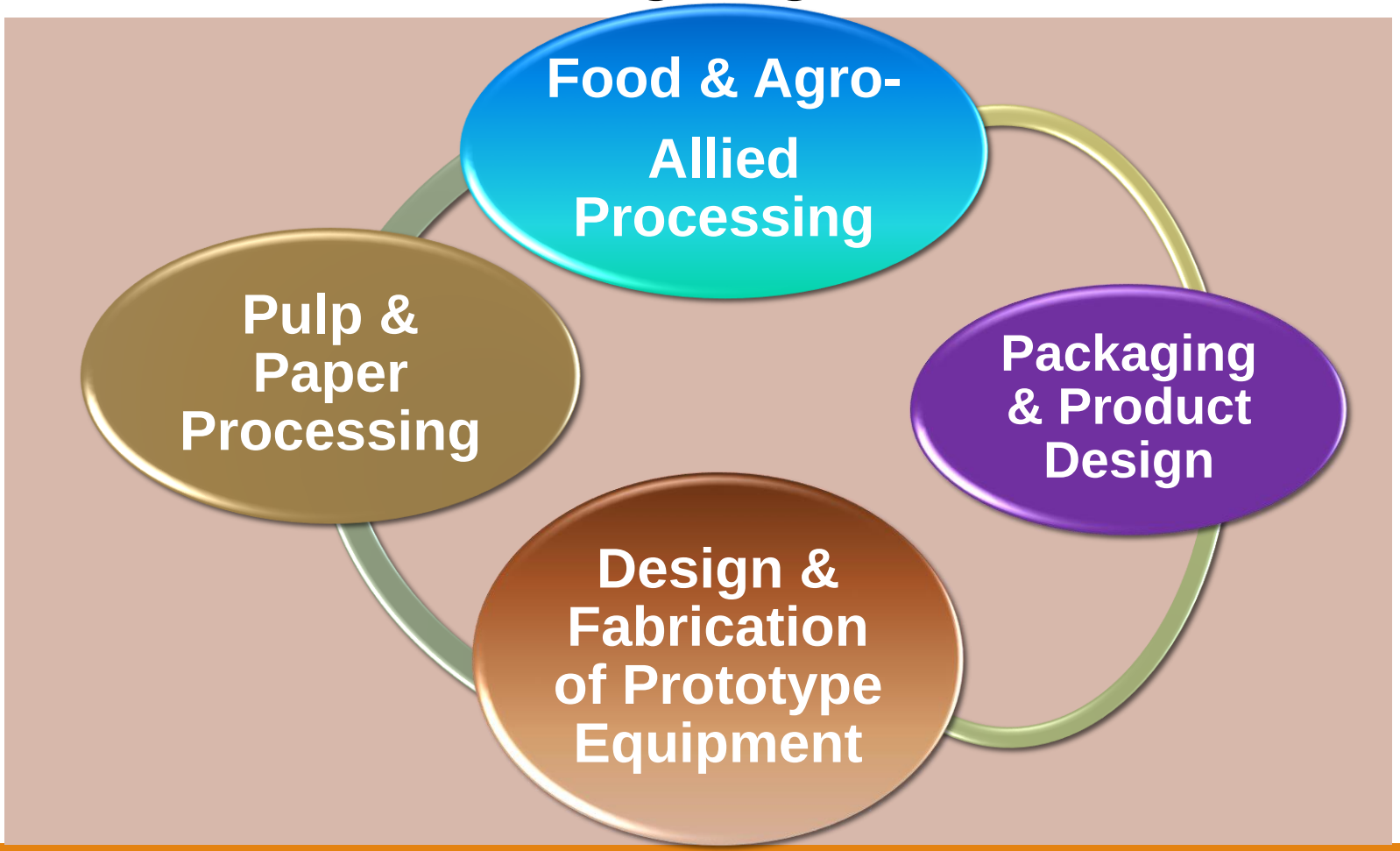
Design & Develop Pilot Scale Operations

Assist in the Transfer, Adaptation and Utilization of these technologies by local manufacturing Industries

