• Introduction
• Forestry and Land Rehabilitation as Mitigation Options - No Help from Kyoto and IPCC
• Land Degradation – Global Warming - Sustainability
• Examples
• Win-Win Approaches
• Managing Land and Resources
• Integrated Environmental Approach Required
Ice melts by the liter, not by the m²
Poor Polar Bears!

Present day

2080s

Fraction of ocean covered by sea ice

2050 - 2080
Forests and Carbon Dioxide

Stefan Leu
It’s all about Surface – Volume Ratio

Water

Food

Intestine

Land - Atmosphere

Gas

Heat/Radiation

Nutrients

Water
Simulated cloud water content above deforested (top) and forested (bottom) tropical landscapes.
Atmospheric Carbon Dioxide Concentration under Current Trends

THE SOLUTION: Carbon sequestration into biomass and soil, Coupled to development of biomass energy industry

Are there sufficient available areas?
Degraded Drylands and Forests, Degraded Farmland, Pastures, etc!

Atmospheric Carbon Dioxide Concentration with Biosphere Rehabilitation Program

Atmospheric Carbon Dioxide Concentration under Current Trends

Are there sufficient available areas?
Degraded Drylands and Forests, Degraded Farmland, Pastures, etc!
Kyoto, IPCC and Forestry

Shooting the Best Horses
• Focus on Developed Countries: A Fatal Miscalculation
• Limiting the Percentage of Offsets Abroad: A Fatal Misconception
• Excluding Forestry;
• No Tools for Smallholders;
• Bureaucratic Nightmare (useless);

ALL DUE TO FUNDAMENTALIST GREEN ORGANIZATIONS LIKE GREENPEACE AND WWF WHOSE AGENDA WAS IDEOLOGICAL
• In one of the most comprehensive synthesis efforts undertaken so far, the Fourth Assessment of the Intergovernmental Panel on Climate Change estimated that an economic potential of 0.12 Pg C year$^{-1}$ could be reached by 2030 at U.S. $20 per ton of CO$_2$, and more than 0.24 Pg C year$^{-1}$ at U.S. $100 per ton of CO$_2$ (10, 11).

• China has used 24 Mha of new forest plantations and natural forest regrowth to transform a century of net carbon emissions in the forest sector to net gains of 0.19 Pg C year$^{-1}$ (3, 12), offsetting 21% of Chinese fossil fuel emissions in 2000. (that is 700 mio tons CO$_2$!!)

• BUT: China’s land area is 7% of global land area (and certainly it does not cost them 70 billion per year) – ergo the potential is……

• 10 billion tons per year!!?? 25% of emissions!
The Potentials (please understand the meaning of potential, IPCC does not)
There is no need for modeling!! There is only need for Copying and Management!!

A Potential can not Disappear!!

Figure 9.15: Comparison of estimates of mitigation potential in previous IPCC reports (blue) and the current report (in red).
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<th>Section</th>
<th>Page</th>
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<td>9.7.1 Conceptual aspects</td>
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<td>12.3.4 Waste and wastewater management sector</td>
<td>732</td>
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<tr>
<td>12.3.5 Implications of climate policies for sustainable development</td>
<td>733</td>
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</table>
Sustainable Dryland Management

It’s the Plant Litter!

Only Trees Recover Minerals from Deep Soil and Rock, and provide sufficient Litter

Forestry and Agroforestry
Two Highlights from Yesterday from 2 World Experts

1. Desertification happens only in Semi-Arid Zones!!

Problem of Definition:
Desertification is Destruction of Soil and Vegetation to the state that it can not or only very slowly recover by itself:

This is a Universal Problem!!

If Switzerland would have managed like Ethiopia, Switzerland would look like Ethiopia!!

The best thing for the Bolivian highlands will be for the farmers to rapidly ruin the soil and then move to the slums of La Paz!!

The Ecosystem will never recover, and the money will be gone very fast!!

