

2nd Biomass Asia Workshop

**Promoting & Building Capacities for
Modern Bioenergy
FAO Initiatives**

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Bioenergy - Definitions

- **Biomass**: material of biological origin (excluding material embedded in geological formations and transformed to fossil), such as: fuelwood, charcoal, agricultural wastes and by-products, energy crops, livestock manure, biogas, biohydrogen, bioalcohol, microbial biomass, and others.
- **Biofuel**: fuel produced directly or indirectly from biomass.
- **Bioenergy**: all energy produced from biofuels.



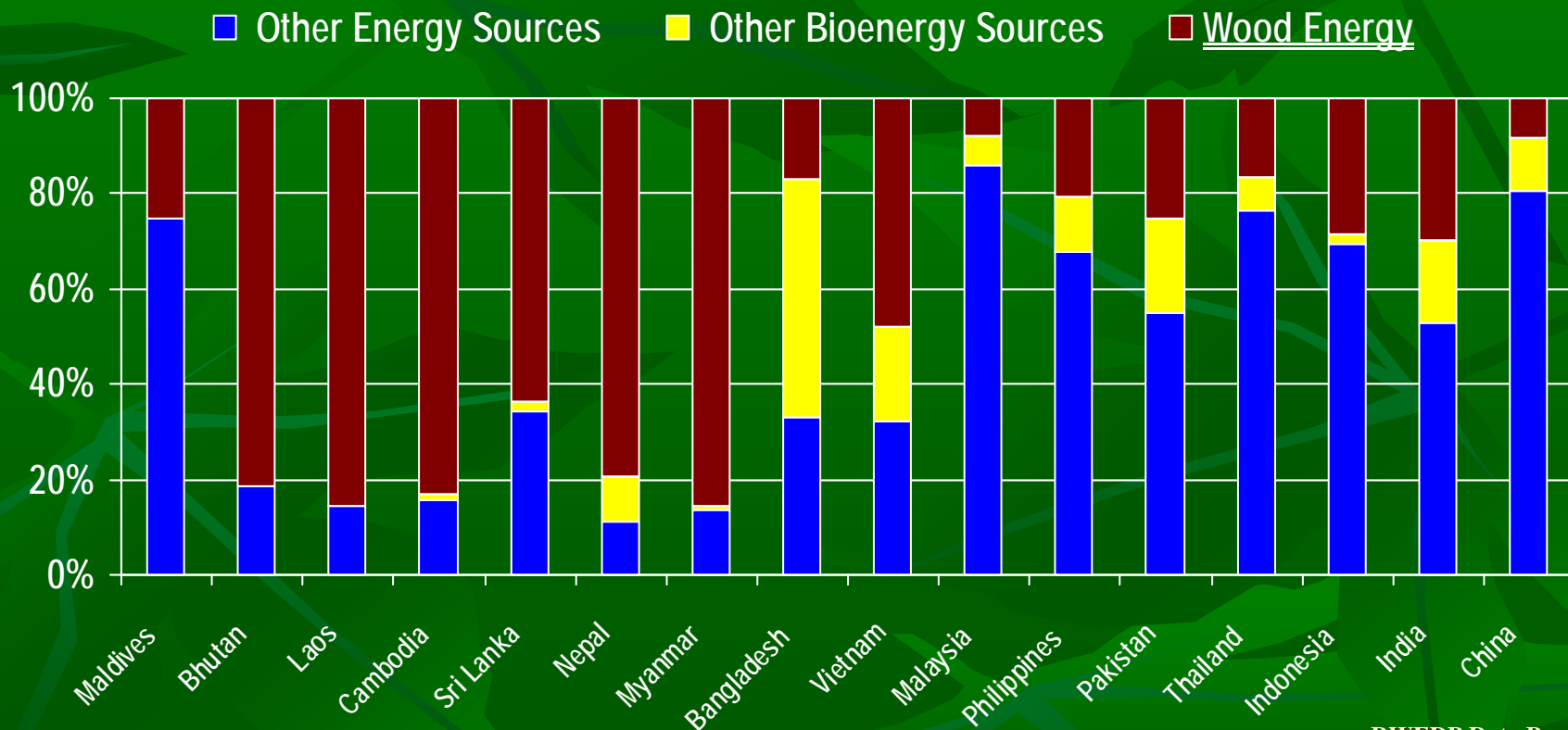
*Traditional household stove
– the simplest example of
bioenergy systems*

Promoting & Building Capacities for Modern Bioenergy

- Outline of Presentation
 - Bioenergy in Developing Countries
 - Modernizing Bioenergy
 - FAO Interdepartmental Programme on Bioenergy
 - International Bioenergy Programme

Bioenergy in Developing Countries

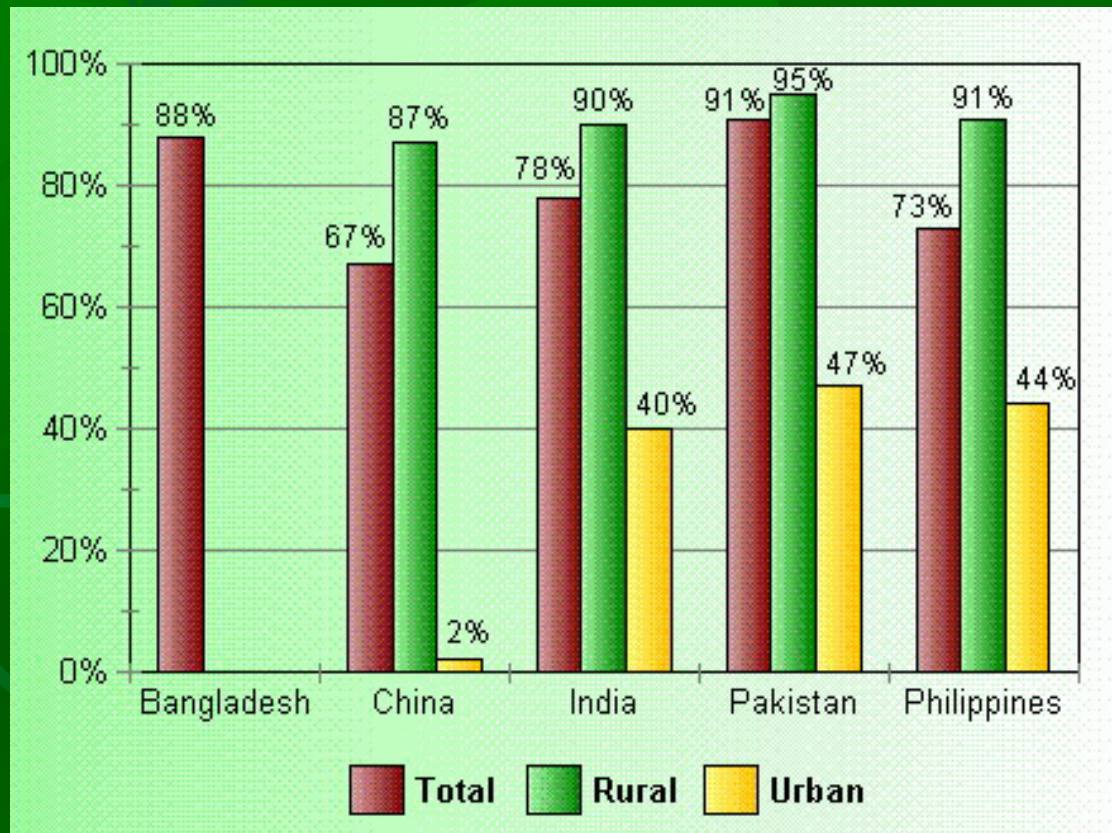
Contributes a significant share in national energy supply mix



