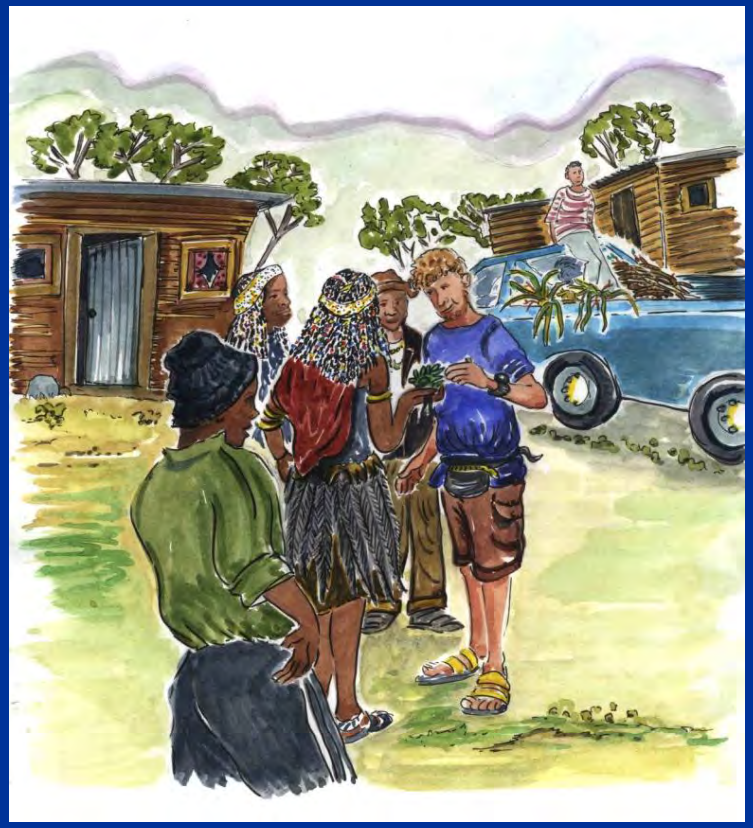
# The Commercial Use of Biodiversity: Access and Benefit Sharing in Practice.

# Session Objectives

- To understand the different ways in which genetic and biological resources are commercialised
- To understand how different sectors engage in and implement ABS
- To understand the basic steps in the bioprospecting process
- Resource: CBD Technical Series 38 (see disk or http://www.cbd.int/abs/casestudies )
- CBD POLICY BRIEF: BIOSCIENCE AT A CROSSROADS

