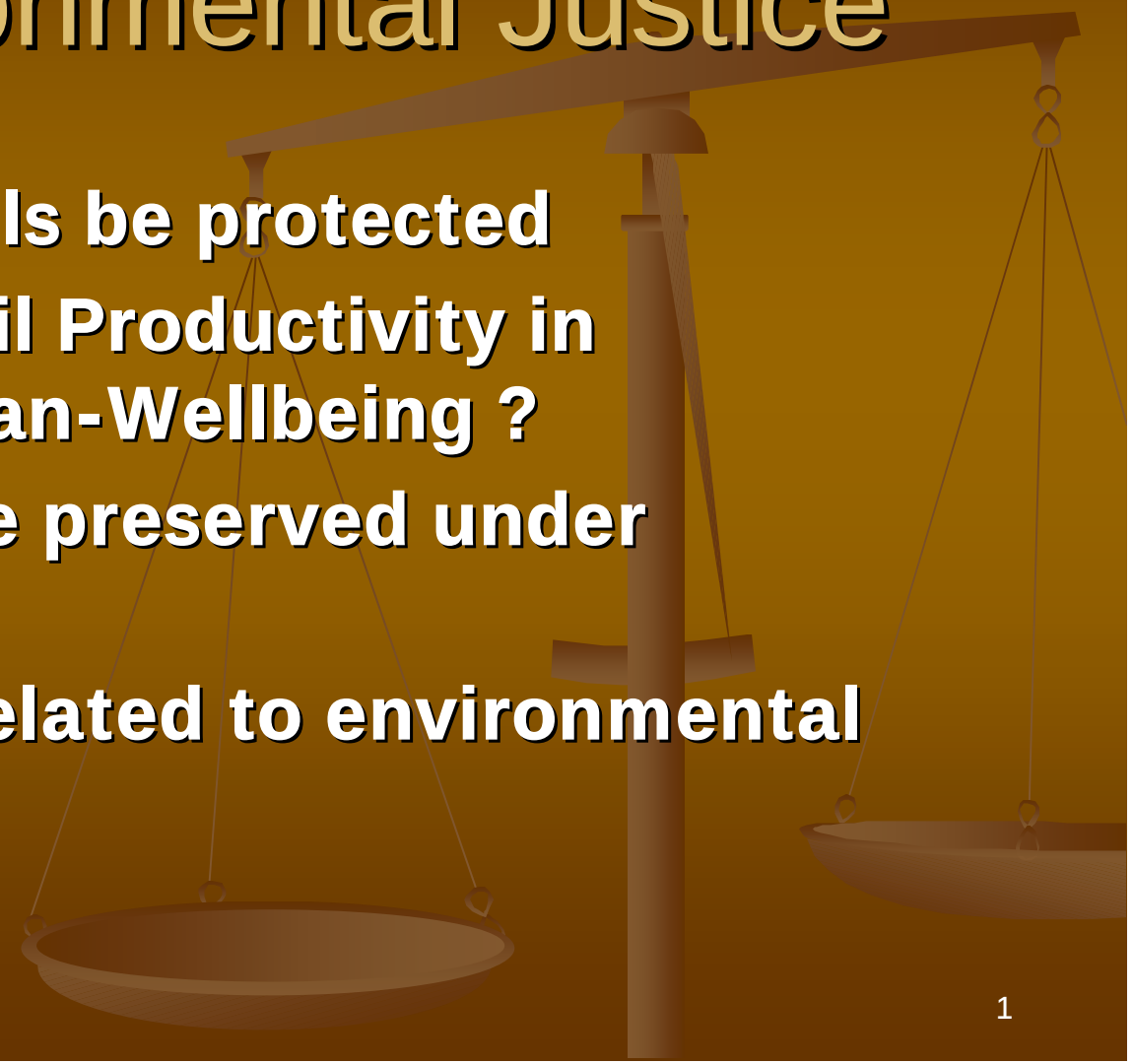
# Soils, Climate, Productivity and Environmental Justice

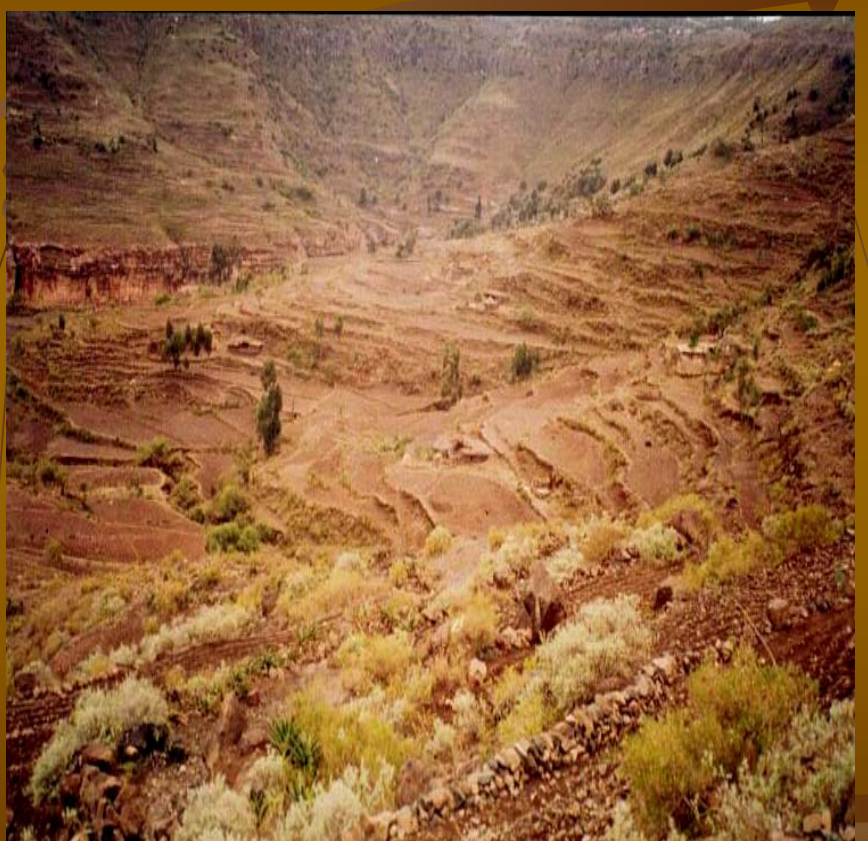


- **Why should soils be protected**
- **Concepts on Soil Productivity in Relation to Human-Wellbeing ?**
- **How can soils be preserved under climate change?**
- **How is all this related to environmental justice?**