RWEDP Data Base

Bioenergy in Developing Countries

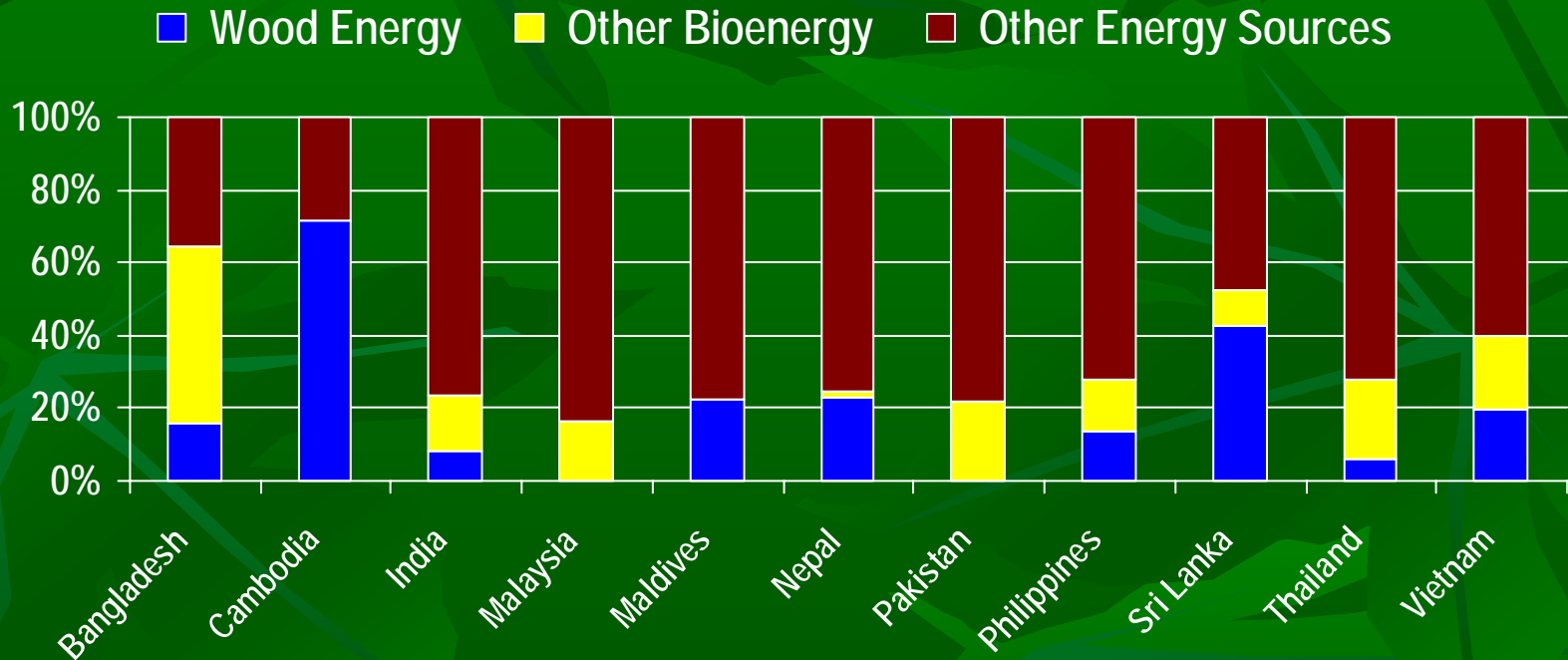
Bioenergy is the main source of fuel for household cooking



RWEDP Data Base

Bioenergy in Developing Countries

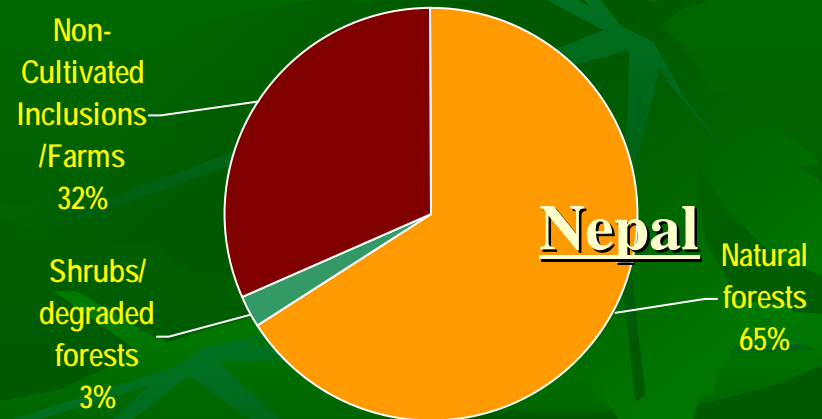
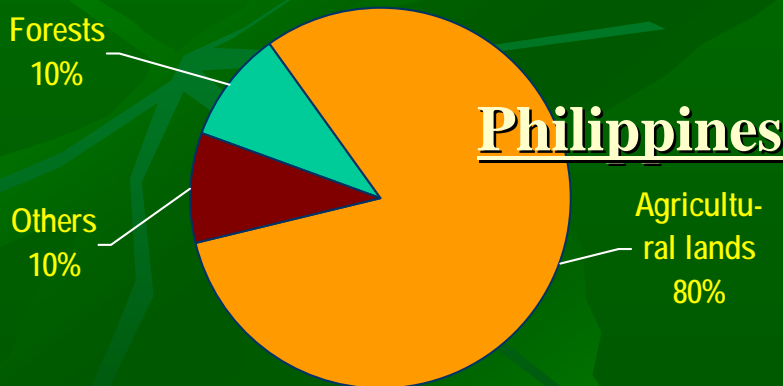
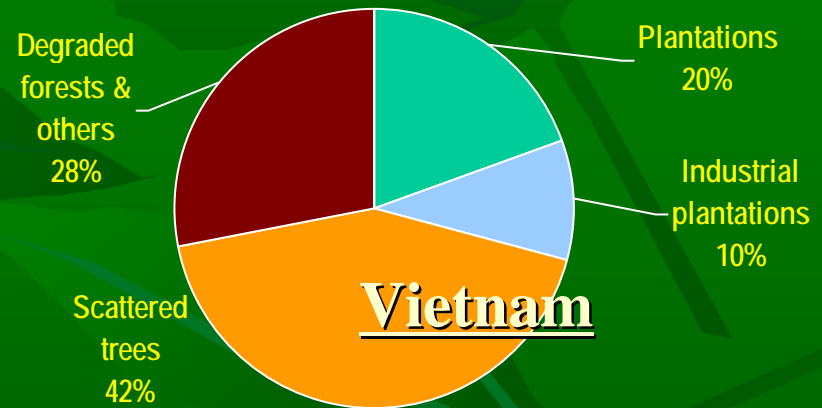
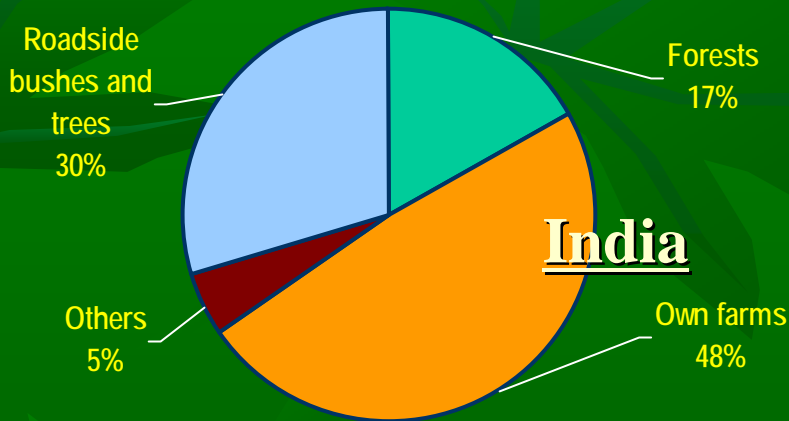
A major energy source for heating in industries & enterprises