Undertake Economic Feasibility of Projects and Consultancy Services

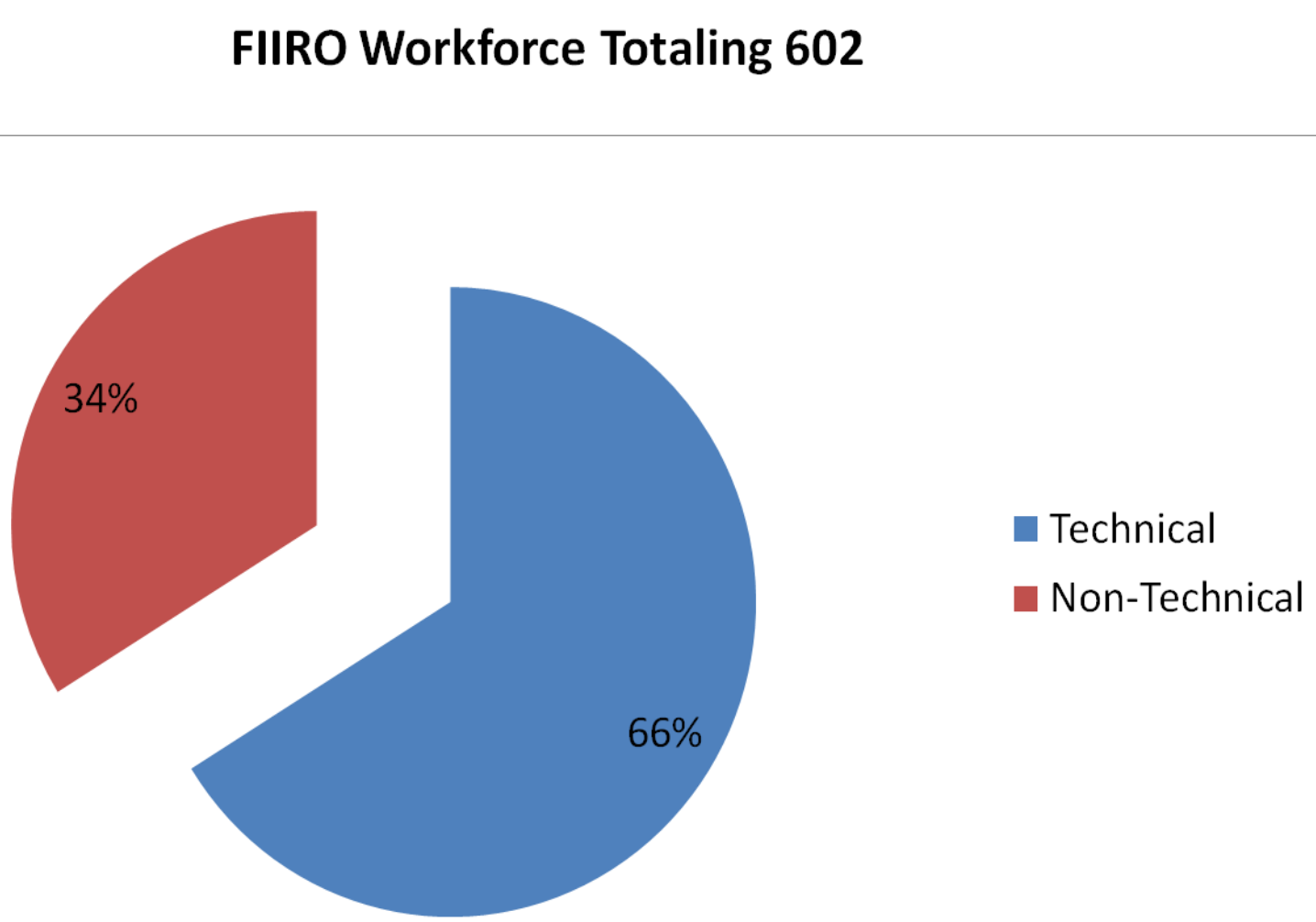
AREAS OF FOCUS

Conduct Cutting Edge Research in

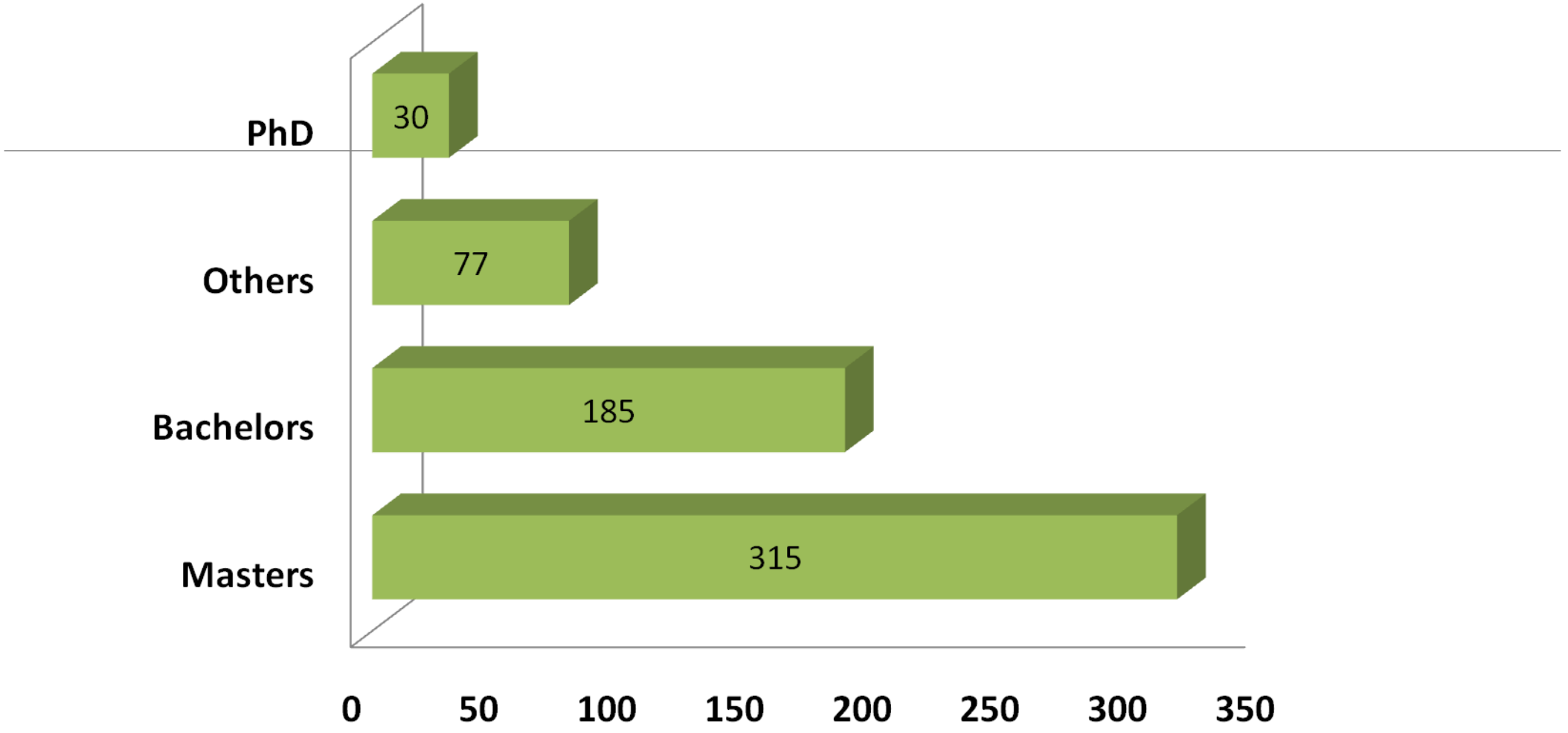


- It will therefore be about 60 years of distinguished Research and Development channeled towards **SCIENCE, TECHNOLOGY AND INNOVATION**
- FIIRO therefore makes a great reference point for addressing the theme of this conference which bother around nation building through science, technology and innovation

Staff Strength



FIIRO Staff Strength and Qualification Breakdown



Majority of the Research workforce are women

WHAT WE DO……

Research and Development (R & D) Programs

- *In-house Research*
- *Sponsored Research*
- *Contract Research*

Services

FIIRO'S CONTRIBUTIONS TO SCIENCE, TECHNOLOGY AND INNOVATION FOR THE DEVELOPMENT OF NIGERIAN ECONOMY

FIIRO is a technology provider to the micro, small, medium & large scale industries in Nigeria.

The Institute has provided technology transfer services to about 70% of MSMEs (especially those in the food & beverage sector) in the South west geo-political zone in Nigeria.

FIIRO has provided her services to over 70% of the SMEs operating in the Technology Incubation centres all over the 36 states in Nigeria.

The Institute has trained over 500,000 techno-entrepreneurs on its various developed technologies.

About 25 technologies are transferred currently on a regular basis to prospective entrepreneurs/investors.