What is Required is Management!!! (like GM)
Soil Conserving *Acacia* Afforestations
15 years old *Acacia victoria* woodland near Yattir farm:

2.5 t per ha and year annual vegetation;  
2.5 tons per ha and year tree litter (edible);  
1 ton per ha and year woody biomass;  
3 tons per year CO$_2$ sequestration;  
Supports 2 goats per ha;  
**RICH ANIMAL LIFE**

Degraded land nearby:

0.5 t per ha and year annual vegetation  
0 tree litter  
0 woody biomass  
0 CO$_2$ sequestration  
Supports 0.2 goats per ha  
**NO ANIMAL LIFE!!!**
Unified Field Theory of Biosphere Management: Degradation by Overexploitation

- Productivity -
- Biodiversity -
- Carbon Stocks -
- Resilience and Sustainability -

Mismanagement

Acceleration of and Sensitization to Effects of Global Warming
Unified Field Theory of Biosphere Management: Rehabilitation

Mitigation of and Adaptation to Effects of Global Warming!
INTEGRATED THINKING

Example Switzerland:
• About 400000 ha replanted + 800000 ha of degraded forest recovering.
• Floods, avalanches and mudslides efficiently controlled
• Sink for up to a billion tons of CO₂;
• Forests at record productivity and biodiversity;
• All key indicator species including bears, wolf, deer and beaver returning;
• Enormous tourism potential created;
• > 10% biofuels potential from sustainable wood

Example Israel:
• About 150000 ha planted and protected forests in 100 years, carbon sink of 2-4 mio tons CO₂ per year.
• Cumulative CO₂ sequestration several hundred million tons!!
• Stopping advance of the desert;
• Stopping erosion and flooding;
• Restored hydrological cycles;
• Recovering biodiversity.
Switzerland: Floods Caused by Deforestation – Stopped by Reforestations
<table>
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<tr>
<th></th>
<th>1995</th>
<th>2005</th>
<th>2015</th>
<th>2025</th>
<th>2035</th>
<th>2045</th>
<th>2055</th>
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<tr>
<td>tropical forest destruction</td>
<td>2</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>permanent agriculture</td>
<td>-</td>
<td>-0.48</td>
<td>-0.96</td>
<td>-0.96</td>
<td>-0.96</td>
<td>-0.96</td>
<td>-0.96</td>
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<tr>
<td>restoring dry areas</td>
<td>-</td>
<td>-0.53</td>
<td>-1.05</td>
<td>-1.05</td>
<td>-1.05</td>
<td>-1.05</td>
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<tr>
<td>forestry plantations</td>
<td>-</td>
<td>-0.5</td>
<td>-1.0</td>
<td>-1.0</td>
<td>-1.0</td>
<td>-0.5</td>
<td>-</td>
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<tr>
<td>'fossil fuel emissions'</td>
<td>6.1</td>
<td>7.4</td>
<td>9.1</td>
<td>11.1</td>
<td>13.5</td>
<td>16.5</td>
<td>-</td>
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<tr>
<td>substitution</td>
<td>-</td>
<td>-0.8</td>
<td>-2.1</td>
<td>-4.2</td>
<td>-7.2</td>
<td>-12</td>
<td>-</td>
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<td>effective emissions</td>
<td>8.1</td>
<td>6.1</td>
<td>4</td>
<td>3.9</td>
<td>3.3</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>ocean uptake</td>
<td>2.1</td>
<td>2.4</td>
<td>1.8</td>
<td>1.2</td>
<td>1.2</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>expanding biosphere</td>
<td>2.1</td>
<td>2.1</td>
<td>2.1</td>
<td>2.1</td>
<td>2.1</td>
<td>2.1</td>
<td>-</td>
</tr>
<tr>
<td>resulting accumulation</td>
<td>3.9</td>
<td>1.6</td>
<td>0.1</td>
<td>0.6</td>
<td>0</td>
<td>-1.1</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 1: Gigatons of carbon released to (+) or absorbed from (-) the atmosphere per year in response to the following scenario:
- fossil fuels: carbon release from fossil fuel consumption growing at 2% per year.
- Biosphere management: Effects of realizing the following plan for sustainable biosphere management within 20 years: stopping net forest destruction, establishing 1.5 mio square kilometers of forests to stop erosion and desertification and establish 1 mio square kilometers of forestry plantations.
- substitution: Increasing the use of renewable energy sources (currently corresponding to about 1.2 billion tons of fossil fuels) by 5% per year, and using the difference towards current consumption to substitute fossil fuels.
- reservoirs: Absorption of 60% of surplus carbon released into the atmosphere by unknown reservoirs, with a delay of 20 years, as is currently observed.
- resulting carbon accumulation: Adding together the effects of all above proposed contributions.
All Those Efforts in the Developing World!