RWEDP Data Base

Bioenergy in Developing Countries

Wood energy comes from crop, forest & degraded lands



RWEDP Data Base

Bioenergy in Developing Countries

Bioenergy in Small, Medium & Micro Enterprises (SMMEs)



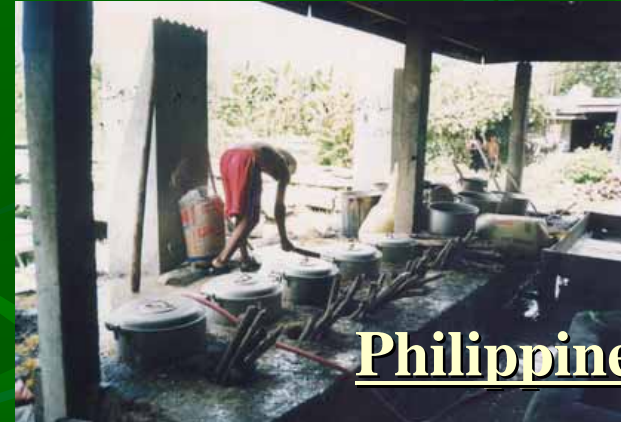
Lao PDR



Myanmar



Thailand



Philippines

Bioenergy in Developing Countries

Bioenergy production & marketing “enterprises”