Numerous entrepreneurs have established production enterprises based on the technologies acquired from the Institute.

Millions of jobs have been created through direct and multiplier effects of these entrepreneurs.

Over 250 technologies developed from locally available raw materials. More than 50 successfully packaged for commercialization by MSMEs.

The Institute organizes training courses for at least 25 of these technologies weekly.

About 75,000 techno-entrepreneurs have been trained through its various Entrepreneurship development training programmes.

Conducted research virtually on all the available raw materials in Nigeria - both agro-based and mineral excluding oil and gas.

The food and beverage, pulp and paper, textile, cement, paint, soap & cosmetics and engineering industry to mention a few, have benefitted immensely from the Institute's R&D results.

Some of the R&D we have carried out using biochemistry and molecular biology includes

Production and utilization of Industrial Enzymes (Enzyme Biochemistry)

We have developed process technologies for the following industrial enzymes

Amylase

Glycoamylase

Alkaline proteases

Xylanase

Pectinase

Cellulase

Glucose isomerase

Phytase


AMYLASE
AMYLASE


XYLANASE
XYLANASE
XYLANASE


Cellulase
Cellulase


PHYTASE
PHYTASE
feed supplement in livestock

Microbial Biochemistry and Fermentation Technology

Bottling and preservation of Kunnu-Zaki

Products from cassava.

Packaged dried fufu flour.

