

2<sup>nd</sup> Biomass Asia Workshop

Bangkok, Thailand

**Issues in Assessing Bioenergy Resources**  
**The Case for Woody Bioenergy Resources**

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# Issues in Assessing Bioenergy Resources

- **Outline of Presentation**

- Types of Bioenergy Resources
- Factors Determining Stock & Production of Woody Bioenergy Resources
- FAO Interdepartmental Programme on Bioenergy

# Types of Bioenergy Resources

- **Woody bioenergy: Fuelwood - chopped trunks, small logs, broken branches & twigs**
  - **Forest sources**
    - Forest harvesting and residues
    - Short rotation fuelwood plantations
    - Wood processing residues
  - **Non-forest sources**
    - Agroforestry systems
    - Woodlots
    - Scattered trees on other land uses
    - short rotation, plantation & natural forests
    - scattered trees on other land types

# Types of Bioenergy Resources

- Non-Woody: Agricultural or crop-based resources
  - Agricultural crops
    - Annual & perennial crops like Jatropha, Miscanthus, Swithgrass
    - Traditional agricultural crops like sugarcane, corn, & oil seeds both for direct utilization or *liquid biofuels* production
  - Crop processing residues
    - Examples include: bagasse from sugar cane processing & rice hull rice milling
  - Crop field residues
    - Examples include: rice & sugarcane stalks, coconuts husks, maize cobs

# Types of Bioenergy Resources

- Organic wastes

- Animal wastes

- includes manure from pigs, chickens and cattle (in feed lots) because these animals are reared in confined areas.