Cambodia

Viet Nam



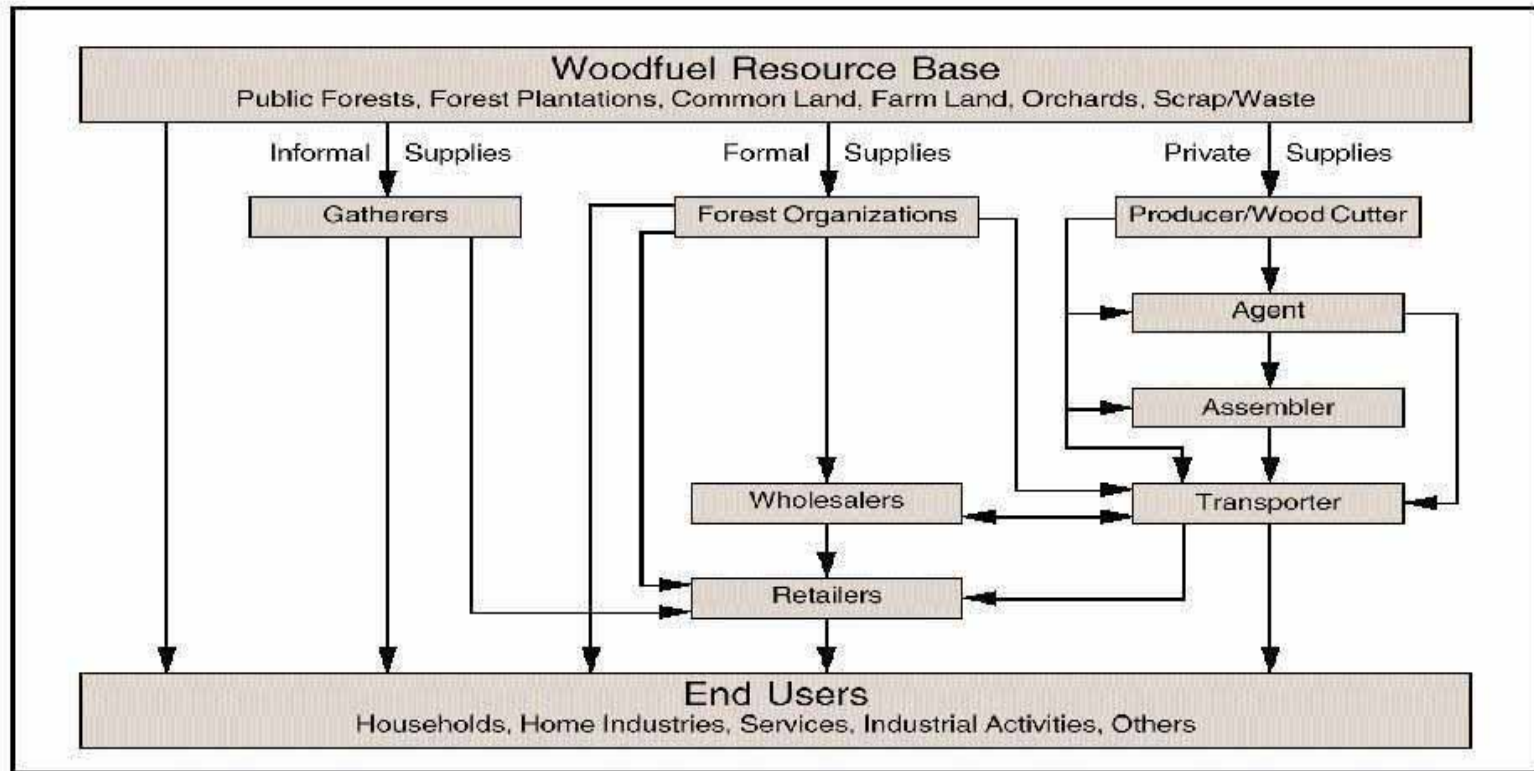
Bioenergy in Developing Countries

An “unaccounted” agricultural & forest product



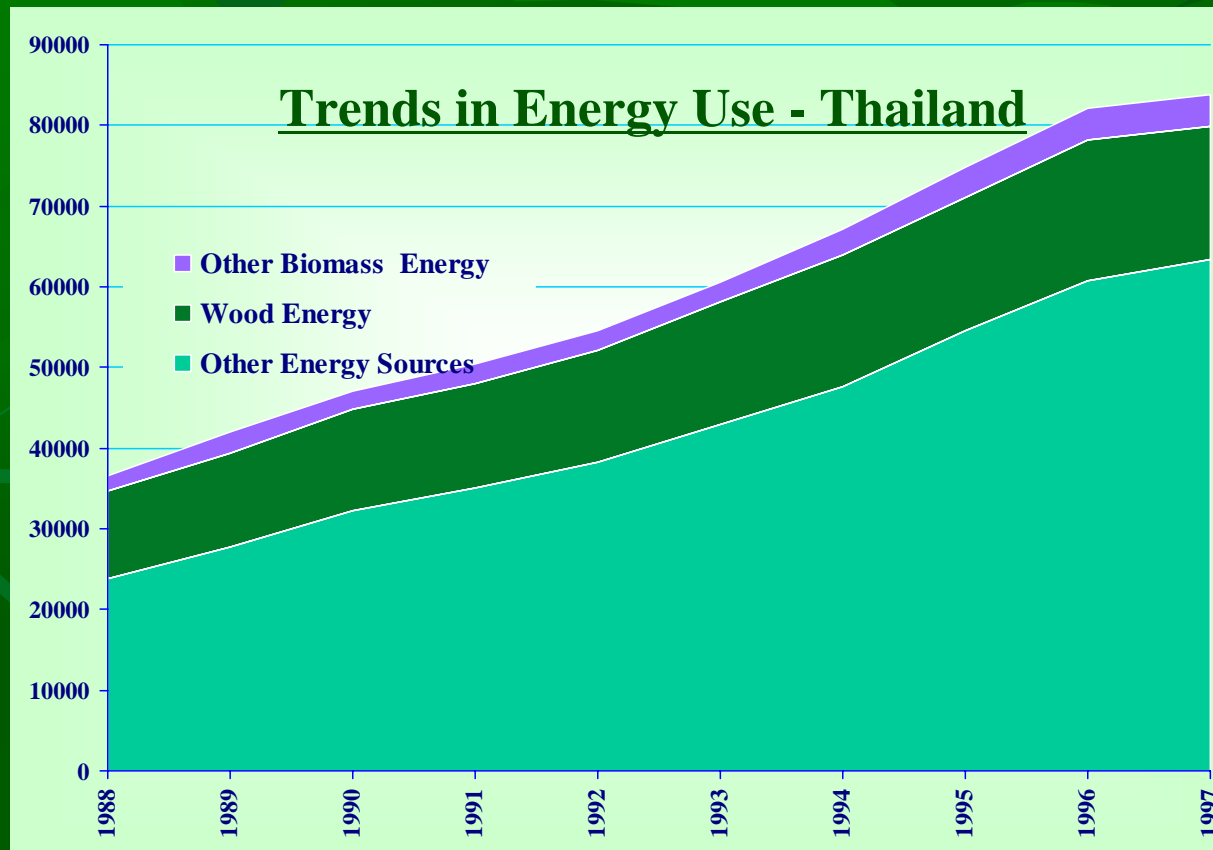
Bioenergy in Developing Countries

An important sub sector in energy, forestry & agriculture



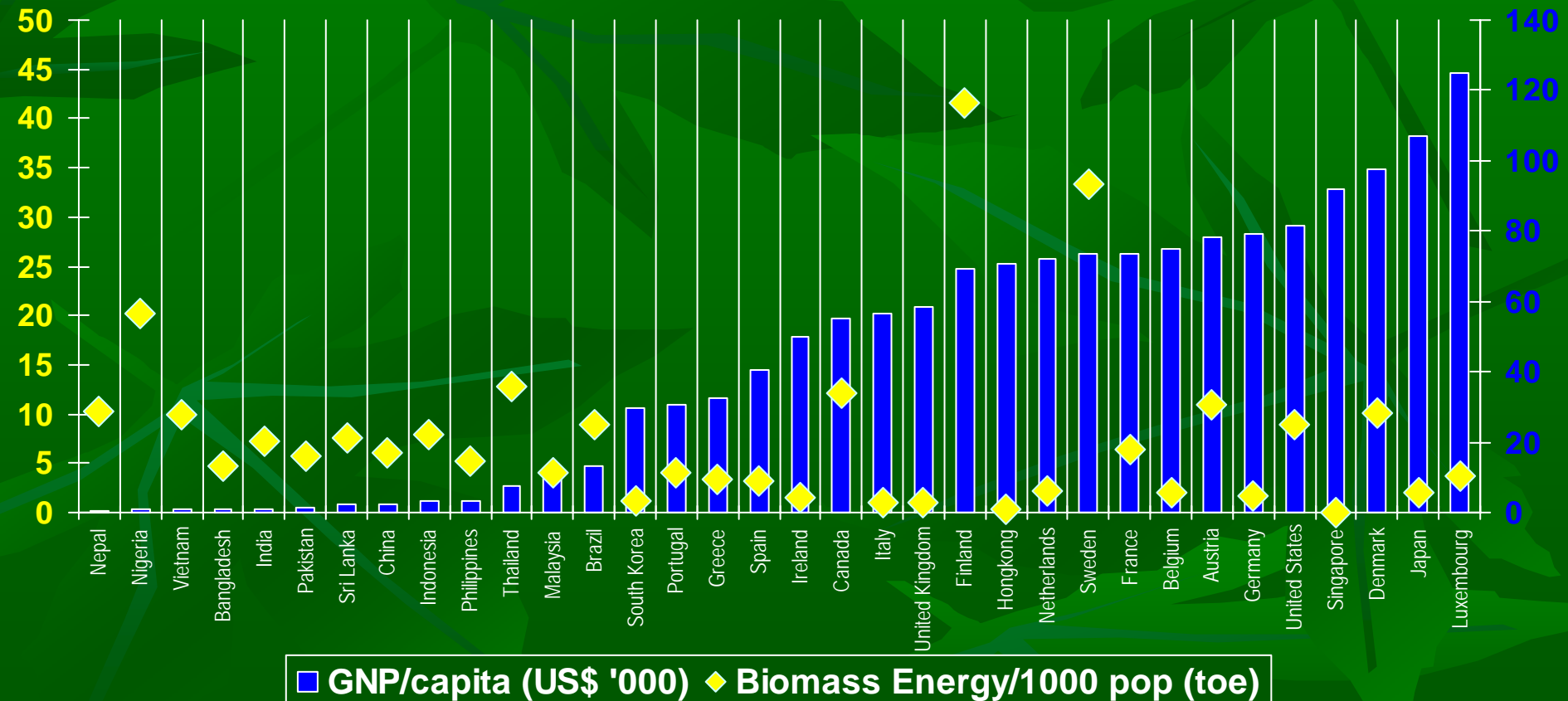
Bioenergy in Developing Countries

Bioenergy use increases with economic development



Modernizing Bioenergy

Bioenergy use & level of economic development



Modernizing Bioenergy

Bioenergy transition in developing countries

TRADITIONAL TECHNOLOGIES	Wood & other biomass in primary form; charcoal	Human Labor	Animal Labor
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- short to medium term changes -