# 0. The Status of Soils and its Causes

- The four major soil „syndromes“

- Change of traditional use of formerly fertile soils (Huang He Syndrom)
- Erosion and soil degradation due to industrialized agriculture (Dust Bowl Syndrome)
- Overuse of marginal sites (Sahel Syndrome)
- Overuse of Forests and other natural ecosystems (Sarawak Syndrome)



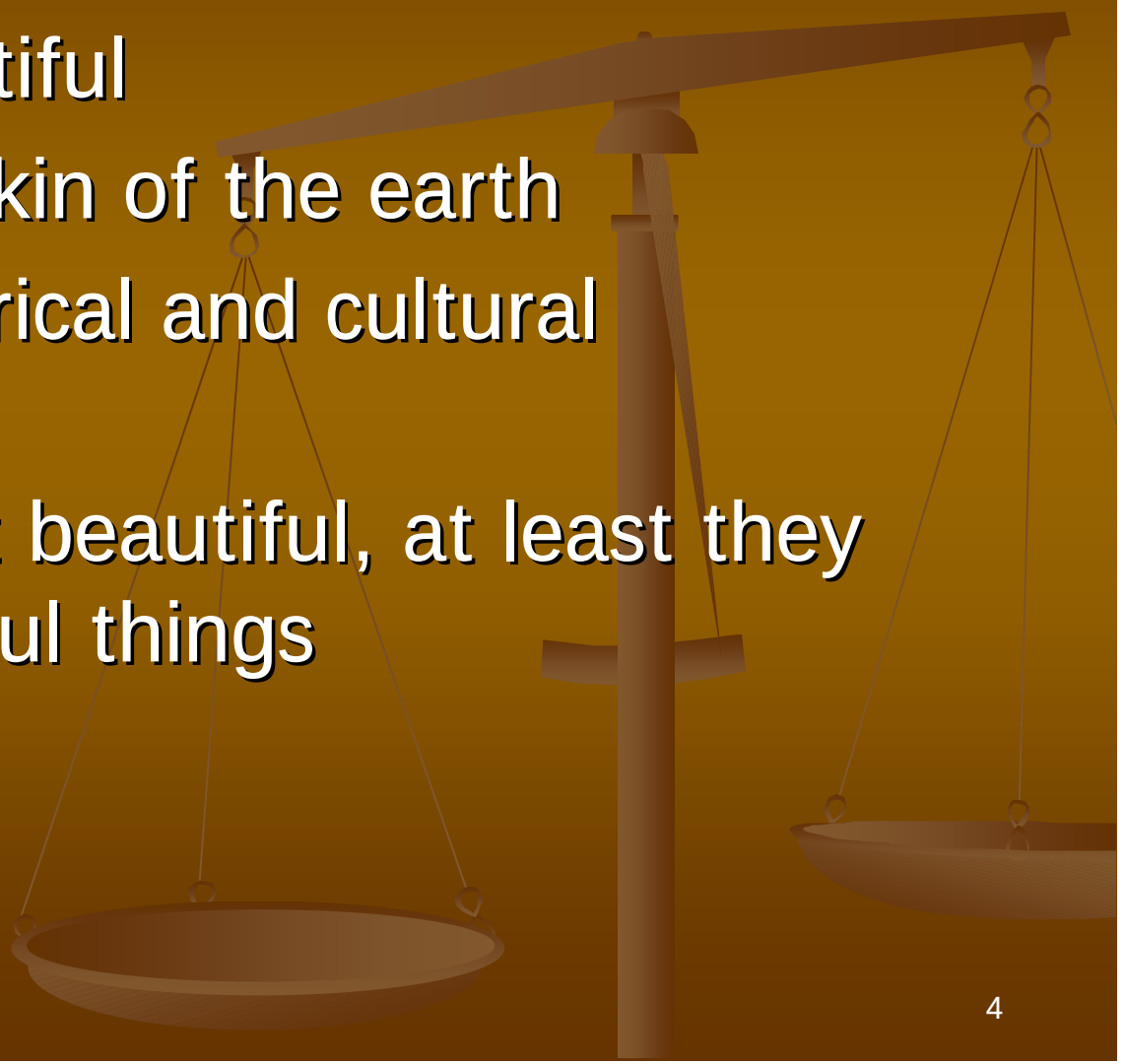
# Introduction: Environmental Justice

- Environmental justice implies that natural resources have to be shared with future generations and among the present generation disregarding ethnicity, gender, age etc… It is thus the precondition of sustainability

- Therefore environmental justice has to be considered within its **temporal, spatial and social dimensions.**

# Why should soils be protected in a sustainable world

1. Soils are beautiful
2. Soils are the skin of the earth
3. Soils are historical and cultural documents
4. If soils are not beautiful, at least they can do beautiful things



# 1. Soils are Beautiful

I hope you agree!!

# because

"If we were to take evolution seriously, the complexity, diversity, delicate balances, the moves of chaos and creativity, the sheer beauty of the earth, we would have a profound sense of wonder, and utter awe and respect for the earth. The immensity, sensitivity, and stunning elegance of life breaks into human consciousness and awakens awareness. Awakening is an ancient spiritual metaphor. To be so moved becomes a source of ethics, values and vision desperately needed in our time."

(Heather Eaton)

# 2. Soils are the skin of the earth

The thin layer of soil covering the earth's surface represents the difference between survival and extinction for most terrestrial life

