

BIODIVERSITY CONSERVATION

O. P. TOKY

PROFESSOR

DEPARTMENT OF FORESTRY

CCS HAU, HISAR 125 004

email: optoky@gmail.com



BIODIVERSITY CONSERVATION

Q. P. TOKY
PROFESSOR
DEPARTMENT OF FORESTRY
CCS HAU, HISAR 125 004

email: optoky@gmail.com

Ag
a
A
Dept of
Sponsors:



Biodiversity : Definitions

- **Norse and McManus (1980) - First definition of biological diversity:**

Genetic diversity (genetic variability within species) plus ecological diversity (no. of species in a community)

- **The term biodiversity coined by Rosen in 1985.**
 - **Totality of genes, species, and ecosystems of a region**
 - **Biodiversity encompasses all life forms, ecosystems, and ecological processes, and acknowledges the hierarchy at genetic, taxon, and ecosystem levels (UNEP).**
-

Why biodiversity is important?

Precious genetic library

- Number of genes range from about 1000 in bacteria and 10,000 in some fungi to 40,000 or more in many flowering plants and a few animals.
 - Genes of wild species have been used to confer new properties such as disease resistance or improved yield upon domesticated species.
 - Limitless possibilities.
 - Extinction of any one species means a lost opportunity for transferring potentially useful genes to other species.
-

Biodiversity and Human Health

- One out of every 125 plant species studied at the Herb Research Foundation, Boulder, has produced a major drug. Market value of these drugs in the US is at least 200 m. \$ per year.
 - 118 out of the top 150 prescription drugs, 74% are based on plants, 18% on fungi, 5% on bacteria, and 3% on vertebrates (all from the snake *Bothrops asper*).
 - Of the top 10 prescription drugs in the US, 9 are based on natural plant products.
 - In 1990, sales of prescription drugs with active ingredients of plant origin were about \$ 15500 million.
 - Losing one tree species a day means losing 3-4 potentially valuable drugs every year (at a total cost of \$ 600 million).
-

Examples of plant-derived substances developed into valuable drugs

Codeine: Analgesic, Antitussin: *Papaver somniferum*

Digitalin: Cardiotoxin, Antimalarial: *Digitalis purpurea*

Quinine: Antimalarial: *Chinchona ledgeriana*

Vincristine, Vinblastine: Alkaloids used in Hodgkinson's disease, lymphocytic leukaemia: *Catharanthus roseus*

Taxol: Ovarian cancer: *Taxus brevifolia*

Castanospermine: Anti HIV activity: *Castanospermum australis*

Artemisinin: Antimalarial agent: *Artemisia annua*

Theokal: Arrhythmic: Hawthorn

Thisilyn: Liver damage: Milkthistles

Ecosystem services and functions

- Regulation of Gas, Climate, Disturbance and Water quality
 - Water supply, Erosion control and Sediment retention
 - Soil formation, Nutrient cycling and Waste treatment
 - Pollination, Biological control, Refugia and Primary production
 - Genetic resources, Recreation and cultural opportunities
-

**How many species are there on
the earth and how are they
packed ?**

Current Knowledge

- Only 1.75 million have been described and named.
 - Less than one-tenth of one per cent of species are exploited by humans; the rest remain untested.
-