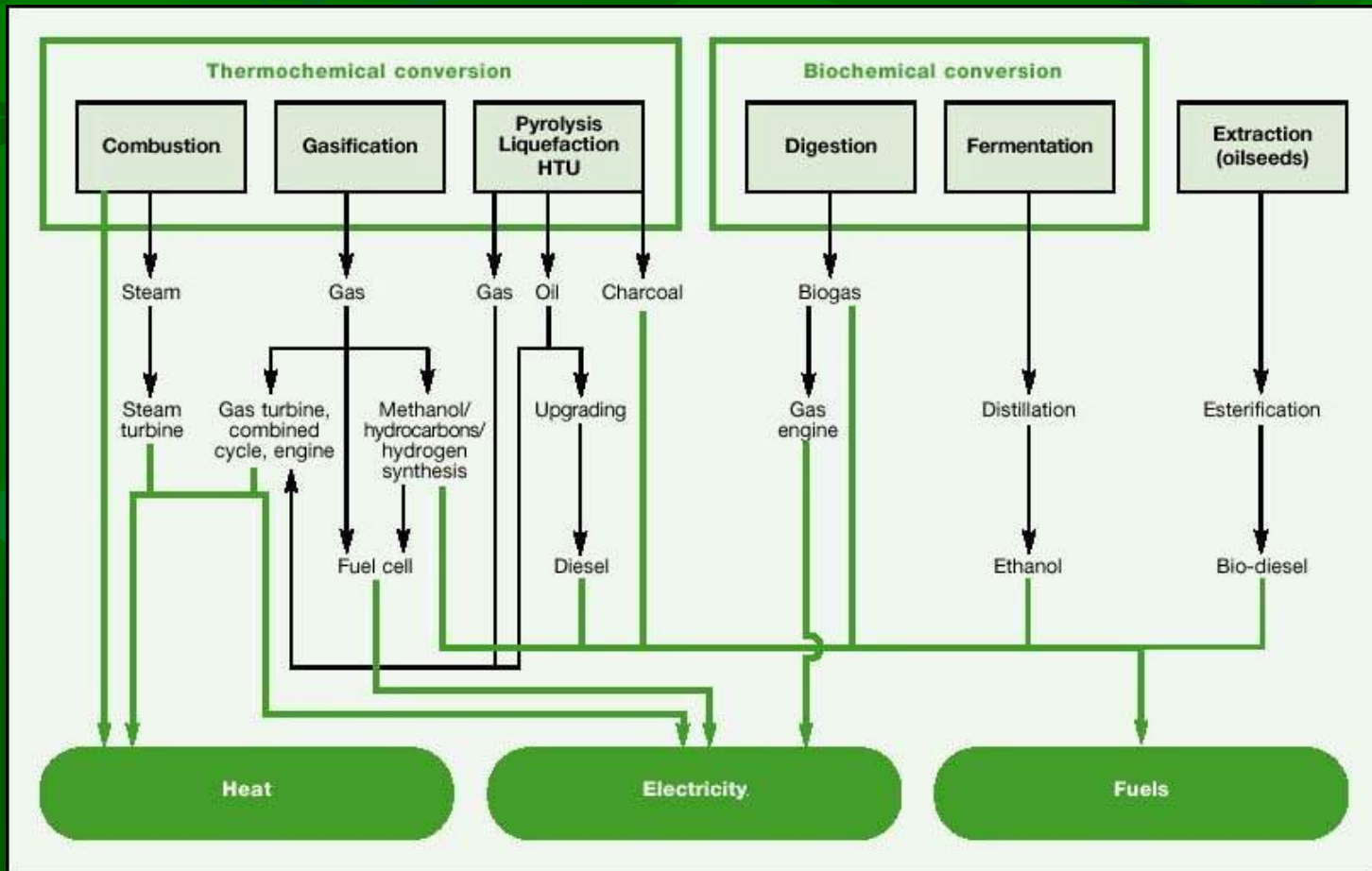
IMPROVED TECHNOLOGIES	Wood & other biomass in primary form; densified biofuels & improved charcoal	Liquid & gaseous biofuels	Small-Scale Renewable Energy Systems	Conventional Energy Systems
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- medium to long term changes -

ADVANCED TECHNOLOGIES	Wood & other biomass in primary form; densified biofuels & improved charcoal	Liquid & gaseous biofuels	Small-, Medium- & Large-scale Renewable Energy Systems	Advanced Conventional Energy Systems
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Modernizing Bioenergy

Modern bioenergy conversion technologies



Independent or grid-connected power plants



Heating for agro-processing & rural industries



Modern, clean, affordable, & convenient cooking fuel



Transport fuels



Process heat, steam & electricity generation for large industries



Modernizing Bioenergy

Energy services from modern bioenergy

Technology	Scale	Energy services provided
Biogas	Small	<ul style="list-style-type: none">• Electricity (local pumping, milling, lighting, communications, refrigeration, etc. and possible distribution via utility grid)• Cooking• Heating
Producer gas	Small to medium	<ul style="list-style-type: none">• Electricity (local pumping, milling, lighting, communications, refrigeration, etc. and possible distribution via utility grid)• Cooking• Heating
Ethanol	Medium to large	<ul style="list-style-type: none">• Vehicle transportation• Cooking
Steam turbine	Medium to large	<ul style="list-style-type: none">• Electricity (for industrial processing and grid distribution)• Heating process heat
Gas turbine	Medium to large	<ul style="list-style-type: none">• Electricity (for industrial processing and grid distribution)• Heating process heat