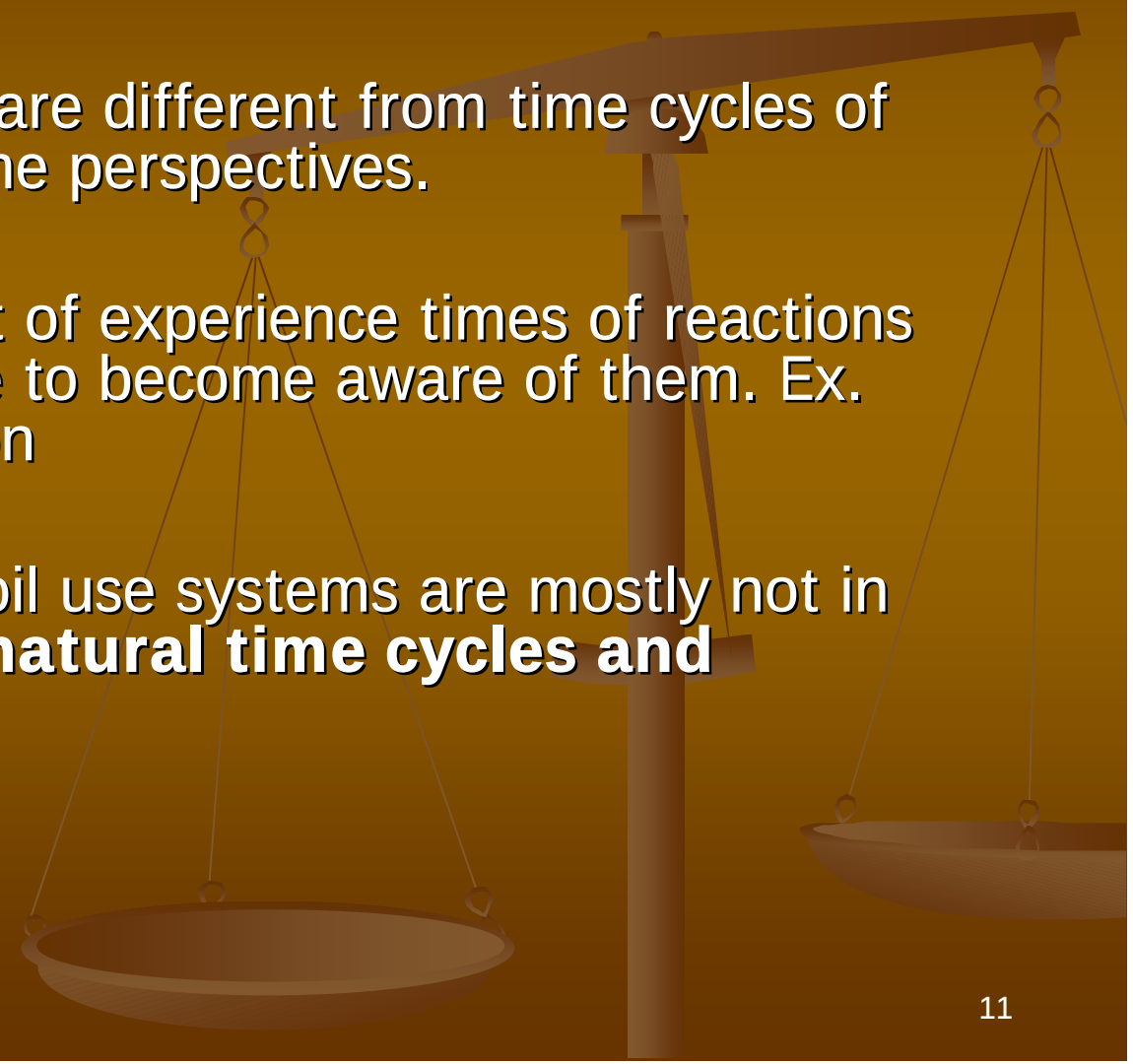
- Soils represent the relatively thin borderline between the surface of the earth and the atmosphere respectively the ground of the seas and the water. It is exposed to all influences coming from the atmosphere, thus has to react to external influences.
- If you realize the picture of the skin, you also will also understand that soil cannot spatially extend. Therefore, soil has **biophysical and socioeconomic as well as cultural dimensions.**

# 3. Soils are historical and cultural documents

- Processes in soils occur simultaneously over large and different scales of times, connected to various subprocesses on other scales.
- These processes, above all soil formation and degradation, occur simultaneously and over large and different scales of times, connected to various subprocesses on other scales. The holon cycles of natural processes , which has been shown by Mae Wan, is also true for soils. For example, many processes of soil formation, that gives new space to root growth, need 10000s of years. Other processes like mineralization of organic matter, the process that gives nutrient to plants, in few days

- Management activities that lead to a destruction of soils thus mean a theft of time in regard do present and coming generations

- For example the transition from conventional to biological farming needs about 20 years until soils reflect the changed conditions. Living organism develops and change in long evolution processes, the time scale of extinguishing varieties of soil organisms however are much shorter..



- Time cycles of soils are different from time cycles of modern societies time perspectives.
- 
- From a human point of experience times of reactions in soils are too large to become aware of them. Ex. Creeping degradation

- Therefore current soil use systems are mostly not in **accordance with natural time cycles and rhythms**

# 3. Soils, times and diversity

- External factors and internal regulation systems of soils that occurred in various time cycles created s**oils, that are highly variable.**
- **The multitude of soils gives a living space for a huge number of living organisms**
- Monoculture means ignoring the diversity of soils and thus leads to a loss of biodiversity

# 4. If Soils are not beautiful, at least they can do beautiful things like

**Cultural and Social**

- Giving a feeling of identiy, thus providing social structures and form spiritual attitudes
- Giving ground and information