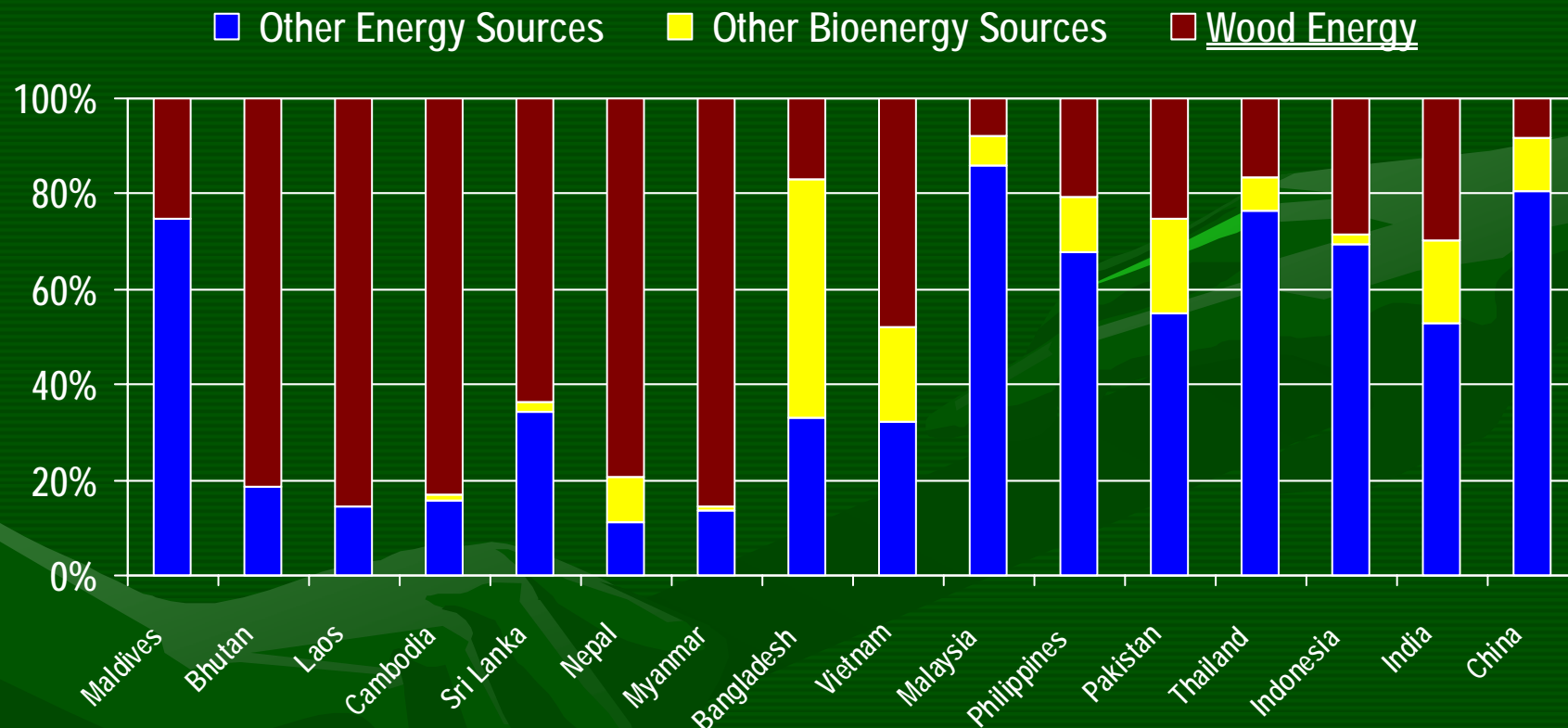
- Sewage sludge

- domestic and municipal sewage from mainly human waste.