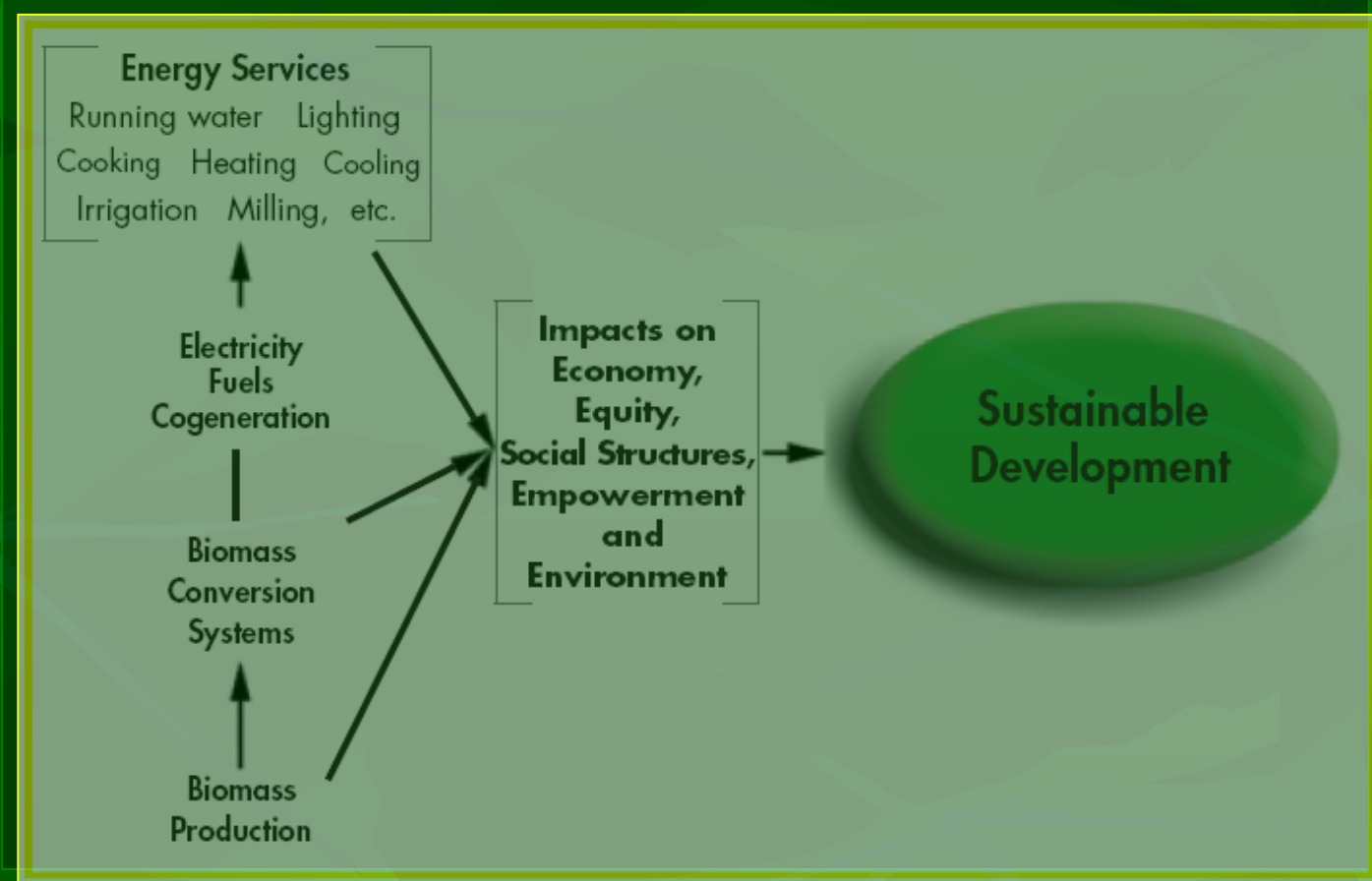
Modernizing Bioenergy

Modern bioenergy is increasingly competitive

Energy Product	Increase in production last 5 years (%/year)	Operating capacity, end 2001	Energy production in 2001	Turnkey investment costs (2001 USD)	Energy Cost	Potential future energy cost
Electricity	2.5	40 GWe	170 TWh (e)	500 - 6,000 USD/kWh	3 - 12 ¢/kWh	4 - 10 ¢/kWh
Heat	2	210 GWth	730 TWh (th)	170 - 1,000 USD/kWh	1 - 6 ¢/kWh	1 - 5 ¢/kWh
Ethanol	2	19 bln litres	450 PJ		8 - 25 \$/GJ	6 - 10 \$/GJ
Bio-diesel	1	1.2 bln litres	45 PJ		15 - 25 \$/GJ	10 - 15 \$/GJ