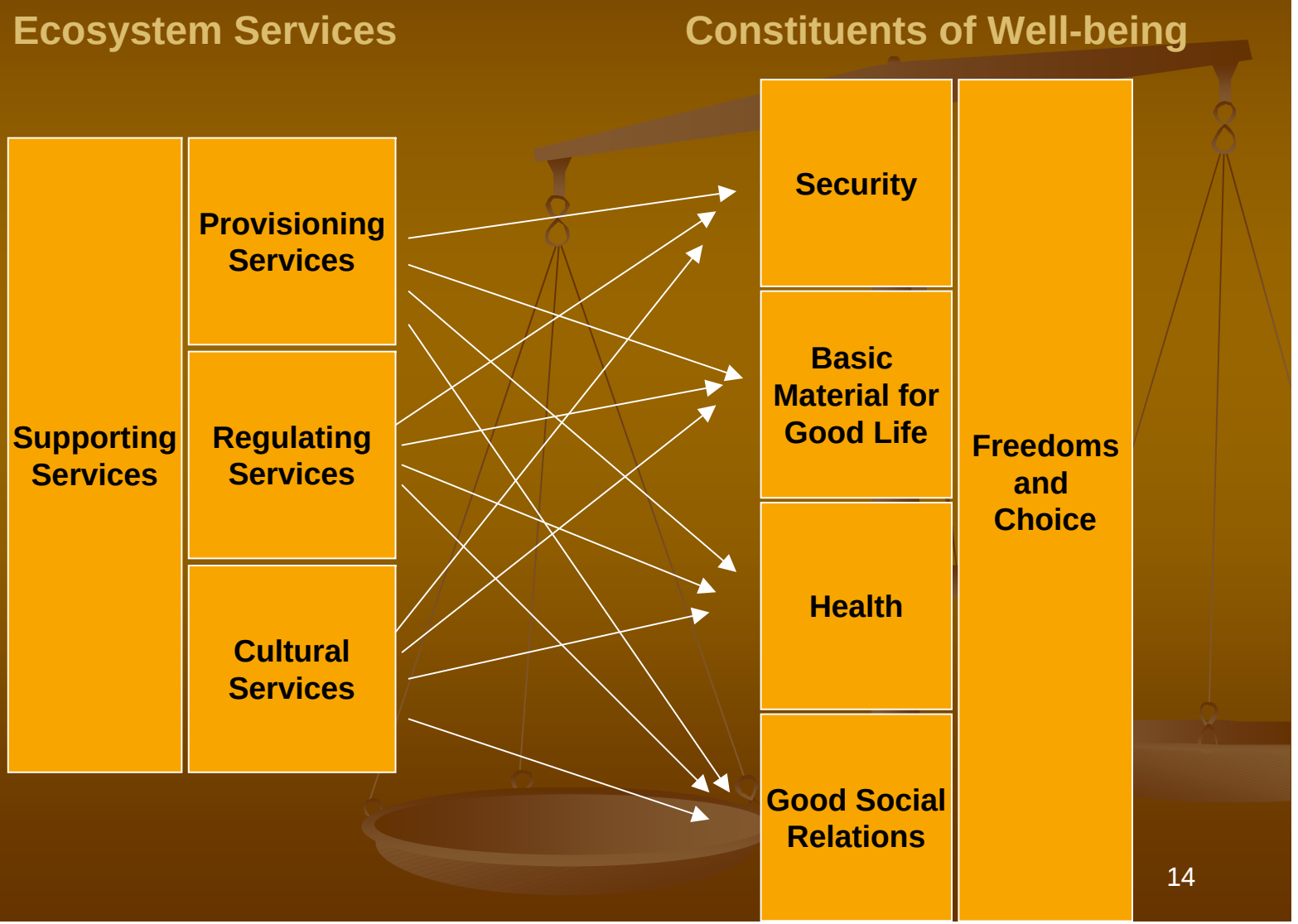
**Biophysical**

- Influence exchange of radiation and temperature
- Control water cycle
- Sources and sinks for nutrients and greenhouse gases
- Filtering and buffering pollutants

**Habitat**

- Provide a habitat for plants, aninams and microorganisms
- Provide us with the opportunity to produce food

# 2. Soils, Food and Human Well-being



# *Constituents of Well-being, closely related to Ecosystem services, transformed into* **capabilities**

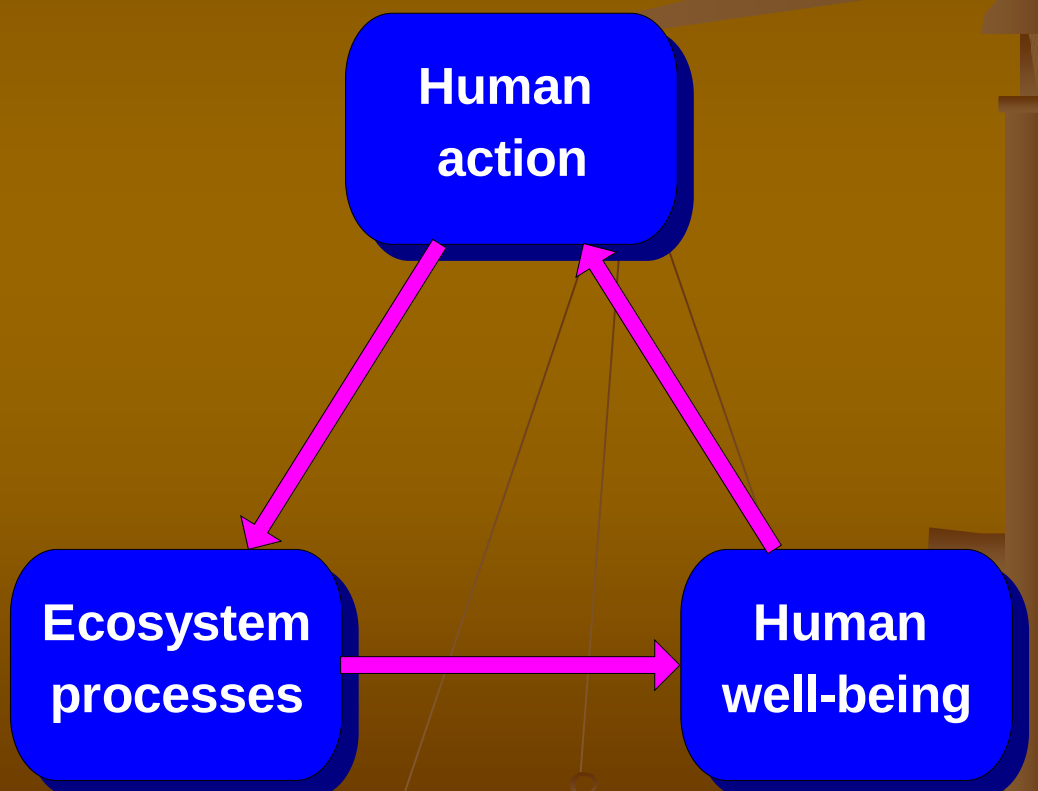
- Being able to be adequately nourished
- Being able to be freem from avoidable disease
- Being able to live in an environmentally clean and safe shelter
- Being able to have adequate and clean drinking water
- Being able to have clean air
- Being able to have energy to keep warm and to cook
- Being able to use traditional medicine
- Being able to continue using natural elements found in ecosystems for traditional cultural and spiritual prctices
- Being able to cope with extreme natural events including floods, droughts, tropical storms and land slides
- Being able to make sustainable management decisions that respect natural resources and enable the achivement of a sustainable income stream
- **Being able to access all the beautiful things that soils are doing.**