Packaged garri granules and flour

Production of soy garri

Production of microbial fortified (proteinized) garri

Development of starter cultures for Ogi, Yoghurt etc.

Production of Oxy tetracycline for animal feed

Biological degradation of aflatoxins in fermented maize and sorghum products

Microbial Biochemistry and Fermentation technology

- Development of biochemical and molecular markers for determining quality assurance in the primary processing of cocoa in West Africa
- Production of ethanol from cassava peels using well-selected starters
- Production of biogas from pig wastes


FIIRO
RED ROSELLE
TABLE WINE
(ZOBOBODO WINE)
FIIRO
FIIRO
CARROT
FIIRO


ogiri
FOOD CONDIMENT
ogiri
FOOD CONDIMENT
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FOOD CONDIMENT
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SHELF STABLE
KUNUN-ZAKI
SHELF STABLE
KUNUN-ZAKI

MAJOR ACHIEVEMENTS

Conducted research virtually on all the available raw materials in Nigeria - both agro-based and mineral excluding oil and gas.

Developed over 250 R & D technologies and have completely packaged 50 of them ready for immediate commercialization.

The food and beverage, pulp and paper, textile, cement, paint, soap & cosmetics and engineering industry to mention a few, have benefitted immensely from the Institute's R&D results.

Spurring Economic Development through Job Creation and Technology Transfer

- FIIRO is a technology provider to the micro, small, medium & large scale industries in Nigeria.
- The Institute has provided technology transfer services to about 70% of MSMEs (especially those in the food & beverage sector) in the South West geo-political zone in Nigeria.
- FIIRO has provided her services to over 70% of the SMEs operating in the Technology Incubation Centers all over the 36 states in Nigeria.

The Mechanization of the Production of Gari

The first of such plant designed by the Institute was duly patented in the UK.

A UK based Engineering firm, Newell Dunford was licensed to produce and market the plant. That plant sold in African, Caribbean countries earning the Federal Government of Nigeria royalties.

FIIRO R&D PRODUCTS FROM CASSAVA Cont'd

The journey of Cassava Bread and other Confectioneries started in 1964 as an intervention by FAO primarily to reduce importation bills on Wheat by developing countries and stimulating local production and processing of non-wheat flour(s) to be incorporated into wheat flour. It also had lots of support from the Tropical Products Institute in England.

Today the Institute holds a Patent on its HQCF.


Cassava bread
Have you been served?


Bread

FIIRO R&D PRODUCTS FROM CASSAVA Cont'd

FIIRO R&D PRODUCTS FROM CASSAVA Cont'd

Cassava Starch as industrial intermediates for Pharmaceutical products, Emulsifiers and Stabilizers in Food industry, Glues and Adhesives in printing, labelling, Chips , Pellets and Glucose syrup.

Spurring Economic Development in the Brewery Sector

- The Institute's R&D into Sorghum malt production led to the ban on Barley malt importation in 1986
- Since then Sorghum malt has replaced Barley malt in the brewing industry in Nigeria for production of beer and non-alcoholic beverages
- The Initiative saved Nigeria over $570million in foreign exchange between 1987 and 1988.

FEMOS BEER

Spurring Economic Development in the Brewery Sector Cont'd

- **The Sorghum malt policy created an expansion in the use of sorghum and created job opportunities**
- **That innovation was adopted by many other nations through the intervention of (UNIDO) that sponsored training programs on the production of alcoholic beverages from sorghum.**

