

Benefits of Biotechnology



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AFRICA IS DETERMINED TO BE PART OF TODAY'S GLOBAL- KNOWLEDGE BASED ECONOMY

PEAP- National Blue Print for Development

- **Several pillars**
- **One of them is the Plan for modernisation of agriculture**
- **We need technologies that we make us be effective part of the so called knowledge based economy**

-NEPAD- CAADP IMPLEMENTATION AREAS

INVESTMENT AND POLICY PRIORITY AREAS THE FOUR CAADP PILLARS

**LAND MANAGMT
AND
WATER CONTROL**

**SMALL & LARGE
SCALE IRRIGATION
MANAGEMENT &
DEVELOPMENT**

**LAND MANAGEMENT
POLICY AND
CAPACITY**

**SOIL FERTILITY
RESTORATION
& CONSERVATION**

**INFRASTRUCTURE
AND
MARKET ACCESS**

**GLOBAL TRADE
POLICIES AND
AGREEMENTS**

**EXPORT
INFRASTRUCTURE
SUPPLY CHAIN
DEVELOPMENT**

**QUALITY CONTROL
& MANAGEMENT
SYSTEM
DEVELOPMENT**

**HUNGER
REDUCTION &
SAFETY NETS**

**FOOD
EMERGENCY
MANAGEMENT**

**LIVELIHOOD
PRIORITY SECTORS:
NERICA, CASSAVA,
MAIZE, FISHERIES,
LIVESTOCK**

**NUTRITION
SCHOOL FEEDING
SCHEMES AND
HIV/AIDS**

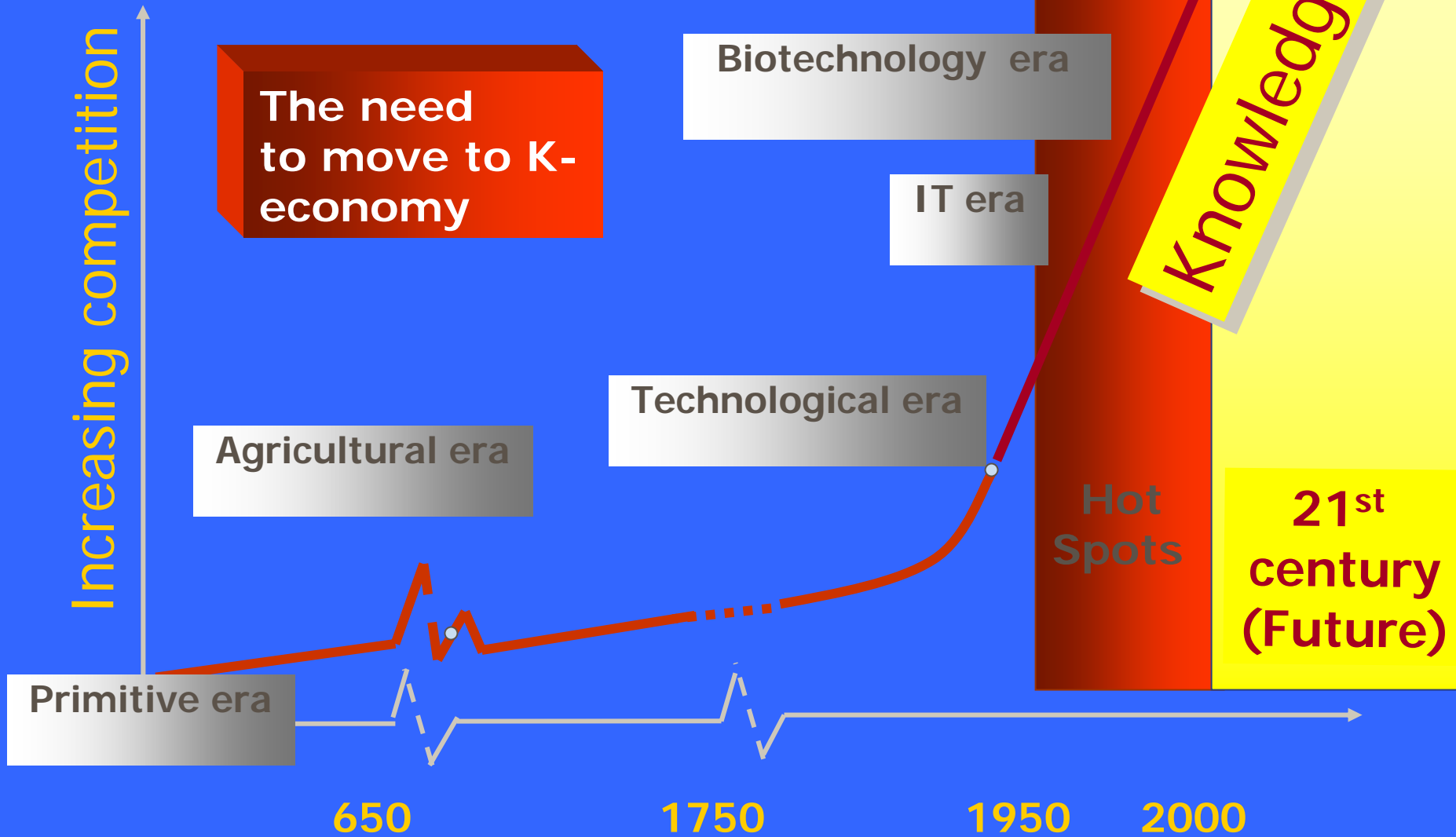
**RESEARCH
AND
TECHNOLOGY**

FAAP

**SEED TECHNOLOGY
DEVELOPMENT,
ACCESS AND
DISSEMINATION**

**NARS/SROS
CAPACITY
BUILDING,
RESEARCH &
TRAINING**

The Global agenda





New R4D challenges

- With the advent of K-economy, there is a need for R&D-based innovations to contribute towards
 - wealth creation and
 - improvement in the quality of life.

Excellence in research (either fundamental or applied) should benefit and contribute (short term or long term) to the community, industry and towards nation building

The benefits of biotechnology are many and include providing resistance to crop pests to improve production and reduce chemical pesticide usage, thereby making major improvements in both food quality and nutrition."





Importance of Biotechnology

- The world population is increasing.-
Uganda's population to double by 2050.

Implications

- Pressure on natural resources
 - land for food,
 - Energy,
 - Other natural resources



Importance of Biotechnology

Why engage in biotechnology

- Innovations will triple crop yields without requiring any additional farmland, saving valuable rain forests and animal habitats.
- Innovations can reduce or eliminate reliance on pesticides and herbicides that may contribute to environmental degradation.
- Others can preserve precious ground soils and water resources.



Generations of Biotechnology

- **First generation-** Use of living organisms to cause change
- **Second generation-** Mass production, vaccines etc
- **Third generation-** mainly genetic engineering- towards improved bioresource use



Biotechnology. A Review

Plant Breeding-

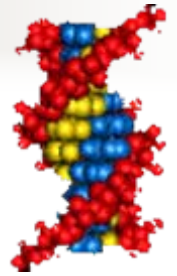
- People have been modifying plants, animals and microorganisms for specific uses for centuries.
- For centuries, humankind has made improvements to crop plants through selective breeding and hybridization -the controlled pollination of plants.
- This gave us the green revolution-
- Produced hybrids, open pollinated varieties resistant plants etc



Plant biotechnology