Source: Duraiappah, 2003

# 3. Ecosystem approach

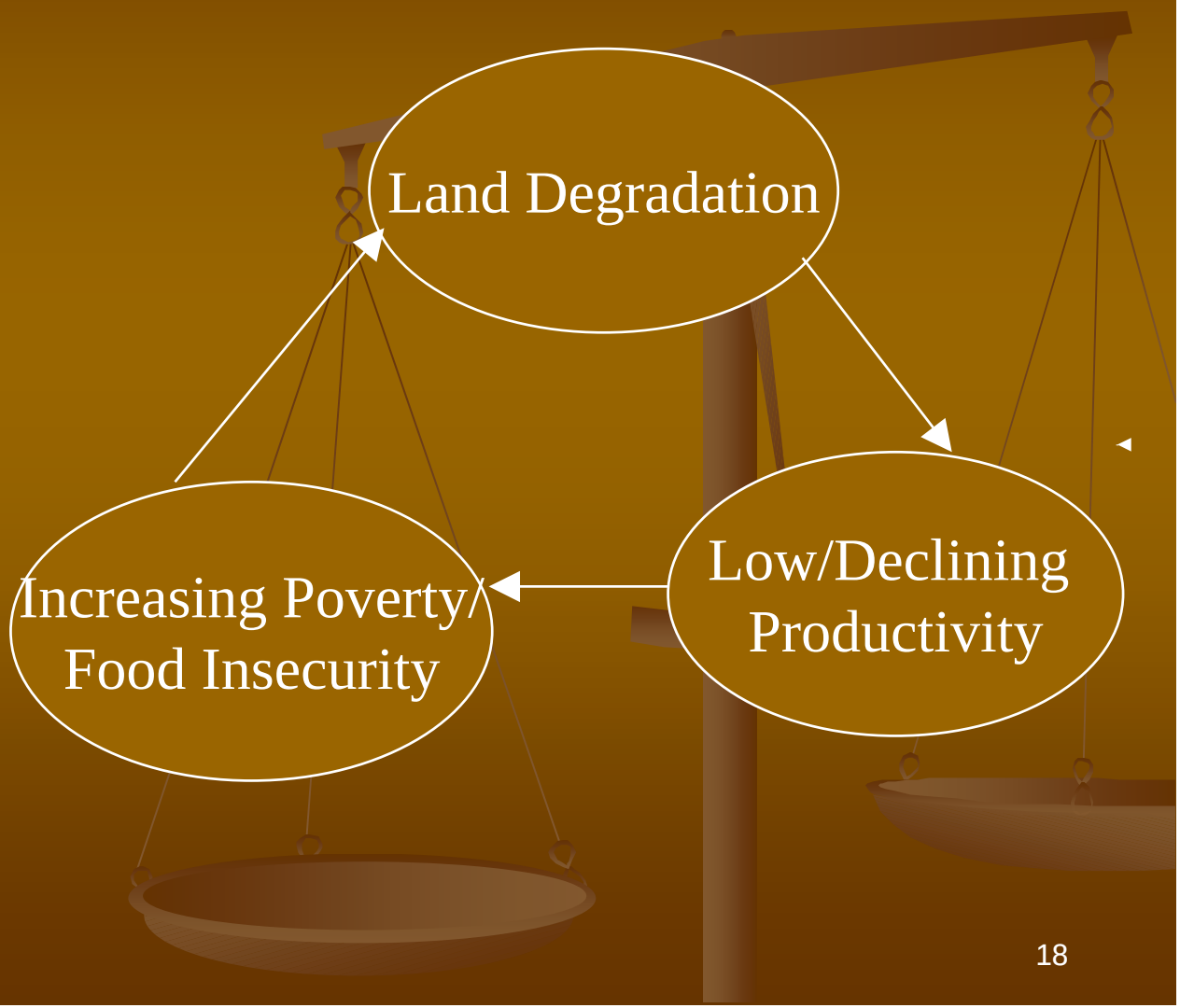
Intervention based on understanding of linkages



# 4. Case Studies: Capability for Food Production

- FAD (Malthusian) explanation: land degradation, population growth
- FED (Lack of entitlement): Poverty, lack of purchasing power
- Institutional explanations: War, changes of governments, institutional failures

# 3. Links between Food Insecurity and Land Degradation



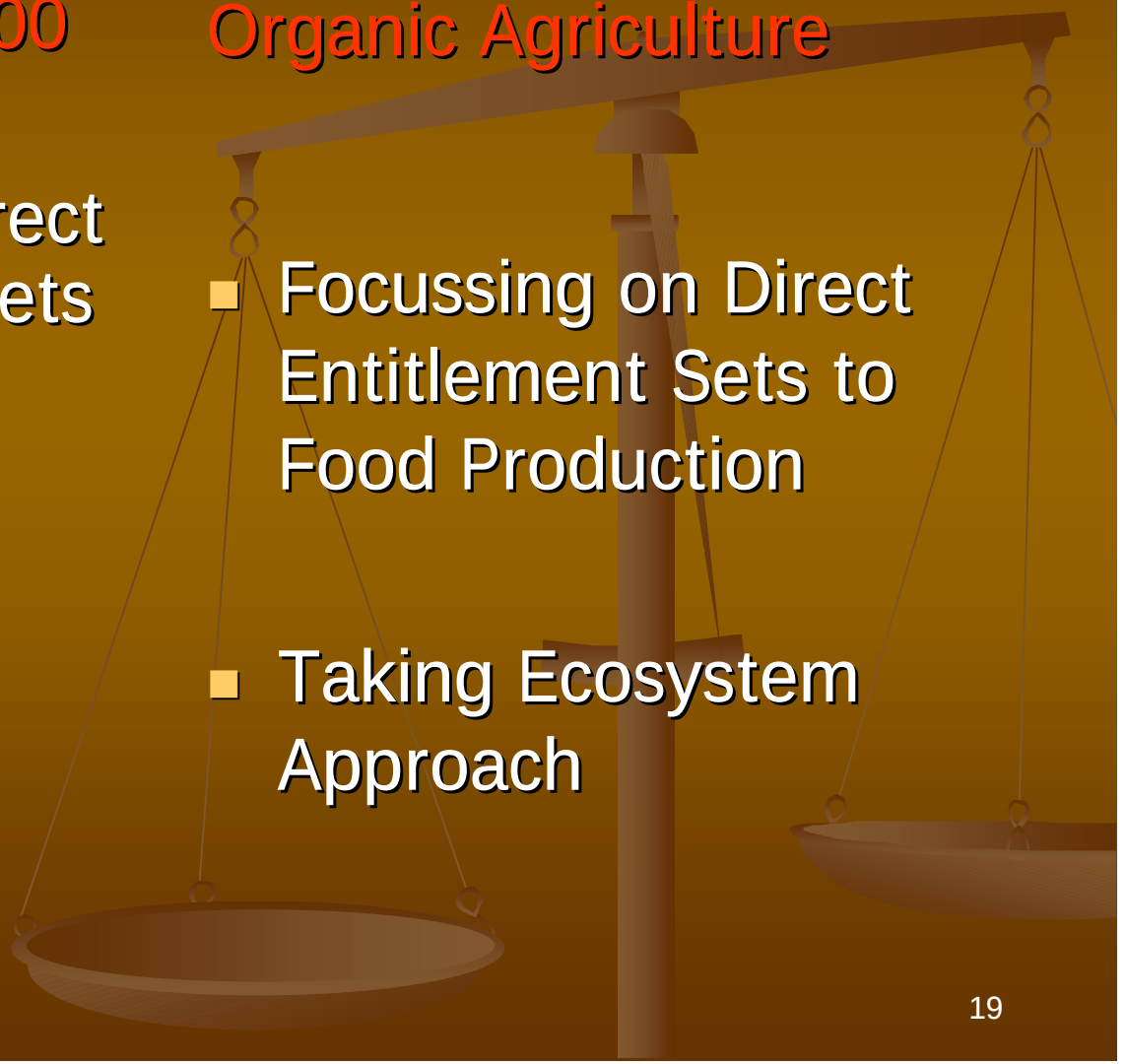
# Case Studies Ethiopia: Comparison of two Strategies