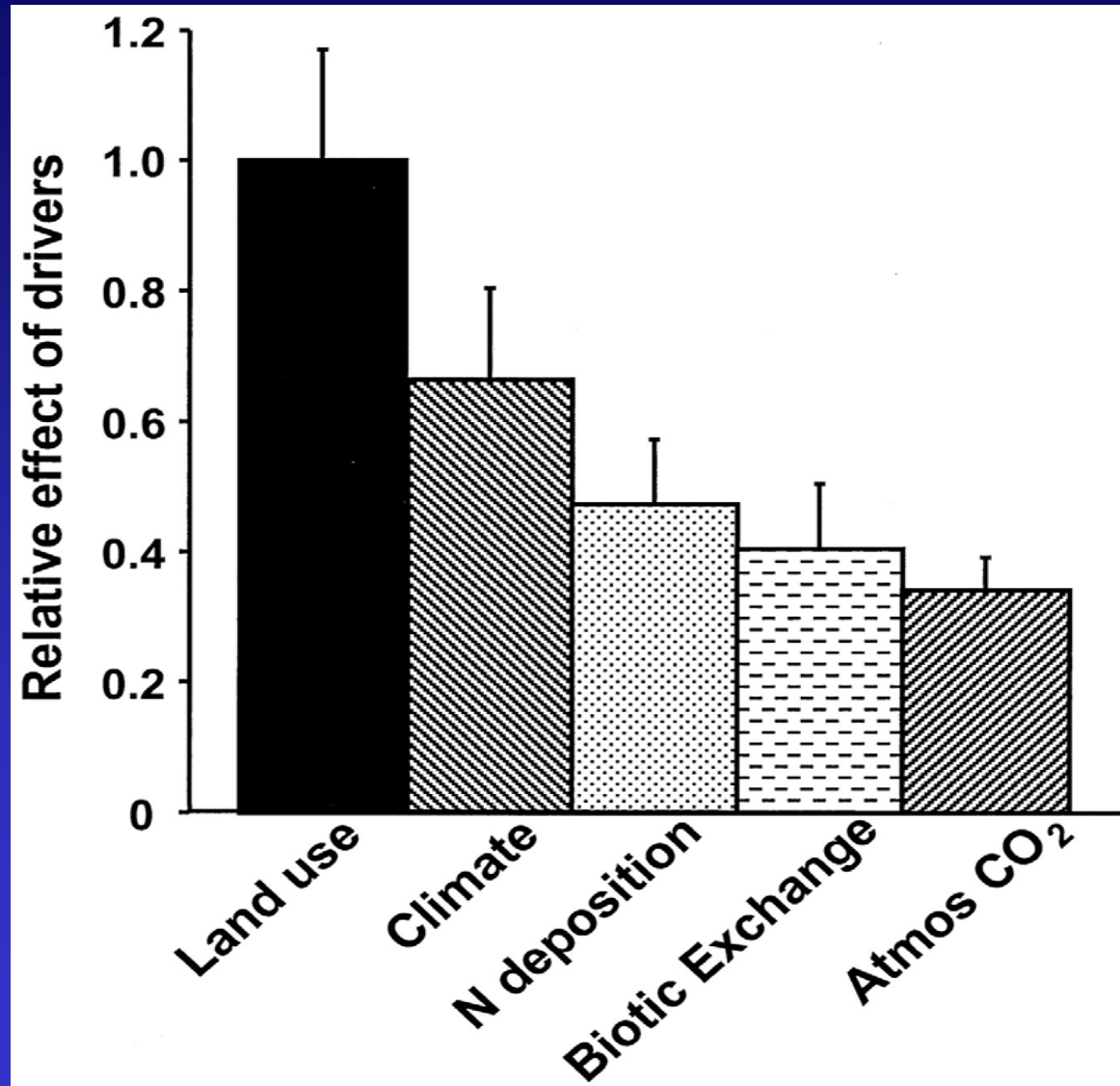
Trees

(300 insect and several bird spp per tree species)

WCMC estimates:

- 80% of all tree spp are in tropics
 - 77 tree species are already extinct
 - 10% of the World's 100,000 tree species are threatened
 - 976 spp are critically endangered
 - In India Ilex khasiana has only 3-4 trees
 - Number of critically endangered tree spp:
 - Malaysia 197, Indonesia 121, India 48,
 - Brazil 38
-

Major drivers of biodiversity change



Biodiversity Conservation

In situ:

- i. Protected area network; corridors (India 550 Parks & Sanctuaries - 4.1% of land surface - requires 10% of land surface).
- ii. Appropriate management practices
- iii. Restoration of degraded habitats.

Ex situ:

- i. Botanical, Zoological gardens, germ plasm bank, tissue culture bank, gene bank, etc.
- ii. Reduce anthropogenic pressure by cultivation elsewhere.