- Plant biotechnology is an extension of this traditional plant breeding with one very important difference
- Plant biotechnology allows for the transfer of a greater variety of genetic information in a more precise, controlled manner allowing development of crops with specific beneficial traits and without undesirable traits.

How biotechnology review



The genome concept:

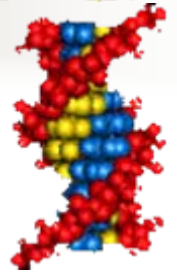
- **The Chromosome:** Complex carrier of genetic information.-A packed form of genes (heritability factors and protein material
- **The gene.** Basic Heritable unit passed on from parents to offspring.
- **DNA.** Is the building material of the gene
- The DNA (deoxyribonucleic acid) from different organisms is essentially the same

How biotechnology works

- Life- a series of organized chemical reactions with proteins as the driver
- The DNA instructs cells to make the proteins that are the basis of life.
- Transcription- translation- effector molecules

DNA → RNA → Protein

How Biotechnology works



- It's the manipulation of DNA and how it works that constitutes modern molecular biology.
- Other aspects of modern molecular biology includes the used of plant tissue culture.
 - Based on the principles that cells contain all genetic information to generate new complete organisms (i.e.Totipotency)
 - Regenerate plant tissues from leaves, stems roots etc



Biotechnology and Agriculture

Agronomic or "input" traits

- These create value by giving plants the ability to do things that increase production or reduce the need for other inputs such as chemical pesticides or fertilizers.
- The aim is to reduce the cost of production and environmental pollution
- Examples: Bt Cotton, Maize herbicide resistance



Biotechnology and Agriculture

Quality traits — or "output" traits

- Help create value for consumers by improving the quality of the food and fiber produced by the plant.
- Examples include fortified foods eg sorghum - *Waxy starch, starch enhanced cassava*
- We are yet to tap into these areas



Biotechnology and Agriculture

Renewable energy

- Seeds will become energy-efficient, environmentally friendly production facilities that can manufacture products which are today made from nonrenewable resources.
- A oil seed rape and other sources could serve as a factories to add beta carotene to oil to alleviate the nutritional deficiency that causes night blindness



Biotechnology and Agriculture

Plant tissue culture

1. Producing disease free planting material-meristem tip culture method
2. Massive production of vegetative planting material



Biotechnology and Agriculture

Disease diagnosis and control

1. ELISA-Enzyme Linked Immuno Sorbent assay for viruses
2. Western blots- viruses
3. PCR- various micro-organisms
4. Study disease development and monitoring- use probes to track pathogens



Biotechnology and Agriculture

Disease diagnosis and control

1. Vaccines for animals to protect against diseases otherwise not controllable.
2. Biotechnology is also used to produce pharmaceuticals, such as human insulin for diabetics and medicine to treat numerous diseases.

Thank you for your attention