## Sasakawa Global 2000

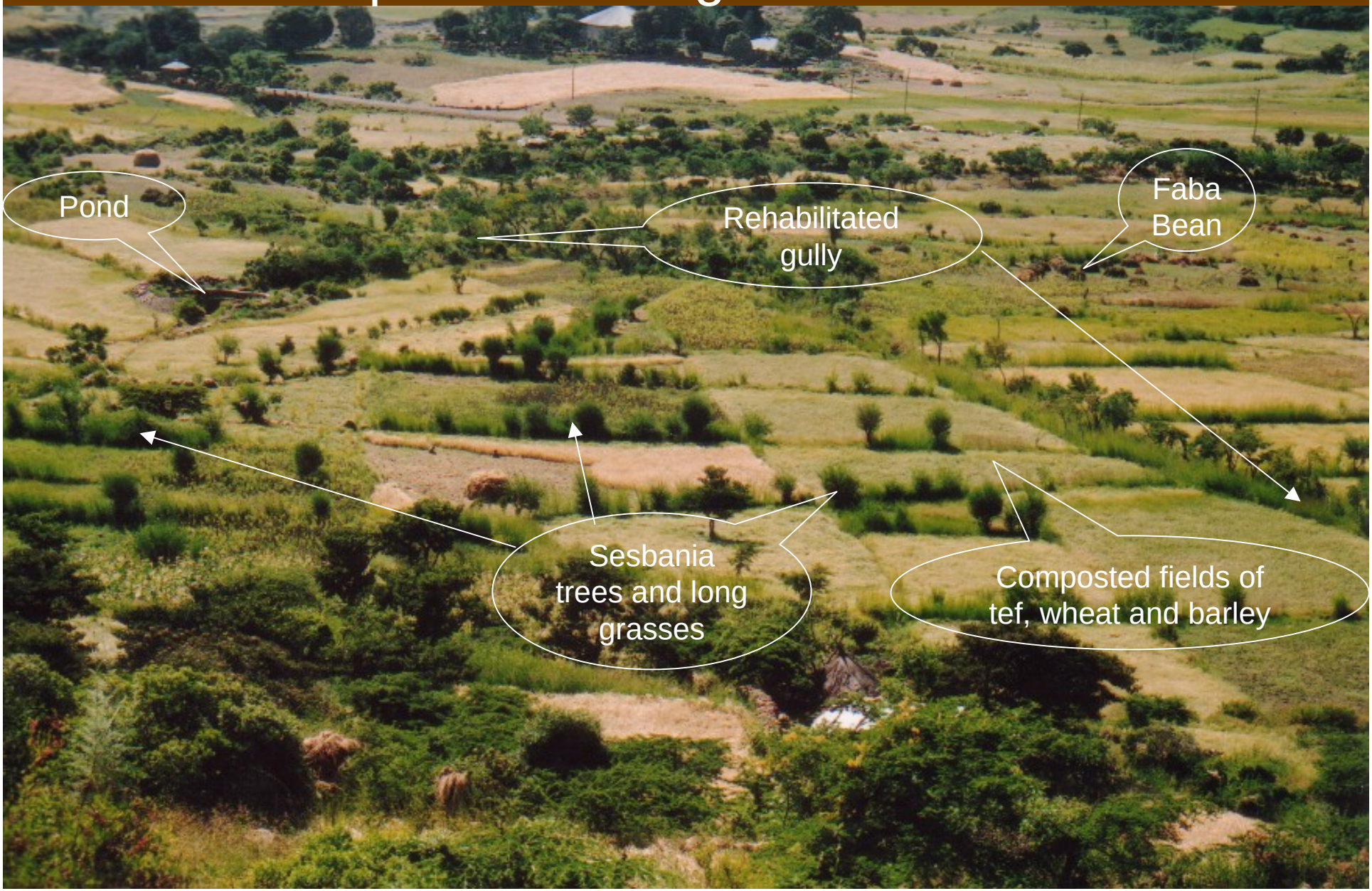
- Focussing on Indirect Sub-Entitlement-Sets for Food Security
- No Ecosystem Approach

## Organic Agriculture

- Focussing on Direct Entitlement Sets to Food Production
- Taking Ecosystem Approach