Rehabilitation of threatened species

- i. Augmentation
 - ii. Reintroduction
 - iii. Introduction
-

Biodiversity Hotspots

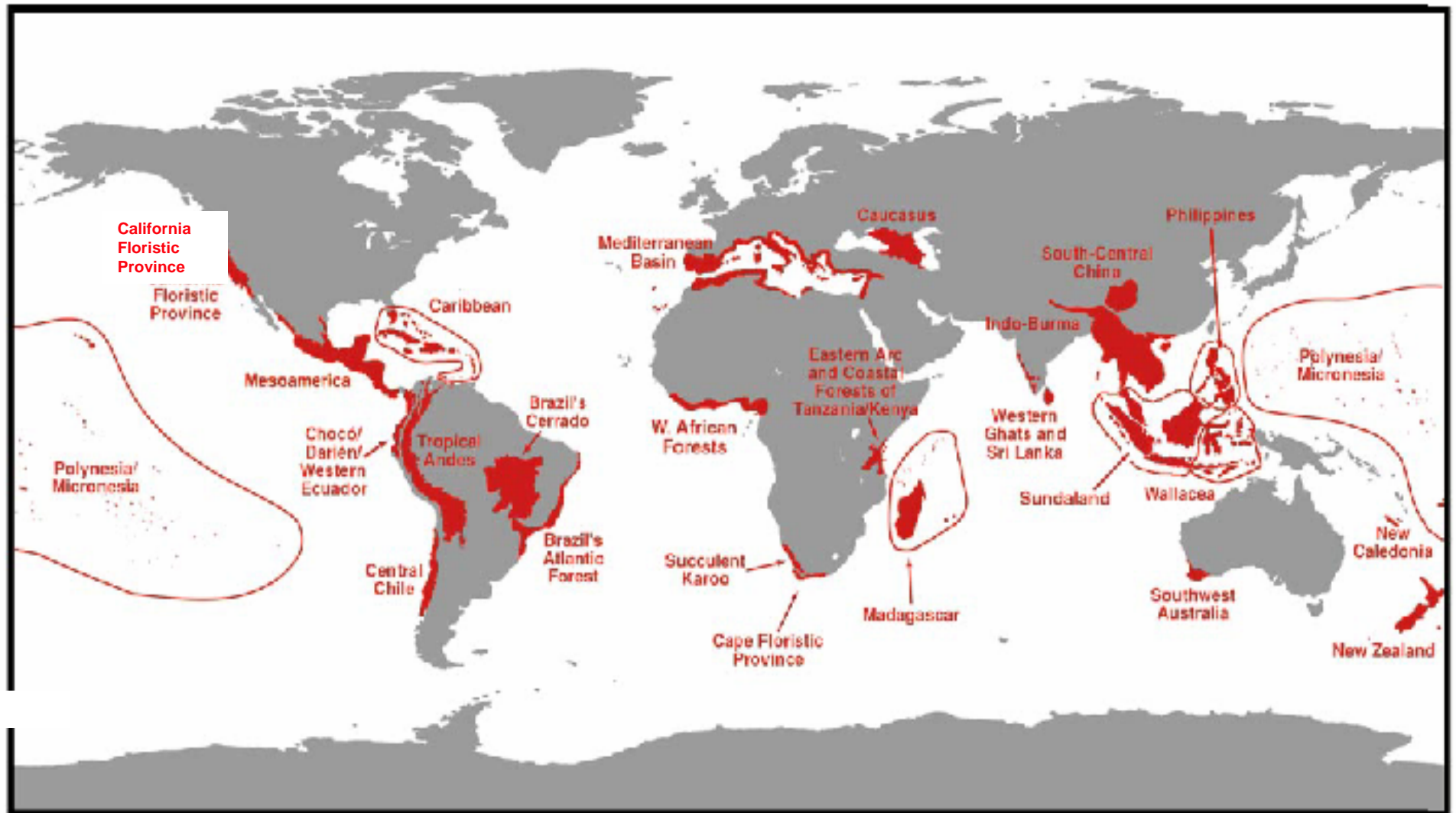


Figure 1 The 25 hotspots. The hotspot expanses comprise 30–33% of the red areas.