- Highly-organic industrial wastes

- Examples include: distillery slops, brewery wastes

# Wood is the Major Component of Bioenergy

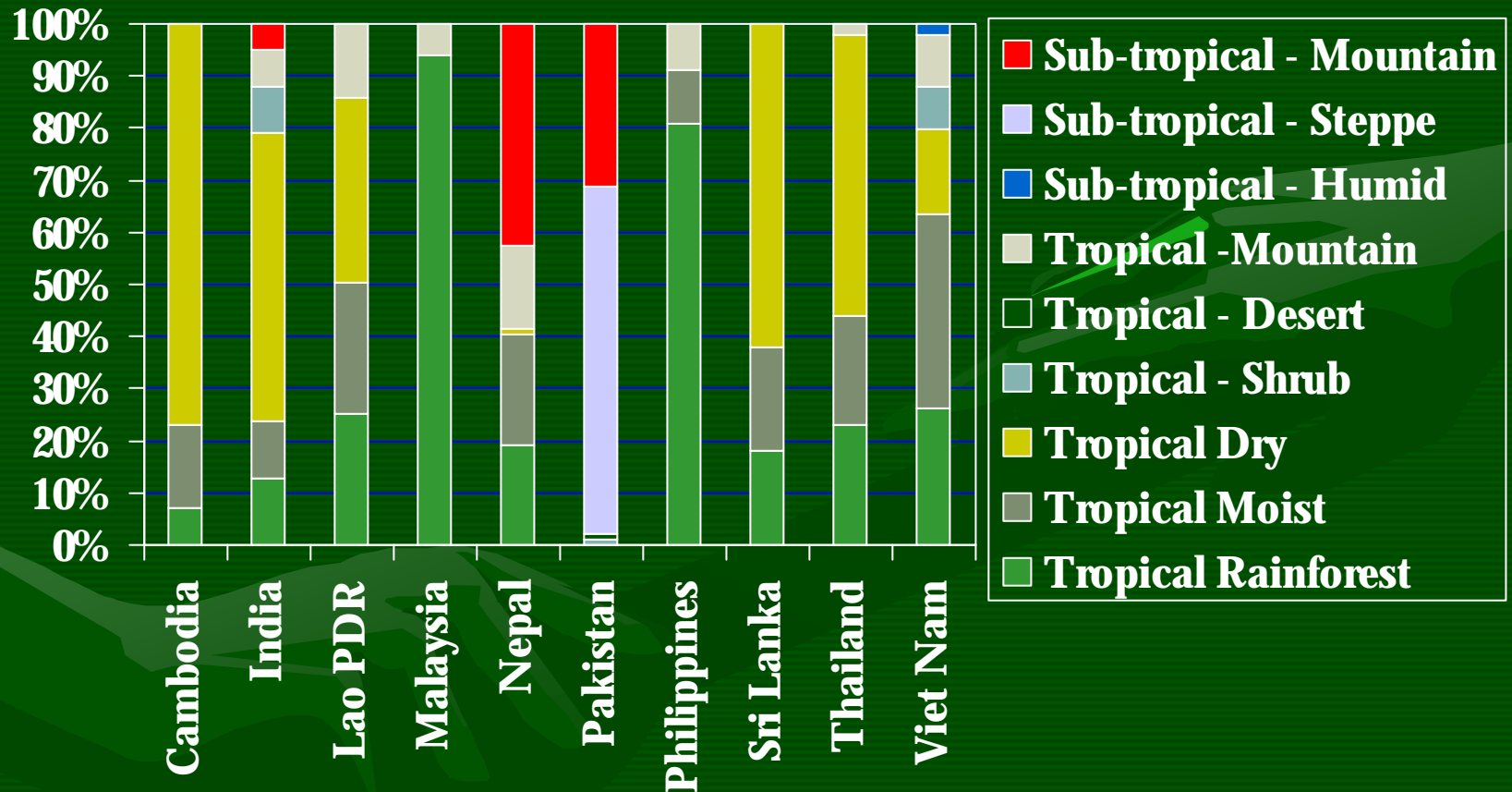