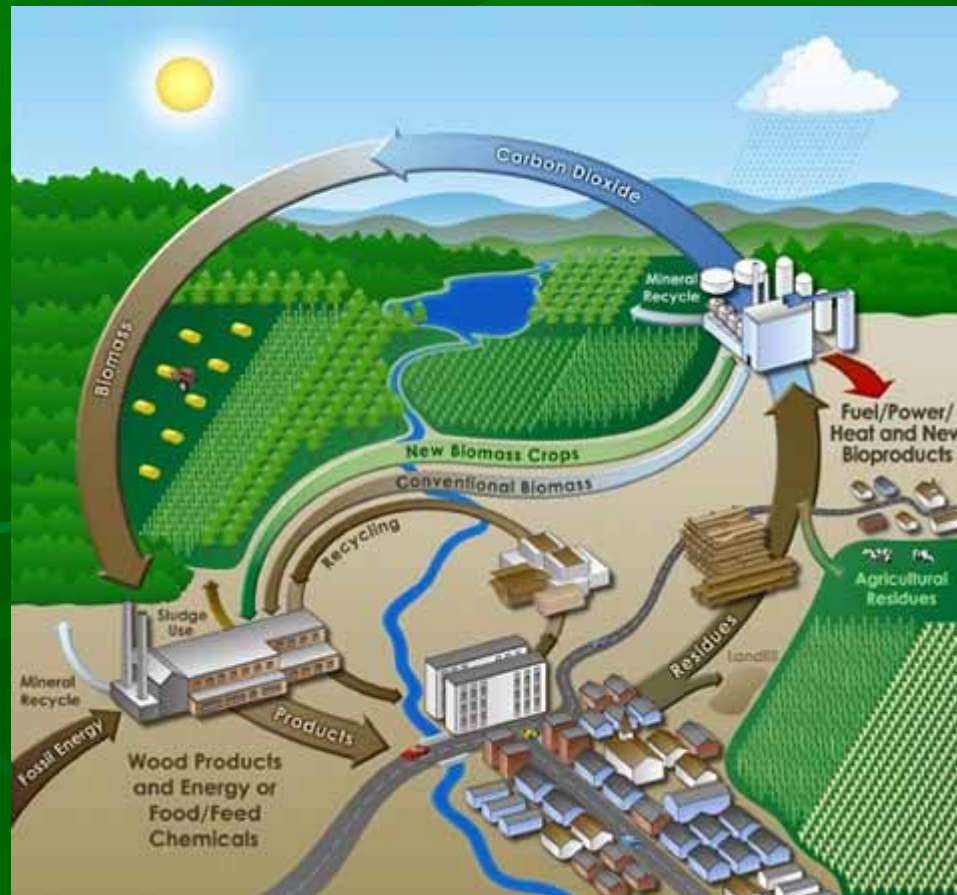
Modernizing Bioenergy

Sustainable development driven by modern bioenergy



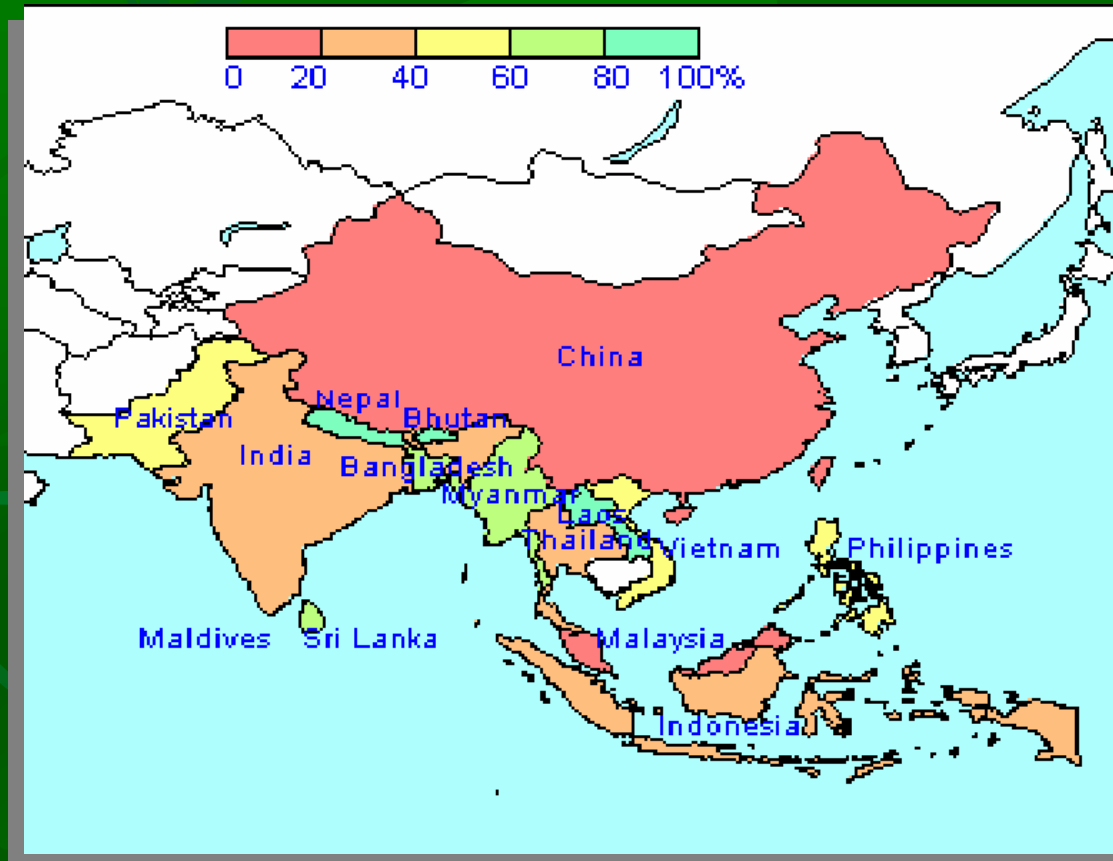
Modernizing Bioenergy

Reduction of GHG emissions from modern bioenergy



Modernizing Bioenergy

Bioenergy situations are country-specific



Modernizing Bioenergy

Bioenergy supply & demand determined by local conditions

Typology of Wood Energy Situations

- | | | |
|---|--|--|
|  | <u>Very heavy stress:</u> | <i>very high population density,
low primary biomass supply</i> |
|  | <u>Heavy Stress:</u> | <i>high population density,
low primary biomass supply</i> |
|  | <u>Low to Moderate Stress:</u> | <i>medium to high population density,
low to medium primary biomass supply</i> |
|  | <u>None to Very Minimal Stress:</u> | <i>low to medium population density,
low to medium primary biomass supply</i> |
|  | <u>Remote (Surplus):</u> | <i>low to medium population density,
medium to high primary biomass supply</i> |
|  | <u>Very Remote (Surplus):</u> | <i>low population density,
high primary biomass supply</i> |



Modernizing Bioenergy

■ Scenarios for Modern Bioenergy Systems:

1. least-cost option to the recipient of the energy services and there are no appreciable barriers to its implementation; commercially viable without external support or policy intervention.
2. least-cost option to the service recipient in the longer term, but requires initial external support to overcome barriers and to get started.
3. Not the least-cost option, but provide external benefits (job creation, ecosystem services, etc.) - attractive from a societal perspective - bioenergy will be lever for development, but continuous policy interventions may be needed to support it.
4. not the least-cost option, and carries unacceptable societal costs; if policy interventions are, the chances of contributing to sustainable development in the long term are minimal.

FAO Interdepartmental Bioenergy Programme

- **Bioenergy in the international agenda:**
 - 1981 UN Conference on NRSE
 - 1998 UNCED – Agenda 21
 - 2000 UN Millennium Declaration – MDGs
 - 2002 Johannesburg WSSD Conference – WEHAB
 - 2004 Bonn International Conference on RE
 - 2006 CSD Conference

FAO Interdepartmental Bioenergy Programme

■ Objectives:

- to promote sustainable bioenergy systems for poverty alleviation; and
- to assist member countries in the integration of wood energy and agro energy into agriculture, forestry and rural energy development efforts.

■ Two areas:

- Wood energy
- Agro energy

FAO Interdepartmental Bioenergy Programme

- **FAO is lead UN agency for both forestry and agriculture, with a mandate to:**
 - generate and disseminate information (for example on bioenergy resources, production, trade and utilization);
 - provide global and long-term perspective studies on the production potential of bioenergy and the impacts of a growing bio-energy production on natural resources;
 - provide multi-disciplinary analyses that assess the economic, environmental and food security aspects of growing bioenergy production;
 - provide technical assistance to member countries; and contribute to international cooperation and dialogue on bioenergy matters.

FAO Interdepartmental Bioenergy Programme

■ **Current Activities:**

■ Information generation & dissemination - production, trade & use

- Wood Energy Information System (WEIS); Unified Wood Energy Terminology (UWET); Guide for Woodfuel Surveys; Woodfuel Integrated Supply-Demand Overview Mapping (WISDOM);
- energy requirements for agriculture
- increase competitiveness of rural agro industries thru bioenergy

■ Technical assistance to member countries

■ Assessment of funding & finance mechanisms

- improve eligibility of agricultural and bioenergy activities for CDM;
- guidebook on opportunities for agricultural activities under the KP.

■ Cooperation with national, regional & international partners.

- promote competitiveness and efficient use of bioenergy in small and medium agro-industries.

FAO Interdepartmental Bioenergy Programme

- Key issues in bioenergy:
 - Policies & institutions
 - Capacities
 - Technical & economic
- Areas for collaboration

FAO Interdepartmental Bioenergy Programme

■ Policy and Institutional Issues:

1. inadequate understanding of the energy implications of the MDGs;
2. fragmentation of responsibilities and lack of coordination among institutions involved;
3. insufficient communication, cooperation and participation of these institutions and private stakeholders such as forest owners, farmers, communities, agro-industries and NGOs;
4. lack of agriculture, forestry & energy policies & cross-sectoral approaches to promote the integration & diversification opportunities of wood & agro-energy activities;

FAO Interdepartmental Bioenergy Programme

■ Capacity Issues:

1. insufficient capacities to promote, develop and implement bioenergy at national, regional and international levels;
2. weak channels of communications between public and private stakeholders;
3. lack of human resources trained in bioenergy;
4. insufficient attention to wood energy and agro-energy in forestry / agriculture/ energy / engineering curricula;

FAO Interdepartmental Bioenergy Programme

■ Technical and economic issues:

1. lack of data on the quantity, quality and potential of bioenergy sources and conversion technologies;
2. poor understanding of the energy balances of bioenergy production systems and of their potential and limits to reduce greenhouse gas emissions;
3. lack of understanding of the mechanisms to draw economic benefits from the positive environmental effects derived from bioenergy production;
4. poor understanding of the interrelations between wood and agro-energy systems;

FAO Interdepartmental Bioenergy Programme

■ Areas for collaboration:

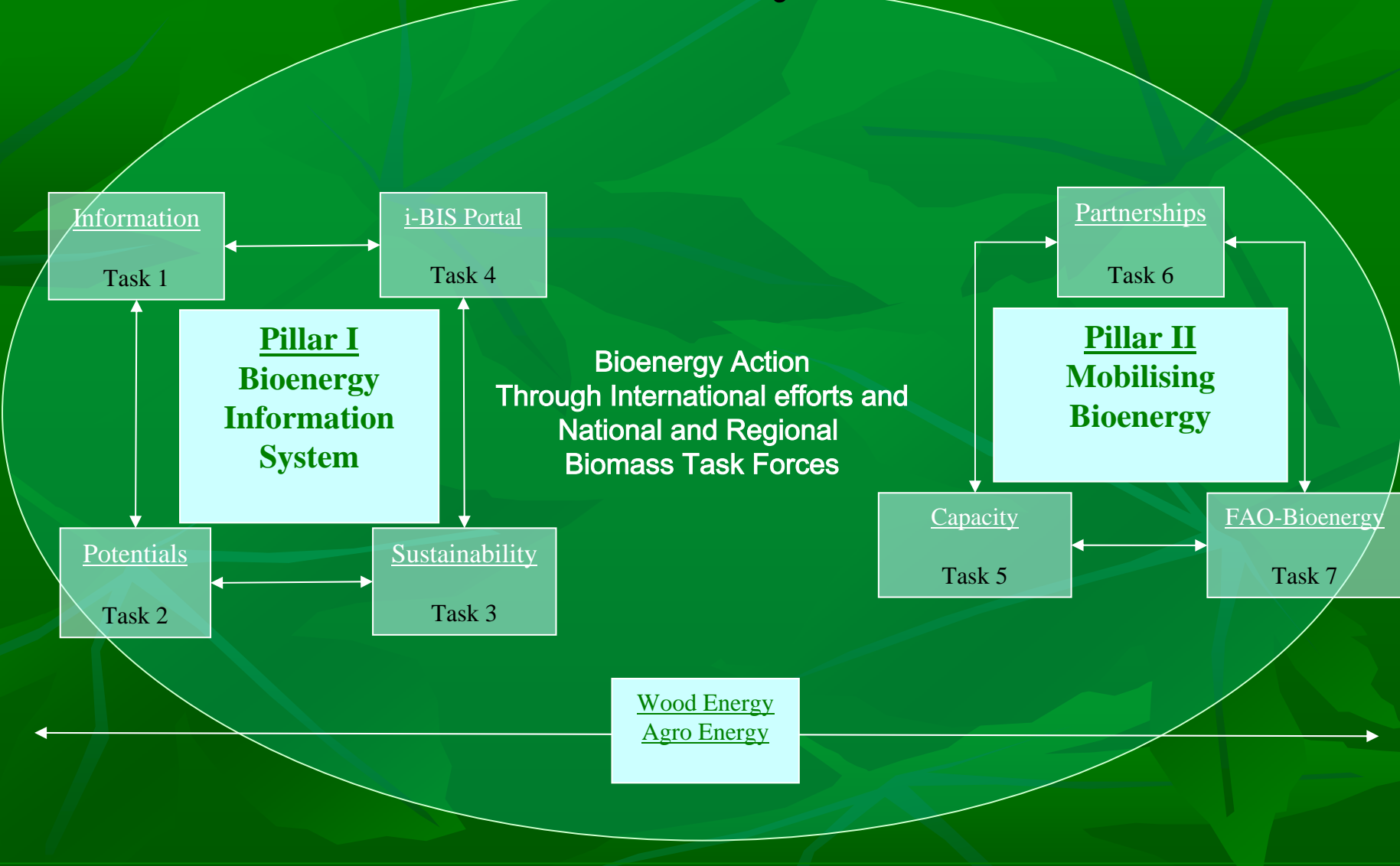
- energy and climate change and carbon balances;
- trade in biofuel;
- information on bioenergy policies, institutional and legal aspects;
- technical, economic, social and environmental aspects of bioenergy systems; and
- land tenure and other socio-economic issues, including rural livelihoods, gender and farming systems.

International Bioenergy Programme

IBEP

to be launched in 2006

International BioEnergy Programme Framework – facilitated by FAO





Vision of International Bioenergy Programme:

Promote and monitor the sustainable use of modern biomass energy systems for sustainable development, energy security and climate change mitigation.

International Bioenergy Programme - Tasks/Objectives



- 1. Information.** Assist project development by providing examples of success and failure.
- 2. Potentials.** Develop tools to quantify the potential bioenergy resource base on a country-by-country level and therefore highlight opportunities.
- 3. Sustainability.** Assist in the development of sustainability strategies and assurance schemes aimed at ensuring the sustainable development of bioenergy.
- 4. i-BIS (Interactive Bioenergy Information System).** Provide detailed 'real-time' data on consumption patterns and existing activities.

5. Capacity and Stakeholders.

Provide an enabling environment for establishing and developing bioenergy programmes and projects.

6. Partnerships.

Assist international bodies to collaborate in the development of coherent national and international bioenergy programmes.



Thank you !

www.fao.org

http://www.fao.org/sd/en2_en.htm

<http://www.fao.org/forestry/index.jsp>



FAO data and Information for decision making on bioenergy

- **Farming practices**
- **Forest Resources Assessment - FRA**
- **Land type and use**
- **Water**
- **Wood energy (40 years old)**
- **Agricultural production – including by-products**
- **Rural institutions**
- **Livelihoods**
- **Nutrition**
- **SEEDS**
- **GTOS**
- **Fisheries**



FAO Interdepartmental Bioenergy Programme

■ Policy and Institutional Issues:

5. inadequate legislation & lack of energy incentives in most countries, such as preferential tax treatments;
6. insufficient support to private sector, forest owners and farmers on biofuels production; and
7. potential overlap in mandates, roles and functions of international organizations.

FAO Interdepartmental Bioenergy Programme

■ Capacity Issues:

5. inadequate educational and technical materials;
6. insufficient tools, methods and models for project development, evaluation and monitoring, particularly regarding bioenergy supply; and
7. weak information and statistical data on resources, production, trade and consumption of biomass for energy purposes.

FAO Interdepartmental Bioenergy Programme

- **Technical and economic issues:**
 5. insufficient information about costs, advantages and disadvantages of using wood and agrofuels;
 6. lack of regulations to ensure that biofuels are produced, traded and used according to appropriate guidelines and standards; and
 7. lack of equipment and poor knowledge of the appropriate practices for harvesting, transportation, storage and use of biofuels.

FAO Interdepartmental Bioenergy Programme

■ Areas for collaboration:

- statistics on wood and agro energy;
- biofuels resources and supply/demand outlook;
- information on energy from crops, residues and wastes;
- bioenergy for rural industries, specially food industries;

FAO Interdepartmental Bioenergy Programme

■ Areas for collaboration:

- analysis of competition between raw materials for food, fuels and other uses;
- cost-benefit analyses of the various forms of bioenergy production both from the producers' and the overall society's perspective;
- assessments of the potential and the impacts of a monetisation of positive external effects, particularly for developing countries;
- analyses of possible impacts on food prices and availability associated with a growing use of land, water and other agricultural resources for bioenergy production, particularly for poor, food and energy importing countries;