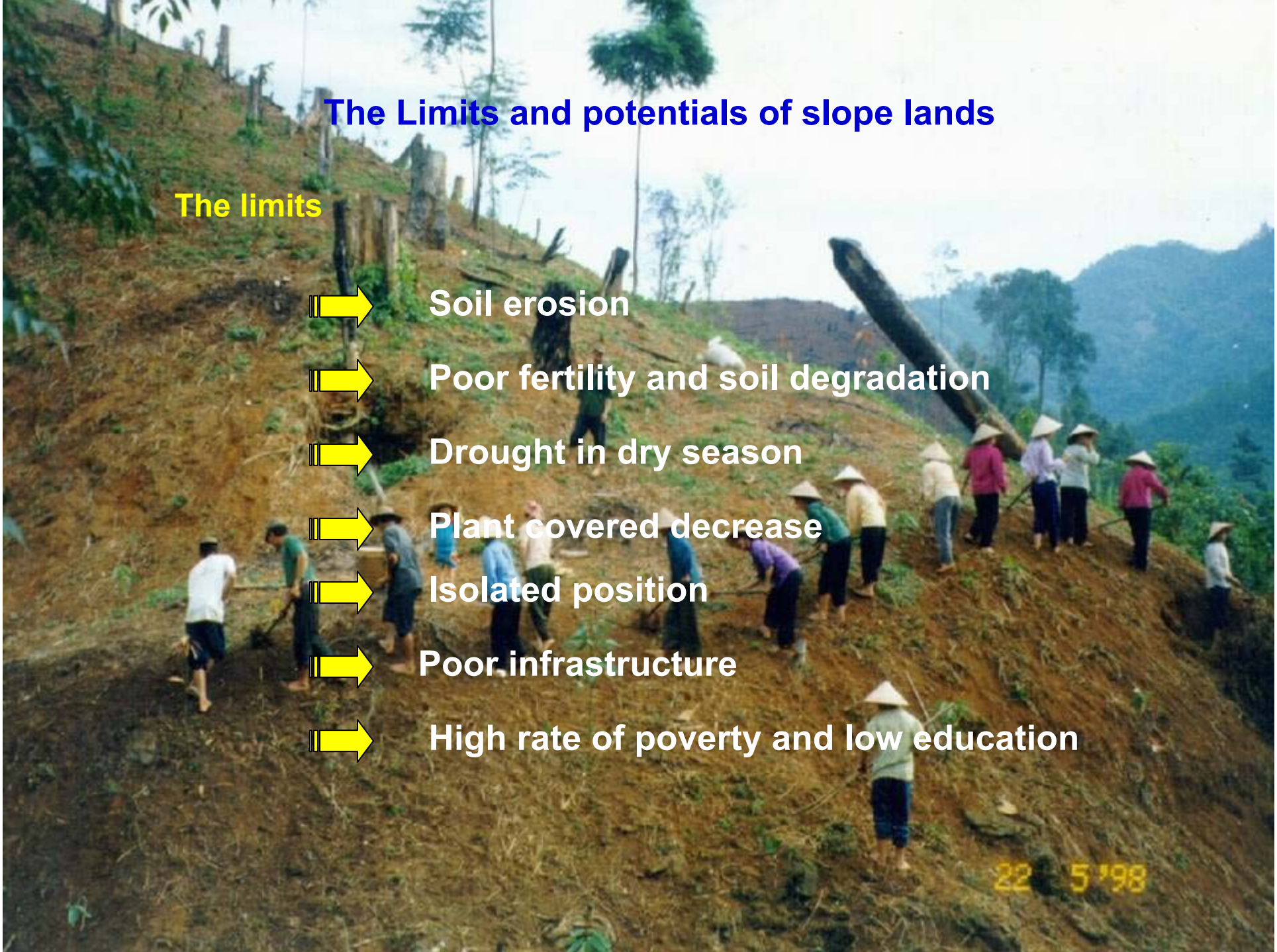


The Limits and potentials of slope lands

The limits

- Soil erosion
- Poor fertility and soil degradation
- Drought in dry season
- Plant covered decrease
- Isolated position
- Poor infrastructure
- High rate of poverty and low education