Biodiversity Hot Spots

- Should contain at least 0.5% (i.e. 1500) of all plant species (i.e. 300,000) as endemics
- Should have lost 70% or more of its primary vegetation

The 25 hot spots

- Contain 133,149 plant species (44% of all plant species and 35% of all vertebrate species)
- Aggregate expanse 2.1 m km² or 1.4% of earth's land surface
- Formerly occupied 17.4 m km² or 11.8% of land surface (have lost 88% of their primary vegetation)
- Several habitat types: Tropical forests in 15, Mediterranean-type zones in 5, nine are Islands and 16 hot spots are in tropics.

Nine areas recognised as Leading hot spots and eight as hottest hot spots.

Western Ghats/Sri Lanka and Indo-Burma are among the hottest hot spots.

Subsidies

- **World Bank, International Monetary Fund indirectly encourage Govts to deplete their natural resources to pay off debt.**
 - **Subsidies for agriculture → Overuse of croplands, erosion, pollution from fertilizers, pesticides**
 - **Fossil fuels → acid rain, global warming**
 - **Road transport → pollution, loss of landscape**
 - **Water → overuse and misuse**
 - **Fisheries → over-harvesting, depleted fish stock**
-

Indian Scenario

- **Total species 126,188**
 - **India has 2.4% of land area of the world but contributes 8% species to global diversity.**
 - **India has contributed 167 cultivated plants and several domesticated animals: rice, sugarcane, banana, mango, cucumber, egg plant, citrus, jute, jackfruit, ginger, black pepper, turmeric, bamboos and several medicinal plants, water buffaloe, camel, etc.**
 - **Secondary centre of domestication for horse, goat, sheep, cattle, etc.**
 - **These resources were treated as common heritage of mankind and no patents were asked for.**
-

Developed vs Developing Countries

- Most of the biodiversity is located in tropics. Access to this biodiversity is vital for continued growth of biotechnologies, and industrial countries would want this access to remain open.
 - They also recognise that biological diversity is rapidly eroding and they would want the developing countries to conserve them.
 - Developing countries, in turn, would want to ensure that the benefits of utilization do not all flow to the North.
-