RWEDP Data Base

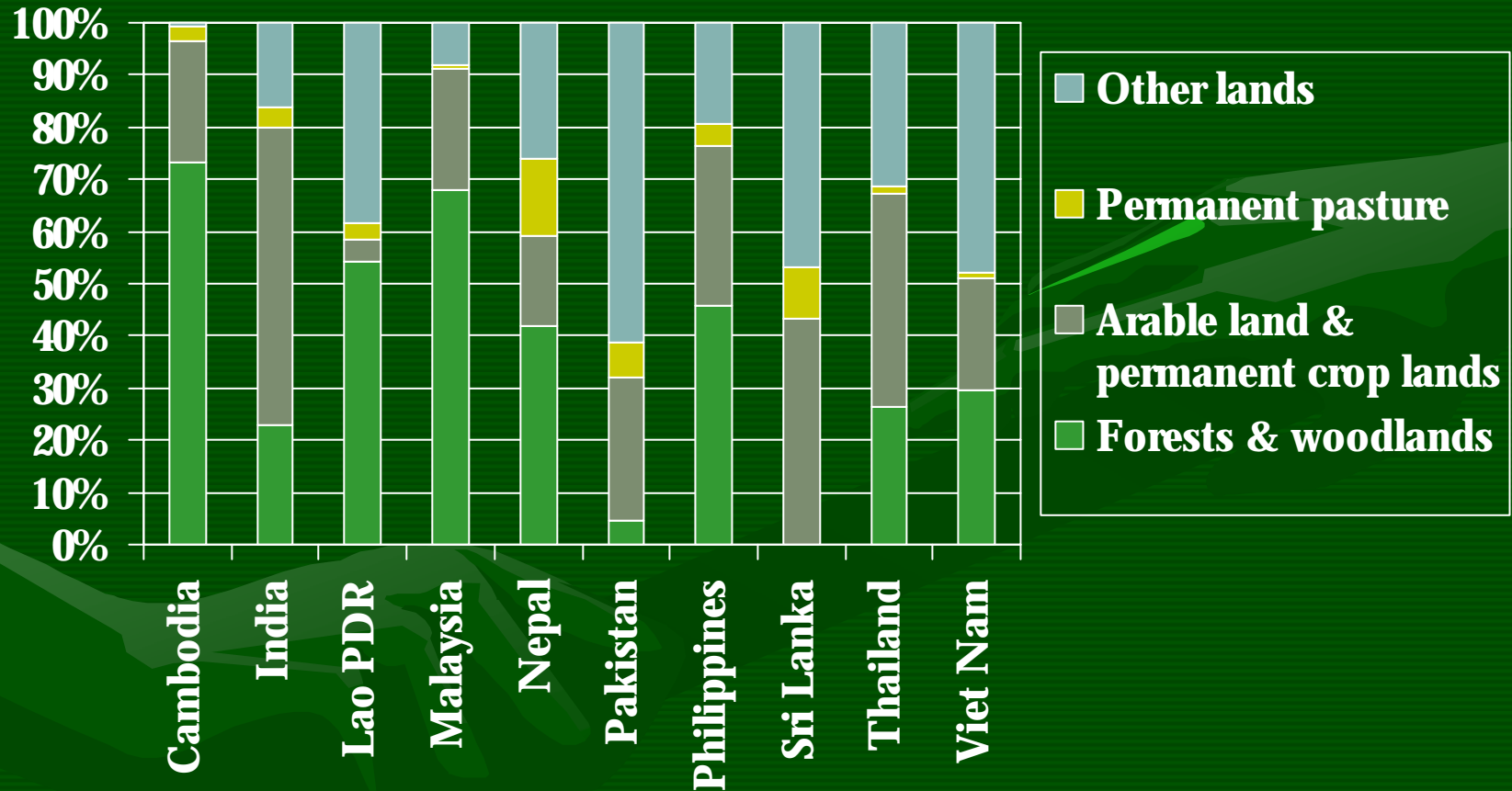
# Factors Determining Stock & Potential Production of Woody Bioenergy Resources