Development of indigenous technologies for sustainable Sloping land use iN Northern mountainous areas of Vietnam

Le Quoc Doanh
Ha Dinh Tuan
Vietnam Agricultural Science Institute


Potentials
Expand areas for cultivation
Forest potentials
Potentials for comercial crops' development
Energical potential
Livestock development

Tendency of changing land use systems in upland areas

Traditional shifting cultivation to non-traditional shifting cultivation

Traditional cultivation

- Hole and sowing *(minimum tillage)*
- Longterm of fallow period *(Low cultivation coefficience)*
- Slow degradation of soil fertility

Non-traditional cultivation

- Careful land preparation *(maximum tillage)*
- Shorten of fallow period *(High cultivation coefficience)*
- Rapid degradation of soil fertility

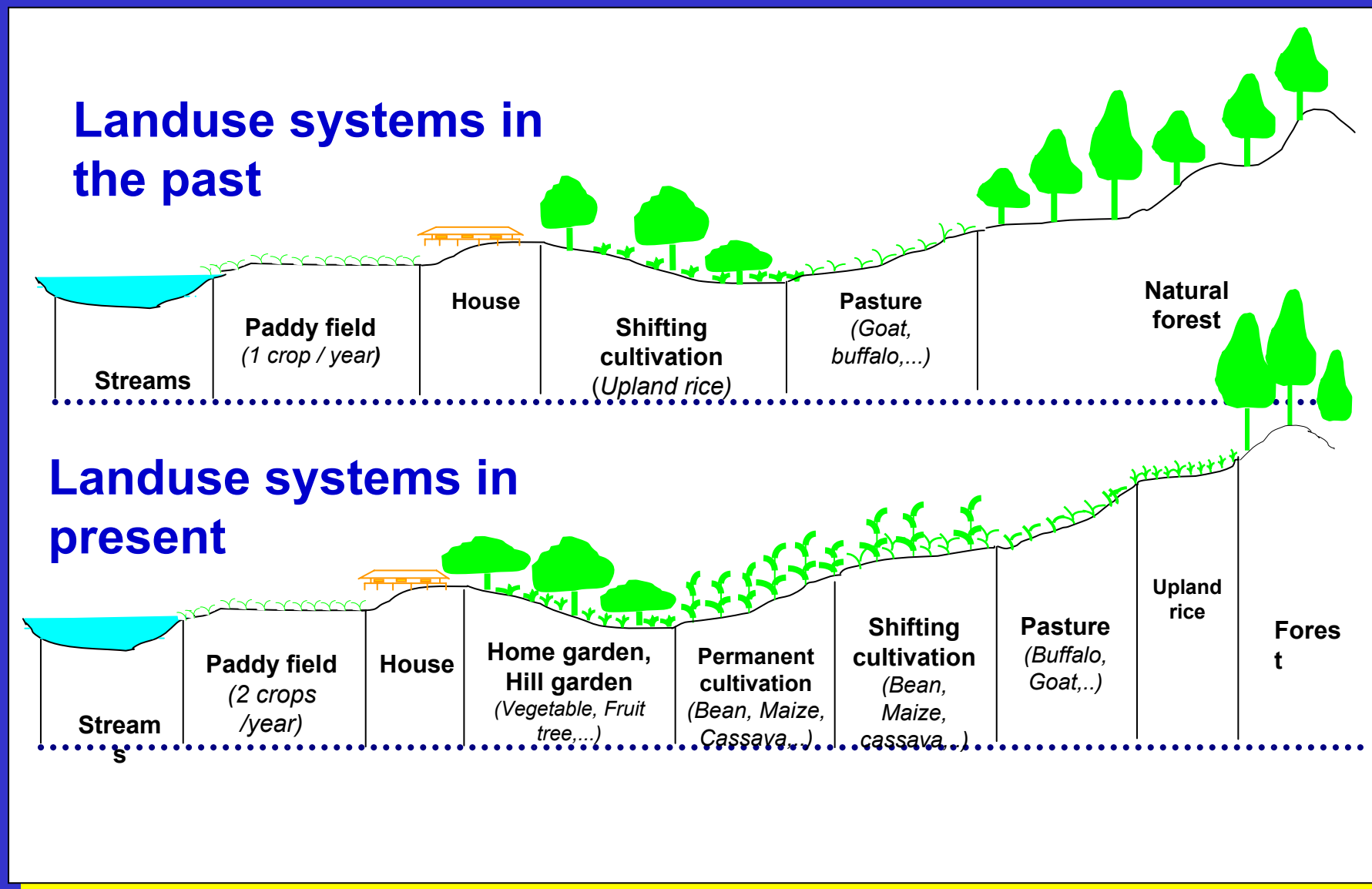
Expansion of permanent cultivation areas

