Use of Biotechnology in the Management of Biodiversity

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Background information

- Biotechnology
  - Techniques for manipulating biological systems to obtain desirable products and services

- Conventional biotechnology: based on phenotypes and products
  - Selection and 'breeding'
  - Provision of specific environments; nutrients, temperature, etc.
  - Been used in:
    - Medicine, agriculture, dairy
    - Beverages
    - Other fermentation products (fermented foodstuffs)
    - Biogas systems

Background information Cont.

- Modern biotechnology: based on DNA properties
  - The gene: DNA section responsible for polypeptide (protein); and indirectly the phenotype
  - Markers: DNA sections located very close to the gene; probability of being separated from the gene during meiotic crossing-over is low
- Can be used in:
  - Genetic transformation
  - Marker assisted selection/breeding
- In agriculture (Bt cotton, etc)
- Medicine (*E.coli* insulin, etc.)

Biodiversity: What is it?

- No generally accepted definition of biodiversity but can be said to be:

  "the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems". (Definition adopted by CBD)

- In summary – is the sum total of the variety of living organisms in a given location

Biodiversity Cont.

- Can be distinguished at three different levels:
  - Ecosystem diversity – all species exist and function as part of a wider environment
  - Species diversity – spp. are the central concept of biodiversity
  - Gene diversity – is the diversity of the genetic material of an organism and is the underlying reason for the variability within and between species. Viewed at 3 levels:
    - Diversity between individuals within one popn.
    - Diversity between popn. within one spp
    - Diversity between diff. species

Key points

- Biotechnology: systematic operations/sets of procedures
- There is the SCIENCE, the thinking, data gathering, analytical and deductive exercises laying basis for the procedures
- Whereas the technology is interested in specific genotypes or products, the science is interested in understanding the entire system; the what, how, why and when of biosystem functions; hence works at the level of the systems:

Key points cont.

- Needs the diversity
- Support diversity - provide knowledge on how best to preserve diversity (*in situ* and *ex situ*)
- Be forward looking

Biotechnology is particularly affected by Articles 16 and 19 of the CBD since they require a fair and equitable sharing of benefits derived from the use of genetic resources

Biotechnology and Biodiversity

- Desires of biotech
  - Get more with less:
    - Less space and volume
    - Less money
    - Less labour
  - Enhance efficiency

- Therefore biotech should lead to:
  - Increased yields
  - Reduced expenses
  - Reduced demand for more land to produce
  - Less habitat destruction hence conservation of biodiversity
  - Preservation of germplasm/genepools

Place of Biotechnology in the establishment of the Center for Culture and Biological Diversity at the Chepkoilel University College

- Chepkoilel University College surrounded by:
  - Large and small scale mixed farms
  - Natural and manmade water bodies and marshes
  - Natural and planted forests
  - Relatively arid lands: to the north and east
  - Many streams and rivers

- Biotech capacity at Chepkoilel
  - Medium level lab for conventional and low level biochemical and molecular research
  - Medium level skilled human resource

WHAT IS NEEDED

- Capacity building (further training in biotech)
- Enhanced research
- Linking curriculum with CBD issues
- For conservation (Botanic Garden and Gene bank)
- Folk knowledge data bases
- Technology transfer for improved production


THANK YOU