R&D PRODUCTS FROM CEREALS

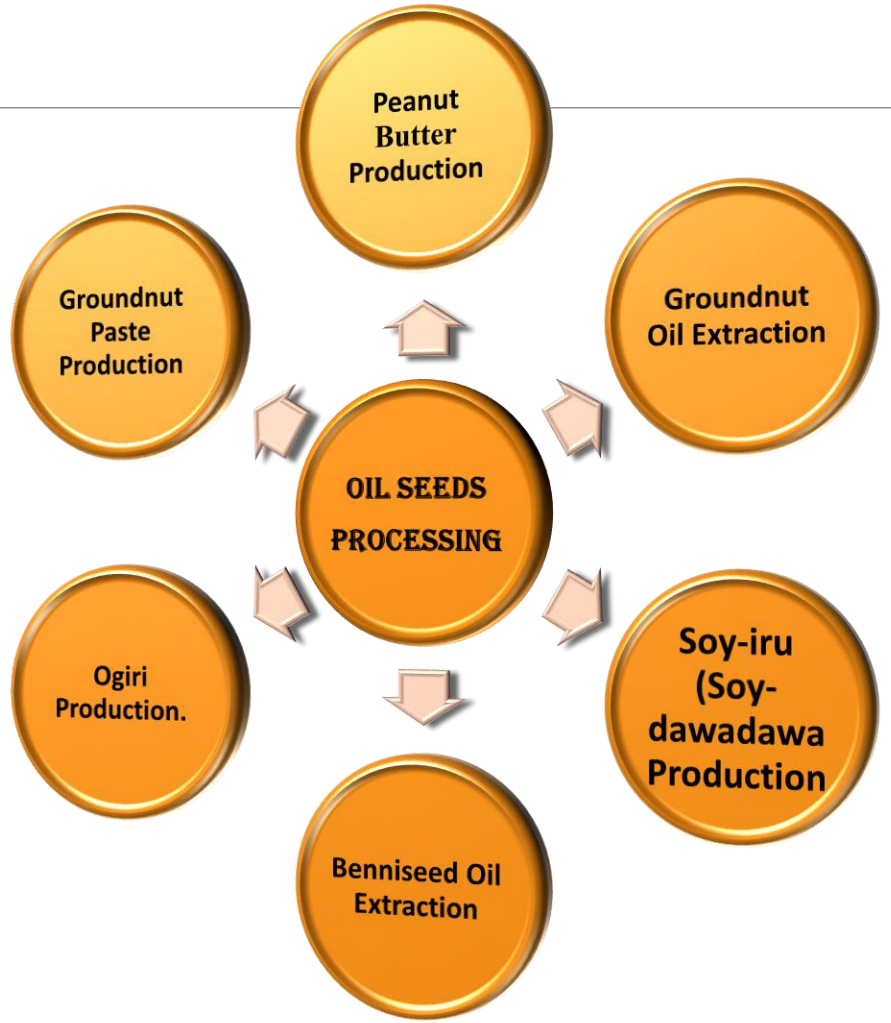
CEREALS AND LEGUMES PROCESSING

- Soy Ogi, Maize Flour and Grits Production
- Ready-To-Use-Therapeutic Food (RUTF)
- Destoning of Maize, Cowpea, Soybeans, etc.
- Soya Enriched Biscuit

CEREALS AND LEGUMES PROCESSING Cont'd

- Ready-To-Use Therapeutic Food (RUTF)
- Soya Enriched Biscuit
- Soy Ogi (Infant and Adult Formula)

FIIRO R&D PRODUCTS



OILSEED PROCESSING Cont'd

SOUP SEASONING (OGIRI)

SOUP SEASONING (SOY DAWADAWA)