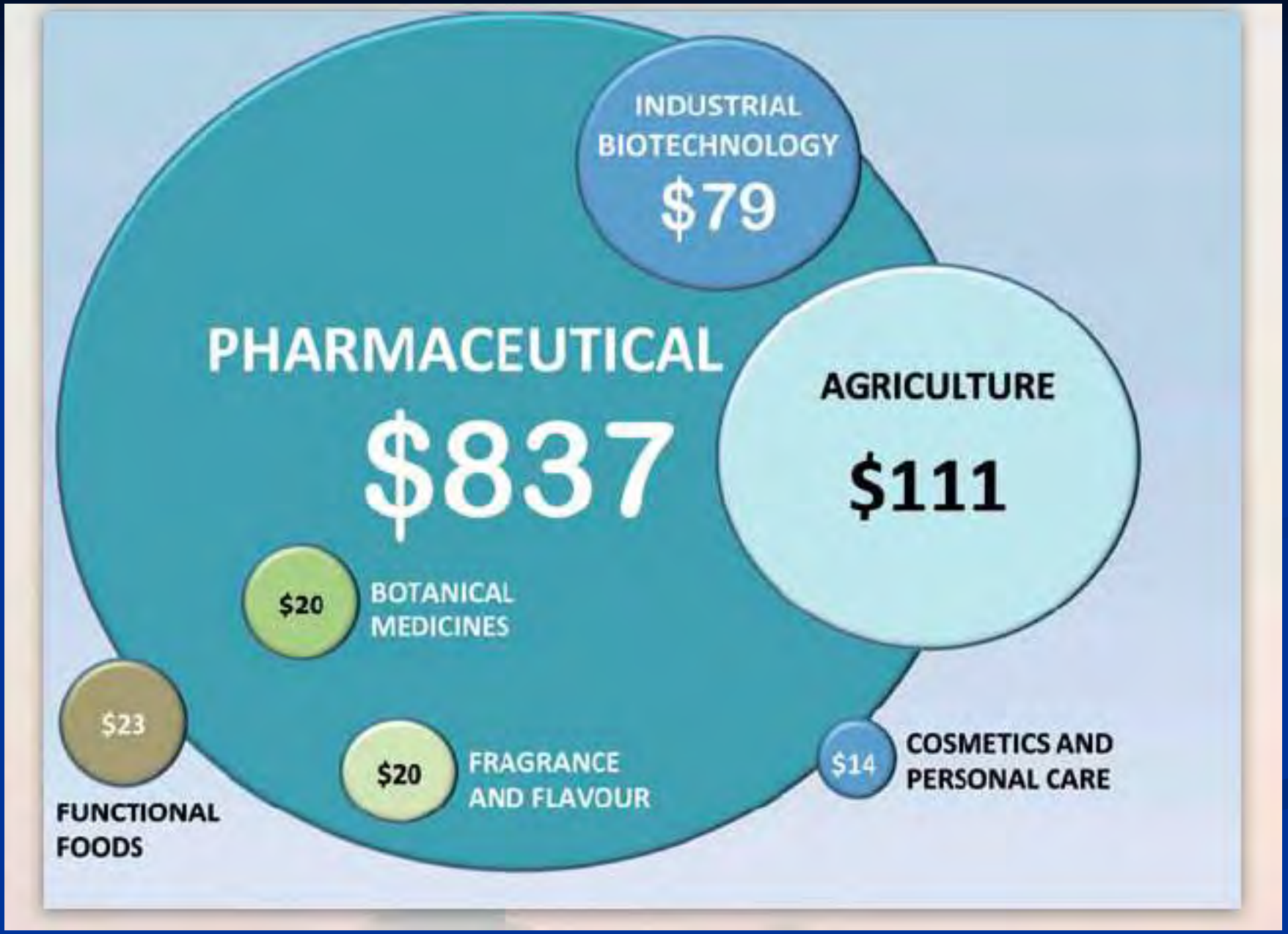
# Overview



- Wide range of sectors undertaking research and developing commercial products from biodiversity
- Unique markets, different requirements and practices
- Understanding poor about the actual research and commercial activities that policy-makers seek to

# Key Sectors

- Pharmaceutical
- Industrial biotechnology
- Seed, crop protection, plant biotechnology
- Animal breeding
- Horticulture
- Personal care / Cosmetics / Perfumes
- Botanicals / nutraceuticals
- Food & beverage


INDUSTRIAL BIOTECHNOLOGY
$79
PHARMACEUTICAL
$837
AGRICULTURE
$111
$20
BOTANICAL MEDICINES
$23
FUNCTIONAL FOODS
$20
FRAGRANCE AND FLAVOUR
$14
COSMETICS AND PERSONAL CARE


RETAILER –
sells final product in retail outlets
INTERNATIONAL BUYER/IMPORTER –
extraction, packaging, marketing
EXPORTER –
sends material abroad in bulk
PROCESSOR/INTERMEDIARY BUYER –
extraction/basic processing/
packaging/marketing
HARVESTERS –
collect material

# Bioprospecting in the 1990s

- Drug discovery model - Screening in pharma industry, often based on TK
- Screening in ag industry, often based on phenotype
- Natural ingredients in cosmetics and botanicals mostly for marketing
- As these industries became more research intensive things changed

# What has Changed?

- Dramatic scientific and tech changes
- Increasing consolidation of companies and mergers
- Changed way technologies and germplasm owned
- Genetic revolution: biotechnology
- Huge biodiversity loss
- Nagoya and CBD have very different environments

## Phase 1
### Collection

This is sometimes referred to as the "harvesting" phase. Samples of biota are gathered from an environment. This usually involves field work. Undertaken by scientists.