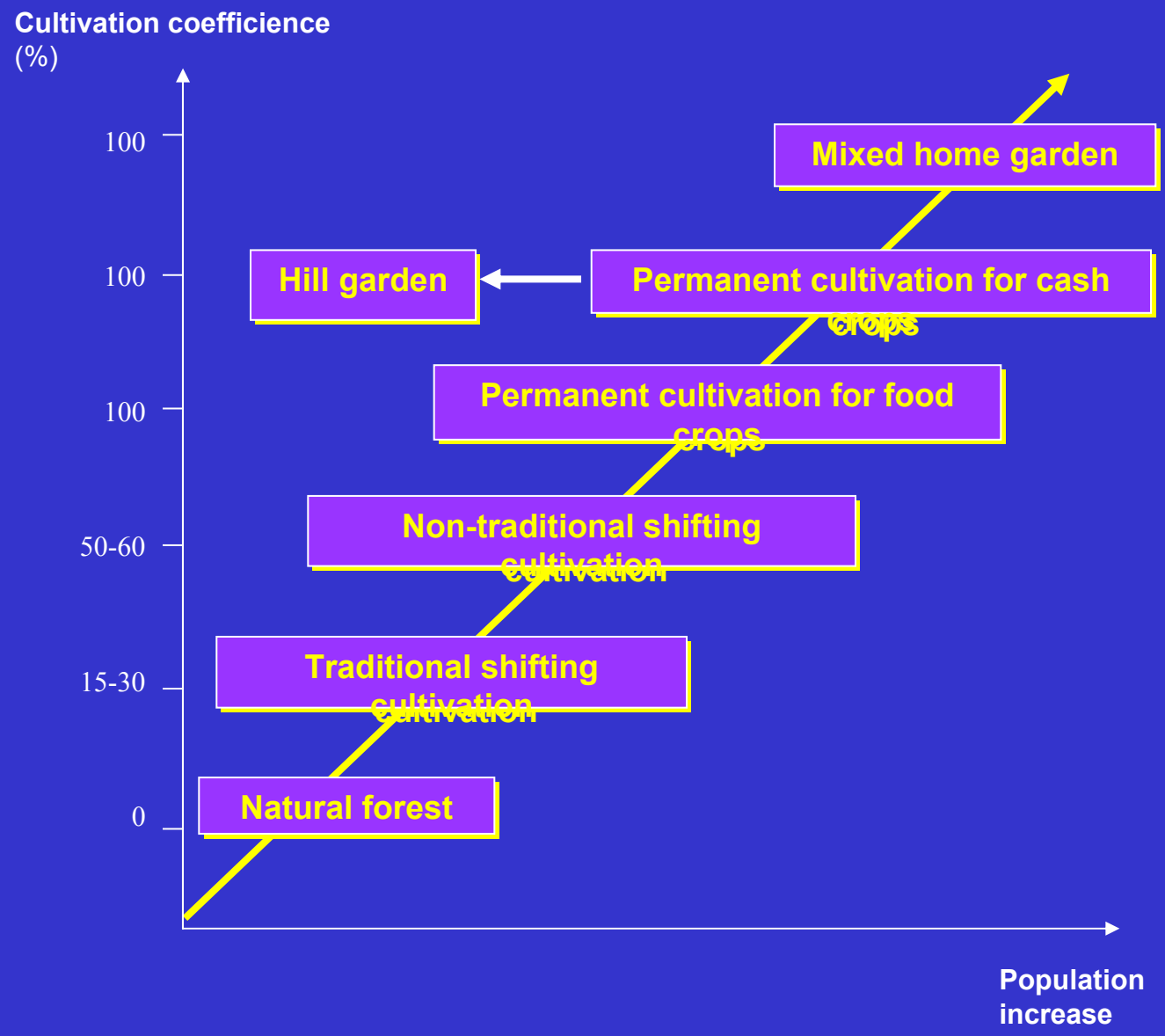
$$\text{Cultivation coefficience (R \%)} = \frac{\text{Number of cultivation years}}{\text{Total years of cultivation cycle}} \times 100$$