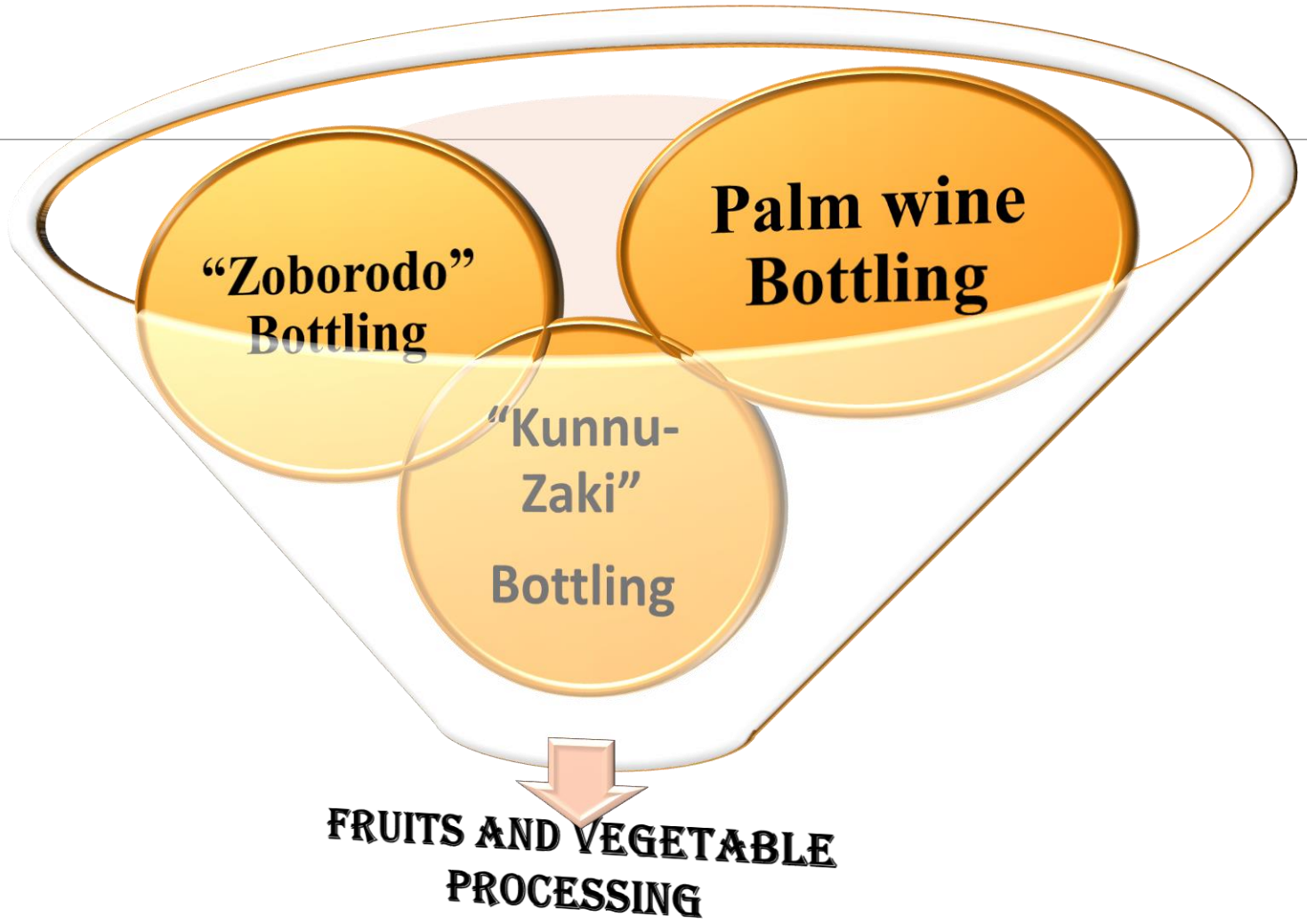
OILSEED PROCESSING Cont'd

Vegetable oils - used for food & as industrial raw materials in the Paint, Cosmetics & Pharmaceutical Industries

- **Upgraded the technology for the extraction of Edible oils from groundnut, beniseed, melon, soybean etc.**

- **Developed technologies for the utilization of non-edible essential oils as industrial raw materials**

FIIRO R&D PRODUCTS



Fruits Processing

- **Fruit juice extraction and bottling from local fruits**
- **Clarified fruit juice production from local pulpy fruits**
- **Food spreads (jam and marmalade) production**
- **Vegetable drink production**
- **Energy/High Fibre drink production**

FRUITS AND VEGETABLE DRINKS PROCESSING Cont'd

FRUITS AND VEGETABLE DRINKS PROCESSING Cont'd

- **DRINKS AND BEVERAGES FROM NIGERIAN FRUITS:-**
- **Fruit Wine**
- **Fruit Juice**
- **Kunu - Zaki**
- **Active Burst-Sport Drink**
- **High Fiber Functional Drink.**
- **Bottled Palm wine.**

FIIRO R&D PRODUCTS

INTERMEDIATE RAW MATERIALS FOR INDUSTRIAL SECTOR

- **Industrial Enzymes Production**
- **Essential Oil extraction (e.g. Eucalyptus, Lemon oil, Citronella, etc)**
- **Adhesives production from cow bone and gum-Arabic**

FIIRO R&D PRODUCTS

PERSONAL CARE PRODUCTS Cont'd

MULTI-PURPOSE LIQUID SOAP

BLACK SOAP

PERSONAL CARE PRODUCTS Cont'd

- **The Institute developed a simple refining process to take off the pale yellow to dark colour of the crude shea fat.**
- **A muscle relaxant "Citrobalm" and an insect repellant were developed from the refined product.**
- **The Institute holds a Patent on this developed simple method of refining crude Shea fat.**

PERSONAL CARE PRODUCTS Cont'd

- Body and Hair Pomade production
- Toilet Cleanser & Liquid Detergent production
- Neem Antiseptic & Black Soap production
- Herbal Dentrifice (Toothpaste) production
- Citrobalm Production from Refined Sheabutter
- Laundry Bar Soap Production

PERSONAL CARE PRODUCTS Cont'd

NEEM TOOTHPASTE

NEEM ANTISEPTIC SOAP

RESEARCH AND COMMERCIALIZATION ACTIVITIES: FLAGSHIPS PROJECTS FOR 2016/2017

1. Commercialization of High Nutrient Density (HND) biscuit and drink through Public-Private-Partnership arrangement
2. Industrial Enzymes Pilot Production
3. Ready-To-Eat Therapeutic Foods (Working on PPP arrangement for commercialization, State government, International development organizations)
4. Commissioning of FIIRO Tomato Processing Model Plant (Public-Private Partnership Arrangement)
5. **Nutraceuticals for the management of diseases Sickle Cell Anaemia –Research & Commercialization**
6. Nanoclay Biodegradable Packaging Materials
7. Reverse engineering to replicate some imported technologies

Fresh Tomatoes Processing

The Institute has completed benchwork on development of the following Tomatoes products:

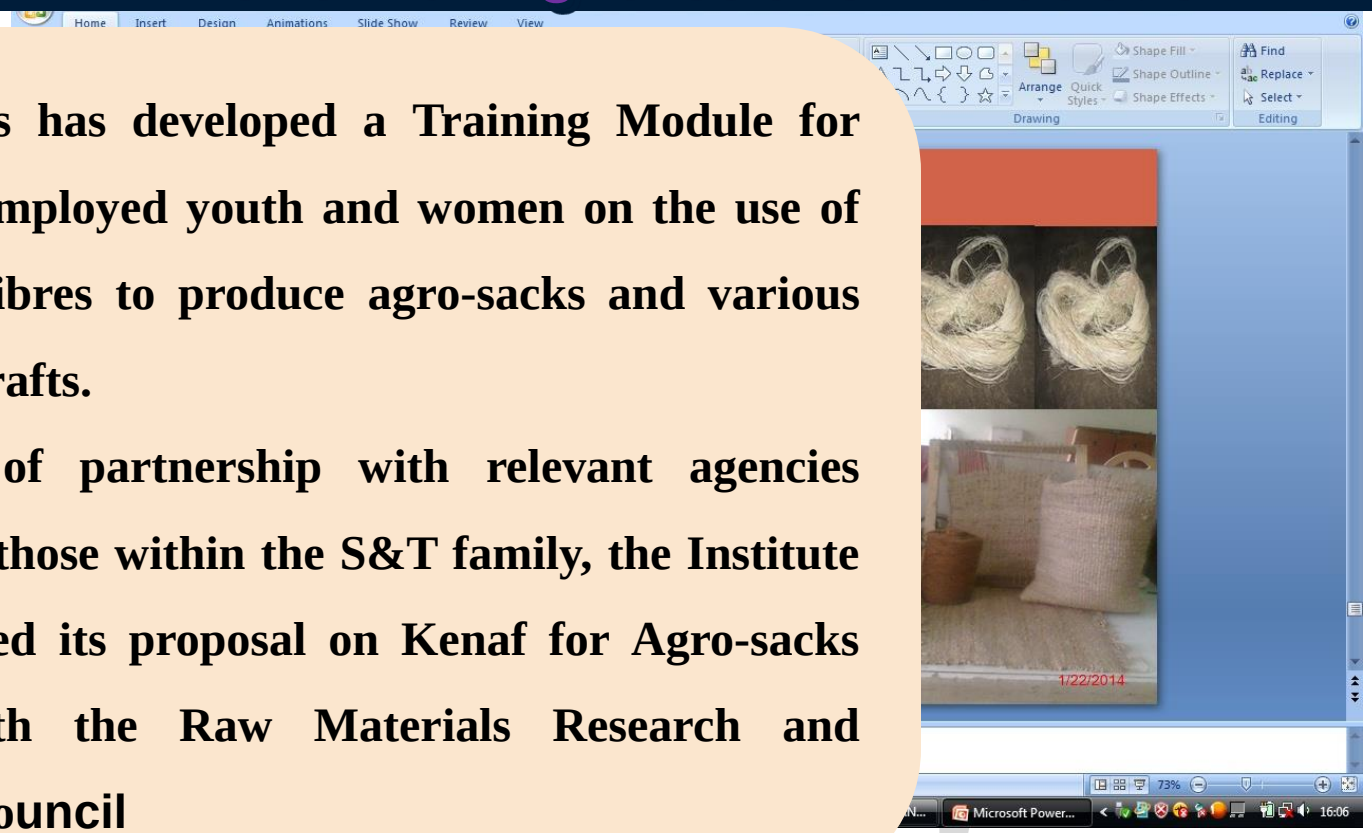
FIIRO TOMATO PASTE	FIIRO TOMATO KETCHUP	FIIRO TOMATO FLAKES & POWDER	FIIRO TOMATO JUICE
			

Fresh Tomatoes Processing Cont'd

Pulp & Paper Processing

Fibres from Banana stem, Plantain stem and Kenaf for Agro-sacks Production.

- **The Institute is has developed a Training Module for training of unemployed youth and women on the use of the extracted fibres to produce agro-sacks and various types of handicrafts.**
- **In the spirit of partnership with relevant agencies especially with those within the S&T family, the Institute recently revisited its proposal on Kenaf for Agro-sacks production with the Raw Materials Research and Development Council**



DISPLAY OF FIIRO PRODUCTS

LIST OF SOME OTHER INDIGENOUS TECHNOLOGIES DEVELOPED AT FIIRO USING BIOCHEMISTRY AND MOLECULAR BIOLOGY

- Laundry and Toilet Soaps
- Liquid Detergents
- Powder Detergents
- Essential Oil Extraction.
- Vegetable Oil Extraction.
- Body and Hair Pomade.
- Industrial Cassava Starch
- Cold Water Starch
- Fruits Concentrates
- Ripo Meal
- Ground Rice
- Fruit Juices Extraction from Nigerian Fruits

- Pharmaceutical Grade Cassava Starch
- High Quality Cassava Flour Production
- Odourless Fufu Flour Production
- Instant Pounded Yam Flour Production
- Mechanized “Elubo”
- Ground Rice
- Corn Starch
- Cowpea Flour
- Soy-ogi

LIST OF SOME OTHER INDIGENOUS TECHNOLOGIES DEVELOPED AT FIIRO SUITABLE FOR JOB CREATION CONTD.