# Adi Nefas
# All the components being used in October 2003

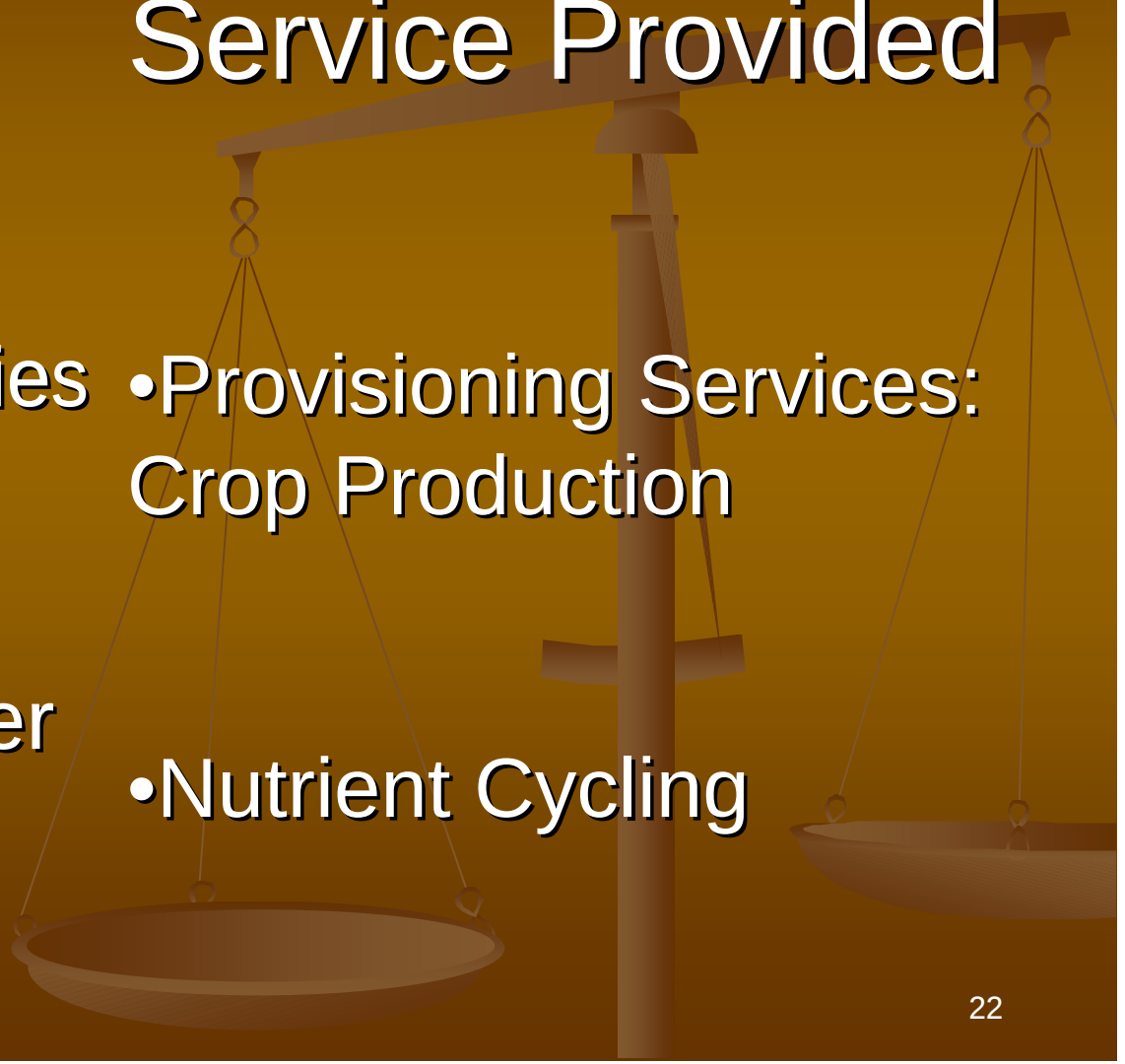


# 5. Project Activities "Organic Agriculture"

| Activity | Service Provided |
| --- | --- |
| Making and using compost | Regulating and sustaining: Nutrient Cycling, filtering, water regulation, increasing inherent value of soil, giving cultural identity, **Sequestering Carbon!!** |
| Trench bunds for catching both soil and water, halting gullies | Regulating, erosion control |
| Planting small multipurpose trees – particularly Sesbania – and local grasses (ISD and BoA initiative improved by farmers) | Provisioning, regulating: Fodder, erosion control |
| Making ponds (farmers initiative) | Provisioning services: water |
| Making and using bylaws to control access and use of local biological resources (ISD initiative) | Successive increase of soil fertility prevents farmers from abandoning their land |
| Building up on traditional crops and farming systems | Enriching services: enhancing cultural values |

# 5. Project Activities "Sasakawa"

| Response | Service Provided |
| --- | --- |
| ▪ High Yield varieties | •Provisioning Services: Crop Production |
| ▪ Promotion of Chemical Fertilizer | •Nutrient Cycling |