(Include cultivation and fallow period)

Year	Land use pattern	R (%)
Before 1954	Traditional shifting cultivation (Long fallow period)	<20
1965	Traditional shifting cultivation (Long fallow period)	20-25
1980	Transfr from traditional shifting cultivation to non-traditional shifting cultivation	30-40
1985	Non-traditional shifting cultivation (Short fallow period)	45-50
Present	Non-traditional shifting cultivation (Very short fallow period)	50-100

Diversitification of landuse system





Tendency of changing landuse systems by increase of cultivation coefficient

Indigenous knowlegdes


Apply green manure

Apply green manure

Intercrop maize with rice bean

Common situation of traditional slash and burn

Need to change the concept on the use and management of SL

•Although the farmers have tried their best to find ways for maintainining their lives and preserve their natural resources, but due to objective and subjective reasons, SL have become very fragile eco-systems, easily to be injured, causing contraints for agricultural and forestry production.

•To ensure sustainability as basis for maintaining and developing agricultural production on SL, we have to change our mind to build the new vision on **the use and management of SL**

•Measures for maintenance and improvement of soil fertility must be highly systematic and diverse, ensuring integration of food production, animal husbandry and forestry development.

Basic principles of Techonologies

Soil erosion control; soil fertility, chemical and physical improvement; Improvement of rain water use efficiency:

- *Permanent soil cover by dead or living vegetal mulch (stop burning any vegetal residues from crops, weeds, litters, etc.),*
- *Direct seeding on vegetal mulch with no- or mini-tillage (minimum soil disturbance),*
- *Improving cropping patterns (intercropping, relay-cropping, crop rotation),*
- *Promotion of soil biological activities;*

Basic principles of Techonologies

- *Diverse technology options to serve fermers with various conditions,*
- *The technologies must be simple, cheap, labor effective, easy to apply and sustainable,*
- *Integration of animal fodder production into crop production systems (reducing pressure on grazing land and on forest resources by less free grazing),*
- *Species adaptation and varietal improvement.*