- Fruit Cordial
- Fruit Flakes
- Dehydrated Fruits
- Fruit Wine
- Roselle (Zobo) Drink Extraction, Preservation & Packaging.
- Palm wine Preservation and Bottling.
- Toilet Cleanser

- Bread and Confectioneries Baking
- Kunu Production and Preservation
- Plantain Chips
- Plantain Flour
- Cassava-based Adhesive
- Hydrated Lime
- Custard Powder Production
- Plain “Ogi
- Full Fat Soya
- Precipitated Calcium Carbonate

LIST OF SOME OTHER INDIGENOUS TECHNOLOGIES DEVELOPED AT FIIRO SUITABLE FOR JOB CREATION CONTD.

- Soy-dawadawa Food Condiment
- Sorghum Malt
- Ready to Eat Traditional Dishes

  (e.g. Ogbono soup, Egusi soup, etc)
- Dehydrated Vegetables
- Tomato Powder
- Tomato Puree
- Tomato Ketchup
- Roselle Infusion Drink
- Jam and Marmalade
- Mushroom-Based Soup Mixes
- Potato Snacks
- Snail Feed
- Grasscutter Feed
- Floating Fish Feed
- Probiotic Drinks
- Cashew Kernel
- Groundnut Paste
- Tapioca
- Food Thickener
- Food Sweetener

LIST OF SOME OTHER INDIGENOUS TECHNOLOGIES DEVELOPED AT FIIRO USING BIOCHEMISTRY

- Ready-to-use-Therapeutic Foods
- High Nutrients Density Biscuits
- High Nutrients Density Drinks
- Sorghum Flour
- Porcelain Insulator
- Glucose Syrup
- Black Soap

- Roasted Groundnut
- "Kulikuli"
- Gelatin Cowbone Adhesive
- Chemical Based Adhesive
- Alkyd Resins
- Fibre and Particle Boards

LIST OF SOME INDIGENOUS TECHNOLOGIES DEVELOPED AT FIIRO SUITABLE FOR JOB CREATION CONTD.

- Carboxyl Methyl Cellulose (CMC) from agro-wastes
- Plaster of Paris (POP)
- Toothpaste (Neem-based)
- Soy Milk/Soy Flour
- Yoghurt and Ice Cream
- Sodium Silicate
- Soda Ash from Trona
- Bio-gas

- Briquette
- Body Cream
- Body Lotion
- Deodorants
- Cassava-based Noodles
- Ethanol (from cassava)
- Soy Gari
- Alcohol Distillation (Portable Alcohol)
- Bio-fertilizer

PATENTS

- Producing Gari from Cassava Root
- Fermented Food Compositions (Soy-Ogi)
- Producing Gari from Cassava Root
- Preparation of Cosmetics from Cocoa fat and Palm kernel oil
- Production of Table Vinegar from Fermented Palm Wine

PATENTS Cont'd

Distillation Apparatus for Crude/Refined Alcohol

Cold Water Starch from Cassava Starch for Textile Printing and Finishing

Preservation and Bottling of Palm Wine

Production of Acid Hydrolyzed Starch of Reduced Viscosity from Cassava Starch for Textile Sizing, Light Textile Finishing and Domestic Laundry using the Slurry and Non-Slurry Methods

PATENTS Cont'd

- The Production of Malt from Nigerian Sorghum Grains
- Brewing Lager Beer from 50% Sorghum Composite Malt
- Instant Pounded Yam Flour production
- Groundnut Dehuller
- Groundnut Sheller

PATENTS Cont'd

Production of Clarified Fruit Juice from Banana, Guava, Cashew Apple, Pawpaw and Mango

Production of Pectinase Enzyme from Corn Pomace using Aspergillus carbonareus

Production of Non Sour Detoxified Cassava Flour

Simple Method of Refining Crude Sheafat

PENDING PATENTS

- Development and Production of Simulated Palm Wine
- Development and Production of Palm Wine Flavor
- Preservation of Kunu – Zaki
- Production of Bio gas and Bio- fertilizer from animal wastes using 42m^3 floating Digester
- Design and Fabrication of Saw Dust Burner

SOME READY-FOR-MARKET PRODUCTS

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CONCLUSION

Nigeria's quest for sustainable development must be through massive deployment of STI in the development of indigenous capabilities; new infrastructure for innovation; production of data base of all commercializable R&D results and innovations in support of STIs; and the need for partnership and effective information sharing among the principal actors to accelerate development through Science, Technology and Innovation.

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