Sovereign Property

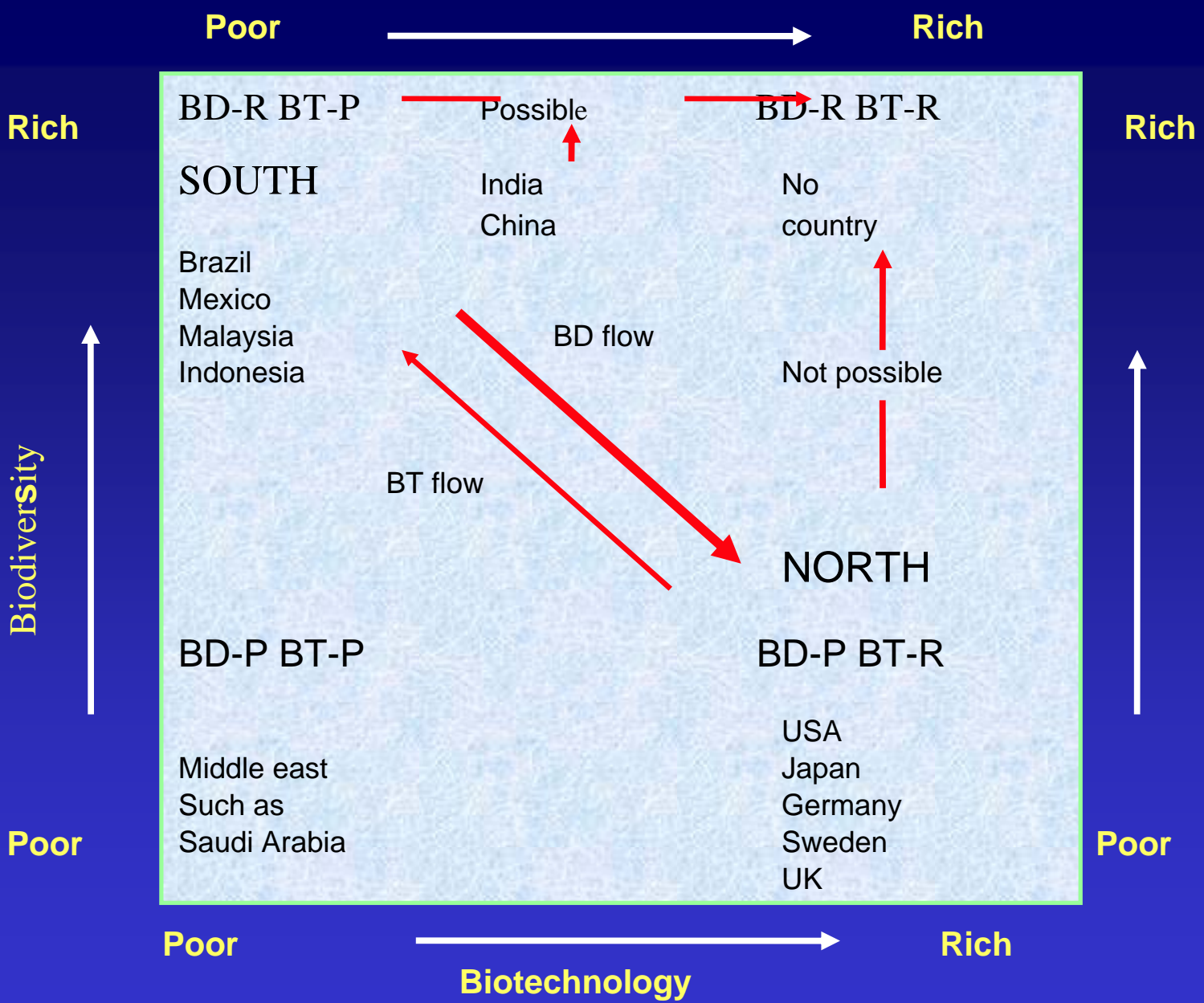
- **United Nations Conference on Environment and Development held at Rio de Janeiro in June 1992**
 - **Convention on Biodiversity.**
 - **(157 countries have signed and 127 have ratified)**
“Biological diversity resources will be treated as a sovereign property of the country of origin”.
 - **Country of origin shall not block access to such resources - but access has to be on the basis of countries’ prior informed consent and on a mutually agreed terms.**
-

Policy

Formulation of policies in gene-rich/technology-poor countries is necessary to avoid “**gene imperialism**”.