# Perceptions of Chemical Fertilizer

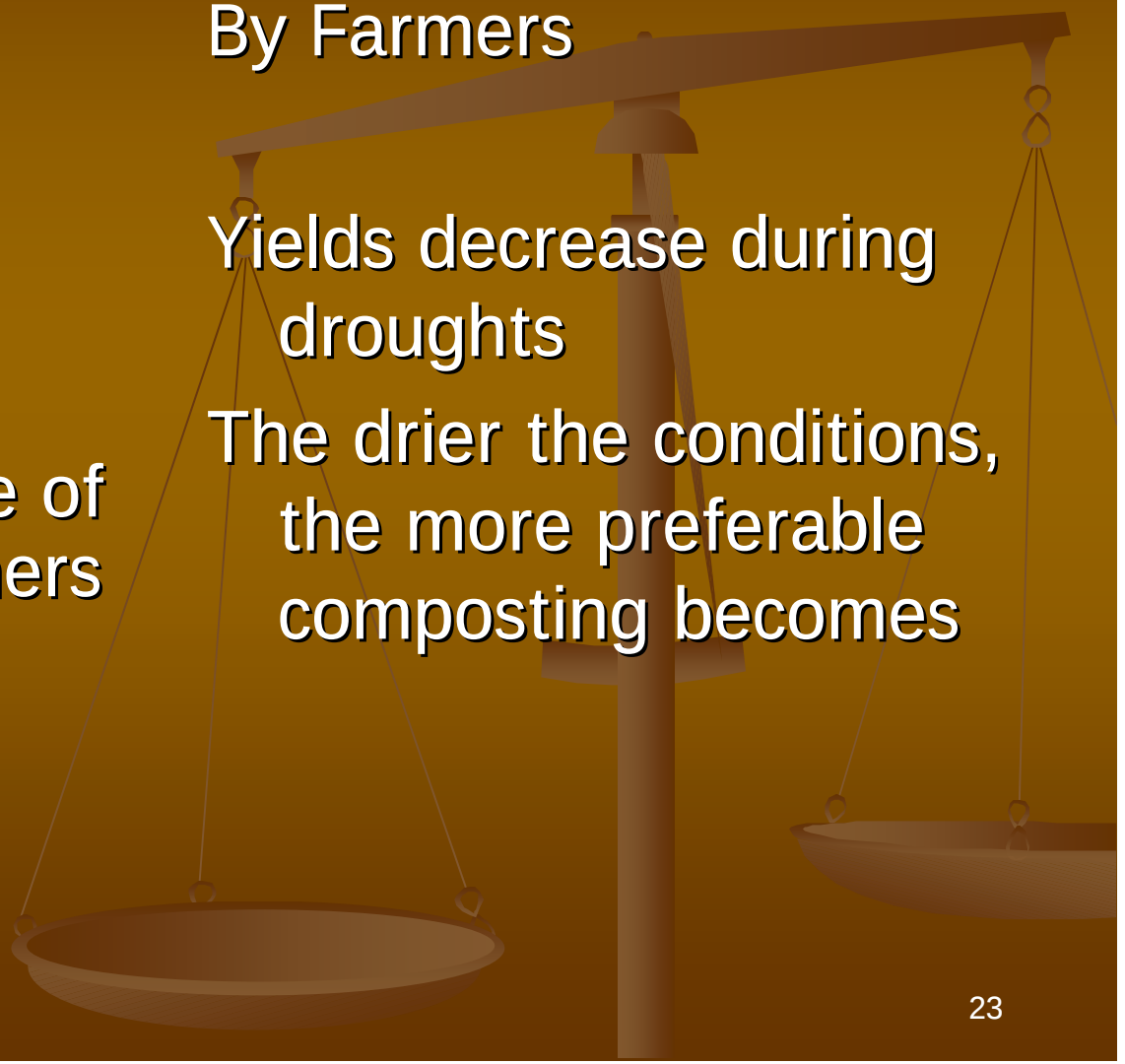
By Government

- Increase of yield
- Famine 2002 happened because of reluctance of farmers to use fertilizer

By Farmers

Yields decrease during droughts

The drier the conditions, the more preferable composting becomes



# Comparison between the two Strategies

- Organic Agriculture much more focussing on sustaining regulating and provisioning services
- Also increases human well-being by maintaining enriching services
- Results of provisioning Services
- in normal years comparable,
- Higher in dry years and dry areas for organic agriculture

  higher for Sasakawa in moist years

# Framework for Assessing Vulnerability

- **Exposure**

**Components**

e.g. individuals, households, classes, staes, flora/fauna, ecosystems

Characteristics

e.g.

Frequency,

Magnitude,

duration

**Sensitivity**

Human conditions

e. g. social / human capital, endowments, institutions, economic structures

Environmental Conditions

e. g. natural capital,

Biophysical endowments

(e. g. soils, water climate, ecosystem structure and function)

- **Resilience**

Impact / Response
e. g. loss of life, Economic production
Soil, ES

Coping response, e. g. extant programs, policies, autonomous options

Adjustment and adaptation response, e. g. new programs, policies, autonomous options

# Vulnerability Analysis of Organic Agriculture in comparison to Sasakawa

- Exposure: During Droughts
- Sensitivity: Decline of direct food availability, but no additional impoverishment by repayments of loans
- Higher resilience due to higher moisture retention capacity of soils and higher diversity.

Conclusion: Higher direct food entitlements due to higher resilience of organic agriculture in drought years compared to Sasakawa, however, no indirect food entitlement

# Vulnerability Analysis of the Sasakawa 2000

**Exposure:**

- During Droughts, when harvests are low (example 2002)
- Deregulation of fertilizer prices (example 1997)

**Sensitivity:**

- Credits have to be paid back, even when harvests are low. Harsh enforcements of repayments
- Decline of income due to increases of fertilizer prices

**Impact:** Decline of prices after harvests,
Impoverishment and lower direct food availabilty, thus:

**General Conclusion: Decline of direct and indirect entitlement to food security in drought years**

# Conclusion

Analyzed from an ecosystem approach, ensuring entitlements for soil fertility by composting is dependent on other locally available ecosystem services.

Thus – independently from the targeted yields, direct entitlements for increasing soil fertility

- increase ecological security
- increase social integrity
- reduce vulnerability
- enhance dignity and self respect
- This Issue is very vital and needs more further research

# Carbon Sequestration as a Response to Climate Change

Carbon sequestration aims at removing CO2 from the atmosphere, mostly by storing it in the vegetation.

- Carbon sequestration in soils is based on the fact, that grasslands and forests can store about 100% more carbon than arable lands

Under the Protocol's Clean Development Mechanism, a corporation can buy a carbon sink in the global South to offset its own emissions. A carbon sink is anything that keeps greenhouse gases out of the atmosphere either by preventing their release or by sequestering them. Forests and tree plantations are the preferred sink, since trees remove carbon from the atmosphere and sequester it in their wood. Renewable energy projects are also admissible as sinks since they produce energy without burning fossil fuels

# Project Activity Carbon Sequestration

- Activities:

Sequestration of Carbon in Developing Countries

Payment of Carbon Bonusses To Developing Countries

Fuelwood for Farmers of Developing Countries

Increase of Organic Matter in Developing Countries

Maintaining the Emissions in Industrialized Countries

# Carbon Sequestration –benefits and their care from the viewpoint of different actors

- Their common care: Maintaining the Emission Level of Industrial Nations on the Same Level

**Developing Countries' Farmers**

**Industrial countries**

Life is considered as a commodity

Climate change is discussed in terms of debts and credits

- To ensure **global ecological fairness**, “we must live at a level that we seriously can wish others to attain, not at a level that requires the bulk of humanity NOT to reach (Arne Naess)”.

# Finally

- **We live in an era wherein it is legitimate to view life as a commodity, to discuss climate change - and its consequences - in credit and debit terms** (Heather Eaton)

**The Earth needs healing in many of the aspects of the ecosystem, including curtailing soil erosion, rehabilitating the hydrological cycle, stopping the extinction of species, stopping releasing alien and harmful chemicals into the biosphere (water, soil, air). Carbon sequestration refers to taking carbon dioxide from the air and trapping it as plant biomass, mostly wood. Carbon sequestration, at best, would treat our sick Earth for 1 symptom, but its disease is now systemic. Healing it would require correcting all our abuses.“**

**(Tewolde)**

In this sense let‘s proceed

– and thanks for your attention!