## Phase 2
### Isolation

Researchers study the biota, attempting to isolate and characterize the samples collected. DNA may be sequenced or chemical compounds observed and recorded. Usually takes place in a laboratory.

## Phase 3
### Screening

The data gathered from the biota is then analyzed and useful compounds or genetic sequences are identified. This is a labor-intensive process that is usually undertaken by commercial parties.

## Phase 4
### Development

The useful aspect of the biota is isolated and synthetically produced. Once an artificial production process is incorporated, a patent can be filed on the invention based on the useful aspect.

- Leaps in our understanding and fundamental changes:
  - new molecular techniques,
  - Bioinformatics
  - Automated laboratory tools
- Genomics = study of the totality of an individual's makeup
- Proteomics = study of proteins
- Metabolomics = study of substances produced in the cells of organisms
- …

# Key trends

- Distinctions between organisms are not always clear-cut
- Rise of microorganisms
- Genome mining of old sources, switching on pathways
- Greater speed and efficiency
- Greater precision
- Solving supply issues using synthesis or cell cultures
- Means tiny amounts needed

# Key Business Trends

- Huge variation between sectors
- Pharma in major transition, patent expirations and reduced innovation, few new drugs, natural product programs closing down
- Agric: massive consolidation, ownership of genetic technologies, seed and agrichemical converging. Increase in private sector research and decline in public sector research – huge implications

- Industrial biotech – huge growth, supplying food industry, pollution control, green economy. Major interest in microbes.
- Raw materials supplying multiple sectors
- Growth of China as the turntable
- Big growth of natural products based cosmetics, “the story”
- Food – lower value but high volumes

# Demand and Use of Genetic Resources

- Constantly changing but generally demand for wild resources is declining
- Eg Seed industry – demand for wild GR replaced by ex situ and private collections
- Eg Ornamentals – some new but mostly variations on old
- Eg biotech – can generate artificial diversity in lab
- BUT increased reliance on wild by some – eg botanicals as helps with competition
- Increased interest in extremophiles

# Demand and Use of Genetic Resources



- Surge of interest in microbes – technology to extract DNA directly makes available 99% diversity not previously available
- This plus unresolved ownership issues means companies more likely to do research in private collections and their own backyards
- Decline in prospecting in recent years – bulk samples for screening no longer the model

# Compliance and Tracking

*Pelargonium x hortum*
cv 'Vancouver Centennial'

- Significant issue on ABS policy agenda
- Addresses users need for legal certainty and providers need for monitoring
- Requires evolving approach because of S&T changes (eg may not involve physical material)
- Material in closed loop easier to manage (eg Tef, Hoodia)
- Trust and mutual respect between parties are key especially with S&T advances
- Huge challenge to design system that suits all kinds of genetic material and all sectors

# Traditional Knowledge

- Role of TK varies by sector
- Many companies have adopted hands-off approach and **not** widely used in pharma, seed, plant biotech sectors today
- Pharma: focus on disease categories that don't feature highly in TM and increase use of microbes
- Seed, crop protection, biotech: prefer 'hands off' approach because of legal and ethical complications
- Widely used in botanicals and personal care (eg Commiphora, Hoodia, marula) but these are also sectors that know least about CBD and use biological rather than genetic resources

# Benefit-Sharing

- Varies widely across sectors
- Depends on revenue streams and cost and profit structures
- Non-monetary and monetary benefits now standard practice in many sectors
- Seed sector: takes place at different points of chain – TT, royalties, license fees, lab facilities
- Personal care/botanicals etc: little financial returns, mostly in prices paid for material, training, job creation
- Greater benefit for countries that build and market their biodiversity knowledge base and capacity

Secretariat of the Convention on Biological Diversity

CBD Technical Series No. 38

38

# ACCESS AND BENEFIT-SHARING IN PRACTICE:

## Trends In Partnerships Across Sectors

Convention on Biological Diversity
UNEP

# Bioscience at a Crossroads:

## Implementing the Nagoya Protocol on Access and Benefit Sharing in a Time of Scientific, Technological and Industry Change

*By Sarah Laird and Rachel Wynberg*

CBD