All Those Efforts Required to Achieve Millennium Development Goals, Conserve Biodiversity and Stop Desertification

Unique Opportunity to Integrate Developing Countries as Equal Partners into Future Climate Agreements
THE INDIVIDUAL STEPS

1. Halting Deforestation

7 Gigatons per year
Principle of Dryland Agroforestry

Annuals, perennials and trees use different resource pools and are active during different seasons:

Optimal resource utilization under minimum competition and potential mutual benefits: shading, nitrogen fixation etc. (don’t use eucalyptus!)

- **Annuals:** Winter/spring active
- **Perennials** (Most medical Plants!): Spring/early summer
- **Trees:** Summer active

---

### Depth (cm)

- 0
- 20
- 50

???

Down to 25 m!!
A simple stone terrace suffices to create excellent conditions for Olive cultivation. The reduced water runoff intensity allows natural vegetation to recover as well.
# Full Exploitation Potential of a 110 ha dryland farm

<table>
<thead>
<tr>
<th>Option</th>
<th>Nr of trees</th>
<th>Benefits</th>
<th>Expected Yield $ within 10 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 ha agroforestry dams</td>
<td>5000 trees</td>
<td>Commercial amounts of organic oil and fruit</td>
<td>80000.-</td>
</tr>
<tr>
<td>50 ha Silvipasture</td>
<td>10000 trees</td>
<td>Increasing grazing yield at least 4 fold</td>
<td>30000.-</td>
</tr>
<tr>
<td>50 ha Agroforestry Windbreaks</td>
<td>10000 trees</td>
<td>Soil Improvement and erosion control, increased grain yields</td>
<td>??</td>
</tr>
</tbody>
</table>

Cost:  
- Trees: 50000.-  
- Initial watering 25000.-  
- Fencing 20000.-  
- Work 25000.-

Carbon Sequestration during 50 years: 25000 t of CO₂ times $15 per ton

Return: $360000 for carbon sequestration alone!  
In addition to farm products

**Wanted: Green Investors**
Land Rehabilitation with Multipurpose Trees:

- Pongamia pinnata
- Marula

Jatropha: NO!!!
High Demands
No Ecosystem Services
= Agriculture

- Ziziphus
- Balanites

Oil producing Dryland Trees with Edible Leaves or Fruit
Possibility 1:
Oil Seed Producing Trees for Intensive or Extensive Biodiesel Production on Degraded Land

India: 40 mio ha of multipurpose oil trees on waste land: 400 mio tons per year carbon sequestration; 100% of diesel demand; Food, fodder, firewood or biopesticides!
Grasslands are highly productive and can fix large amounts of carbon in organic and inorganic form. Unnecessary tillage causes enormous damage in Israel.

Minuses of Tillage:

- Double Working Time
- Cost: $50 per hectare for fuel and equipment
- Exposure of Rocks
- Erosion, Loss of Organic Matter and Soil Fertility
- Loss of Soil Biological Activity, more Pests

Main Reason (in Israel):

Marking of Property!
In 1925, Haiti was lush, with 60% of its original forest covering the lands and mountainous regions. Since then, the population has cut down all but an estimated 2% of its original forest cover, and in the process has destroyed fertile farmland soils, contributing to desertification.

Haiti

Nothing better symbolized the vicious cycle of poverty in Haiti than the process of deforestation. Haiti was once a lush tropical island, replete with pines and broad leaf trees; however, by 1988 only about 2 percent of the country had tree cover. The most direct effect of deforestation was soil erosion. In turn, soil erosion lowered the productivity of the land, worsened droughts, and eventually led to desertification, all of which increased the pressure on the remaining land and trees. The United Nations Food and Agriculture Organization estimated that this cycle destroyed 6,000 hectares of arable land a year in the 1980s.
Jeanne has proved to be the deadliest of all the hurricanes this season, killing more than 1,500 people.

The hurricane hit Puerto Rico on 15 September, while it was still a tropical storm, and killed at least two people. The following day it came ashore on the island of Hispaniola, divided between the Dominican Republic and Haiti.

At least 11 people were killed in Dominican Republic as flood waters forced thousands to flee their homes or seek refuge on roofs and tree tops.

In Haiti more than 1,500 people died, many drowned, when torrential rains and rising floodwaters submerged entire cities and towns in the north of the country.