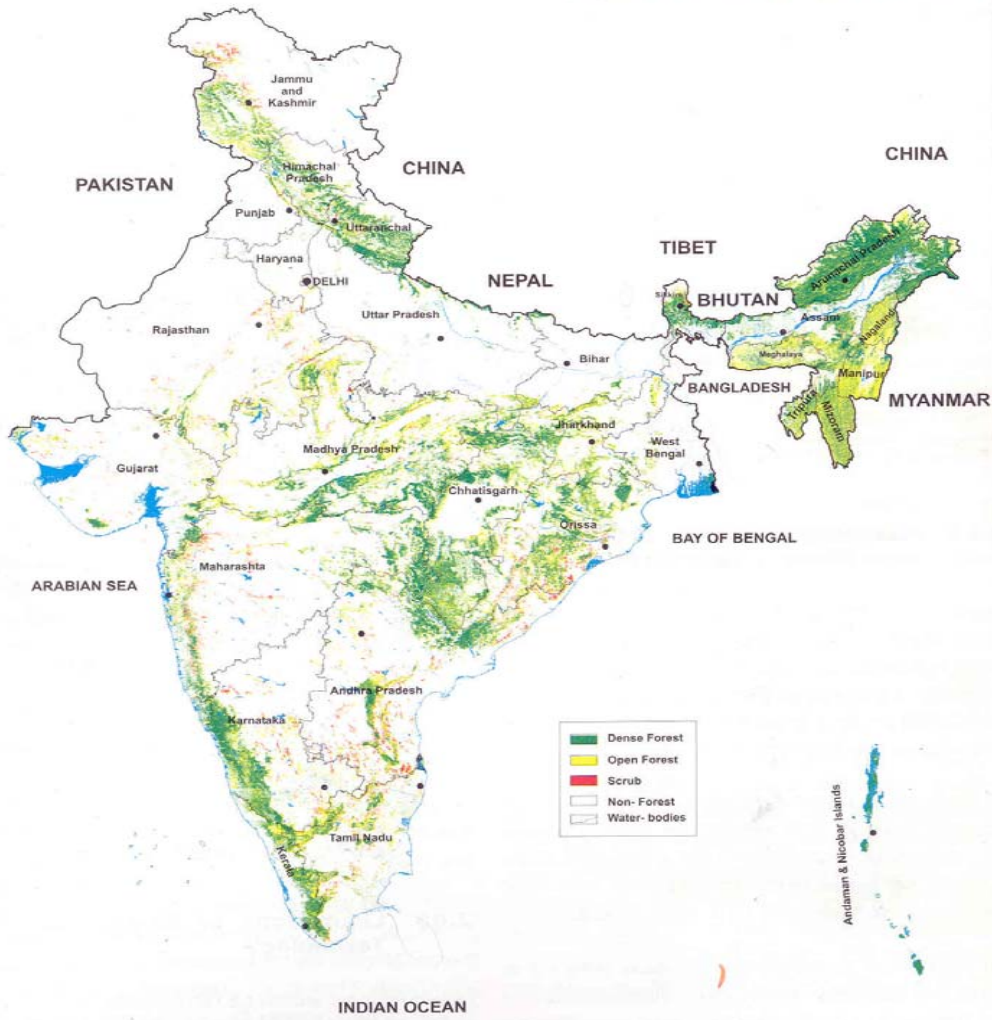
Two options:

- **Emphasize regulatory measures denying access to genetic resources, information on their location, properties and uses.**
 - **Emphasize promotional measures, develop good information and make it widely and easily accessible.**
-



Countries in the south have to become self-reliant in Biotechnology

FOREST COVER OF INDIA



Forests

: 19.27%

People

: 1000 million
(73% Rural)

Tenure

: Forest Govt.
Owned

**Pressure on
forests**

: Heavy

Key policy

: JFM,
Agroforestry

CONCEPT OF AGROFORESTRY



FIRE : A DERIVING FORCE



AUSTRALIAN EXPERIENCE



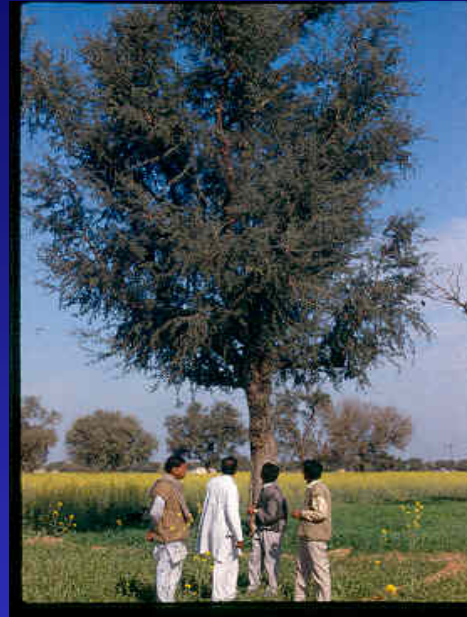
DRY LAND FARMING



KHEJRI - CROP COMBINATIONS



VARIATIONS IN *KHEJRI*



Interaction of khejri and crops

Distance from tree (m)	Grain weight per plant (g)	
	Gram	<i>Brassica</i>
0-2	11.4.	26.5
4-4	11.2	23.7
4-6	8.6	19.9
Open	8.1	18.4
C.D.	0.68	0.82

COMMERCIAL AGROFORESTRY



MULTISTORIED SYSTEMS



Thanks...