Using vegetal residues

to cover the soil surface in sloping land


Maize sown directly into dead mulch

Fully weed control

-Control soil erosion
-Maintain soil moisture
-Promote soil biologica
activities


Yield increased 45 %
2003 6 9

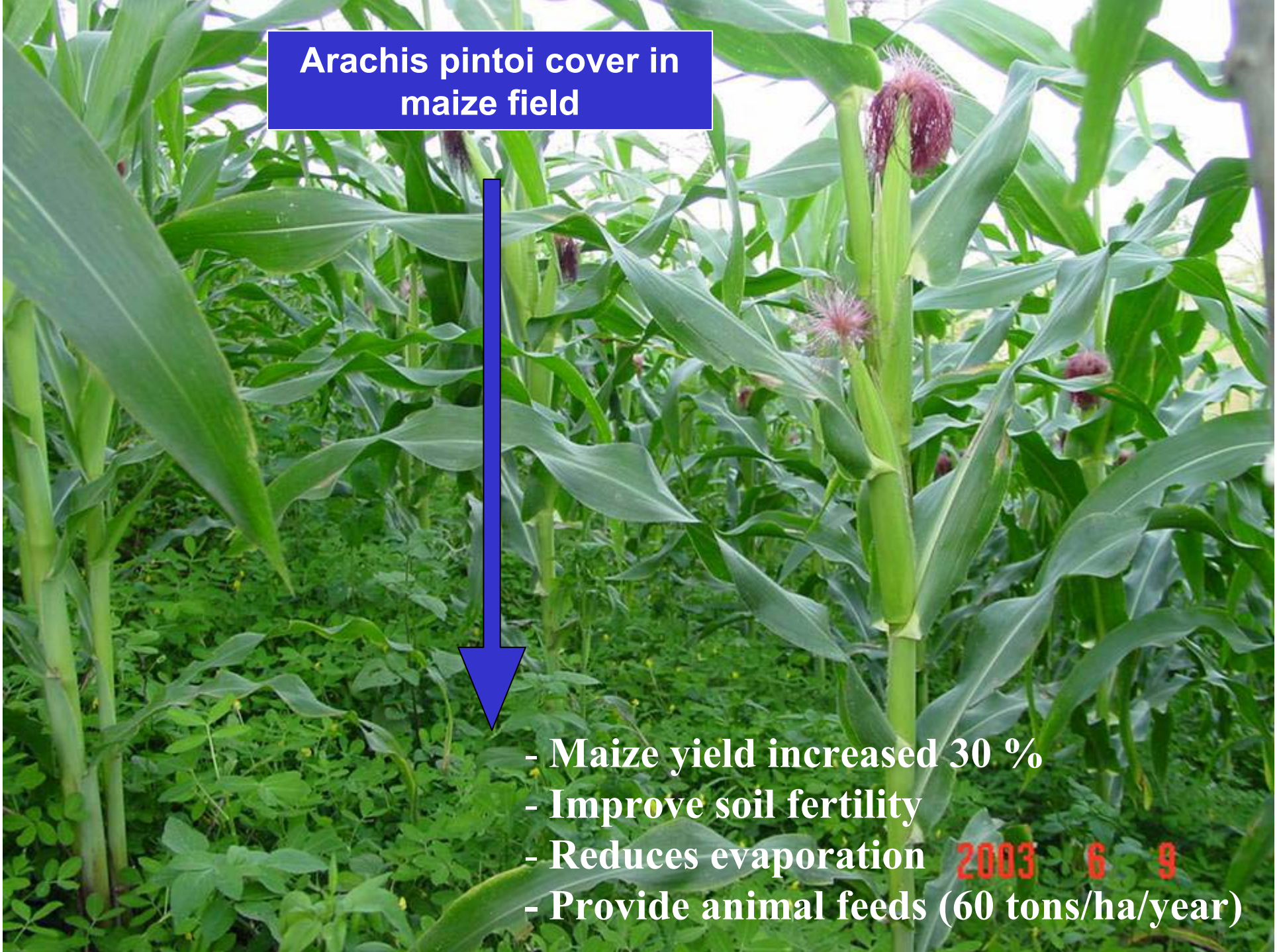
Difference between mulched and un-mulched plots

Maize and wheat sown directly into vegetal mulch

(Note: Complete suppression of weeds)

TOTAL IMPROVEMENT OF SOIL PRODUCTIVITIY

Creation of living vegetal mulch


Arachis pintoi cover in maize field
- Maize yield increased 30 %
- Improve soil fertility
- Reduces evaporation
- Provide animal feeds (60 tons/ha/year)
2003 6 9

Arachis pintoi cover in plum garden ***(after 20 days)***


Lac dai trong 2001
Permane
nt
mulching
-Plum yield increased 25%
-Improve soil fertility
-Reduces weed-crop competition
-Provide 50-70 tons/ha/year
as animal fodder or green manure
2002 11 2

Miniterrace making combined with the soil mulching and mini - tillage

Making mini-terraces


Maize on mulched miniterraces
with Brachiaria riziziensis


Maize on mulched miniterrace with
arachis pintoi cover
-Maize increased 50-80%
-Control soil erosion
-Improve soil fertility
-Provide manimal fodder

Intercropping of legumes in anual crop fields

Intercrop sugar cane with soybean

Intercrop sugar cane with mungbean


Intercrop sugar cane
with soybean
- Reduce soil erosion
- Improve soil fertility
- Increase income from soybean
(1.5 tons/ha)
2003 6 9

Intercrop cassava with peanut

Mono cassava cultivation


Intercrop cassava with peanut
- Control soil erosion
- Improve soil fertility
- Increase income from peant
(1.5 – 2.0 tons /ha)
- And increase cassava yield
2003 6 8