Widespread deforestation in Haiti is believed to have made the situation worse.
THE PLAN

• 1.200.000 mio ha of degraded mountain slopes (45% of total land area) planted in the next 20 years;
• 20 t CO$_2$ per ha per year sequestered (that’s a very low estimate);
• 24 mio t CO$_2$ per year;
• times $15 per ton (1) = 360 mio $ per year;
• = 6% of Haiti’s GDP from carbon trading alone!
• All at the benefits of the poor (and that’s the real problem!!)

1) http://www.ecobusinesslinks.com/carbon_offset_wind_credits_carbon_reduction.htm
Example Ethiopia
Afforestation Plan:

20 mio ha times 10 t CO₂ per ha per year = 200 mio tons per year.

Times $ 15 per ton = 3 bln $ per year;

30 % of GNP

AND:
Flood and drought control;
Sustainable Renewable Energy;
Food and Fodder;
Restoration of Biodiversity (African Megafauna)
Ecotourism

Management Demands:
1. Land Management
2. Restoration of native vegetation;
3. High value wood, food and energy plants;
4. High value agroforestry;
IMPOSSIBLE??
IT HAS BEEN DONE!!

- Switzerland
- Israel
- China

- Its being done:
- Brazil
- India
- etc
Mutual Incompatibility due to mismanagement and false economic modeling

Free Market: Unstable State; Unsustainable;

Dissipation of Global Sustainability

Legal Framework and Planning; = Partial Solution

Classical View of Economic Development: Growth Incompatible with Environment
The Free Market Model (Reagonomics, Thatcherism) has Miserably Failed to Address the Problems of the Environment and Development!!

Those economic models are fundamentally evil! Shifting Production to the cheapest possible production places and technologies under complete disregard for social and ENVIRONMENTAL standards.

Gandhi: Earth provides enough to satisfy every man's need, but not every man's greed. Is this insight critical to our future? 92% Yes!

ERGO: Back to the controlled Market Policies of the 1970ties!!! Food Subsidies No speculation with essential commodities.
Not a Place for Seeking Short Term Profit and Image!

| • e. g. Land Grabs in Africa for Biofuel Production |
| • e. g. Efforts of carbon offsetting companies and NGOs |
| • Completely Useless in the absence of National Carbon Inventories |
| • Do it the Sustainable Way. |
| • Deal with Poverty and Subsistence first. |
| • Establish National Carbon Management Plans. |
Controlled Market Economy and Carbon Management can Overcome the Incompatibility

Mutual stimulation by win-win approaches

Carbon Management as Common Attractor

Economy
Trade
Resources
Growth
+

Development
Poverty
Millenium goals
Conflicts
+

Environment
Biodiversity
Degradation
Global warming
+

Legal Framework; Planning

Carbon Emissions Pay for Development and Biosphere!!
Alice came to a fork in the road. "Which road do I take?" she asked. "Where do you want to go?" responded the Cheshire cat. "I don't know," Alice answered. 'Then," said the cat, "it doesn't matter."
IPCC and Kyoto efforts have to be abandoned in favor of a global Biosphere Management Effort Based on Well Documented Win-Win Approaches dealing with:

- Deforestation
- Desertification
- Biosphere and Biodiversity Protection
- Agriculture and Resource Management

Immediately Available Potential for 30 – 50% of Carbon Emissions Reductions!!!

Creation of Enormous Socioeconomic and Environmental Synergisms!!!
Towards Kyoto 2

1. The Task is far too Complex for an Agency like IPCC;

2. Can only be Handled by Interdisciplinary Bottom up Management Approaches;

3. Local Mapping of Expected Development Needs, Land Privatization;

4. Local Mapping of Rehabilitation or Protection Needs and Sequestration Potentials;

5. Compilation and Aggregation into National Biosphere Management Plans;

6. Establishment of National Carbon and Biosphere Inventories;

7. Promotion of Carbon Sequestration by Subsidies, Law Enforcement, Technical Assistance and Education;

8. Funding Rehabilitation by Trading for Carbon Emissions;

WE SHOULD TRY THAT IN THE NEGEV!
An average sink of 200 tons CO$_2$ per ha will be achieved in the next 50 years by rehabilitation of degraded lands in the Lehavim-Yattir area, leaving agricultural land and nature reserves untouched!
Thank You Very Much