- **Types of Ecological Zones**
- **Patterns of Land Use**
- **Types of Forests and Other Wooded Areas**
- **Above-Ground Woody Biomass**
- **Accessibility Factor**
- **Wood from Non-Forest Areas**
- **Changes in Forest Areas**

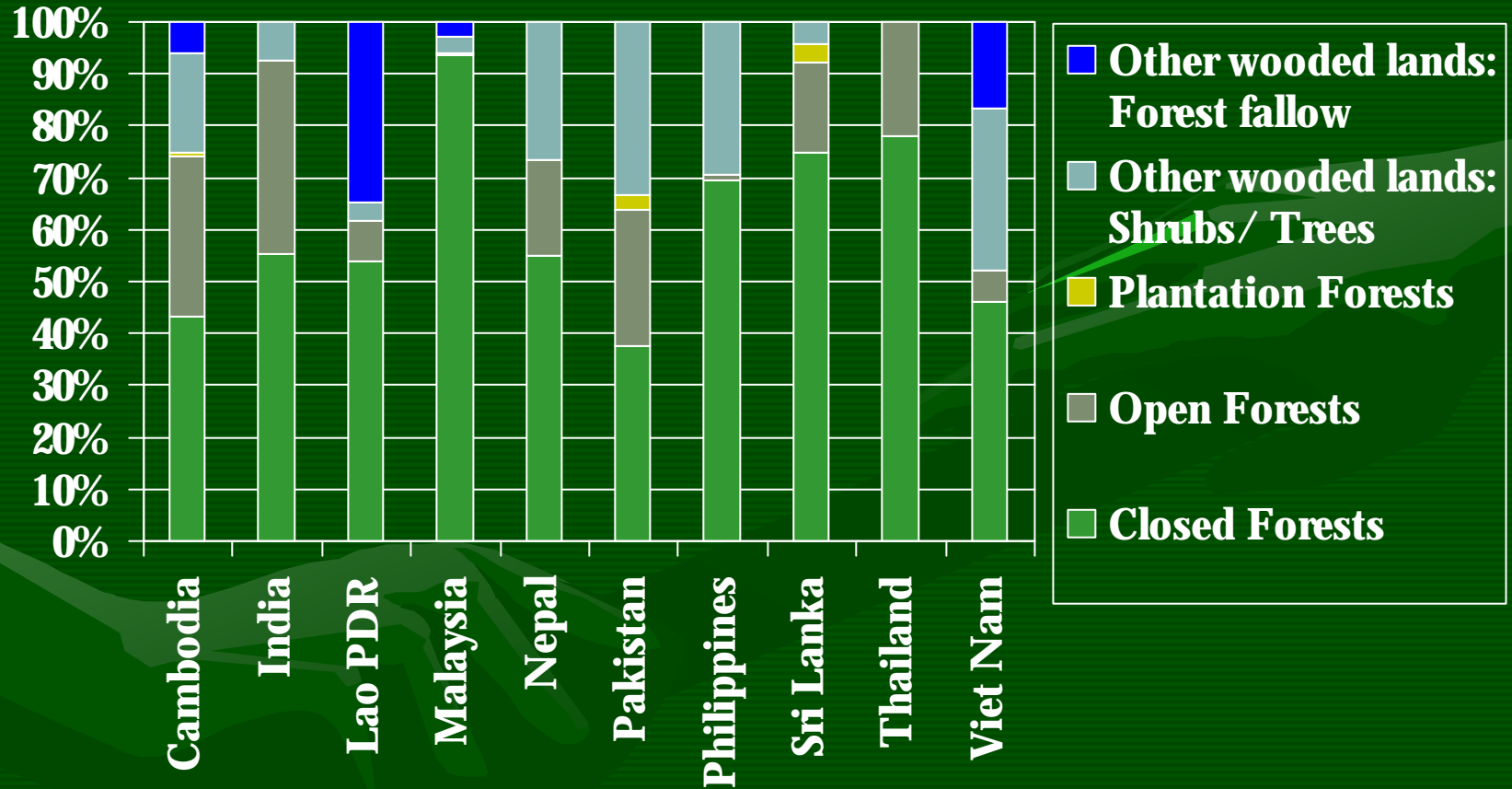
# Type of Ecological Zone



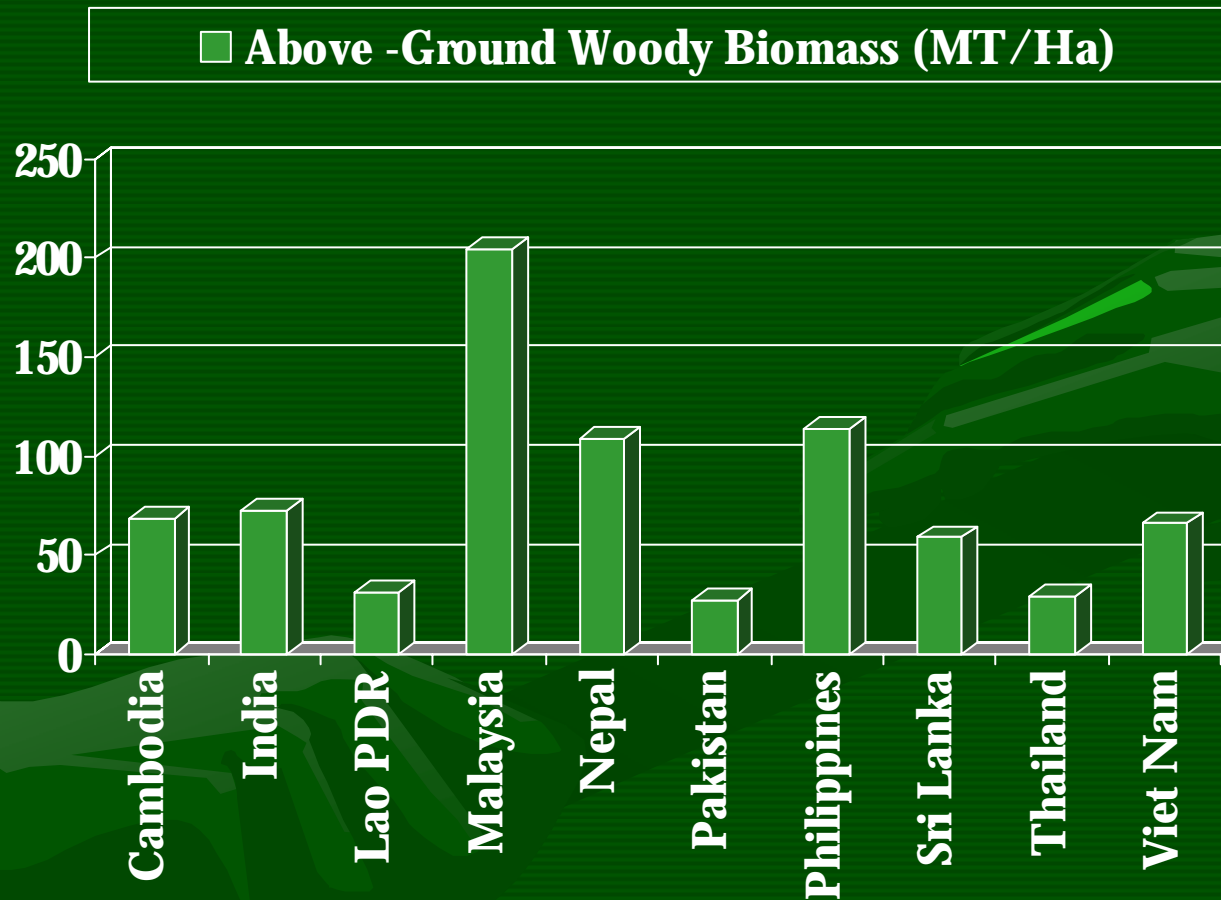
# Patterns of Land Use



# Types of Forests and Other Wooded Areas

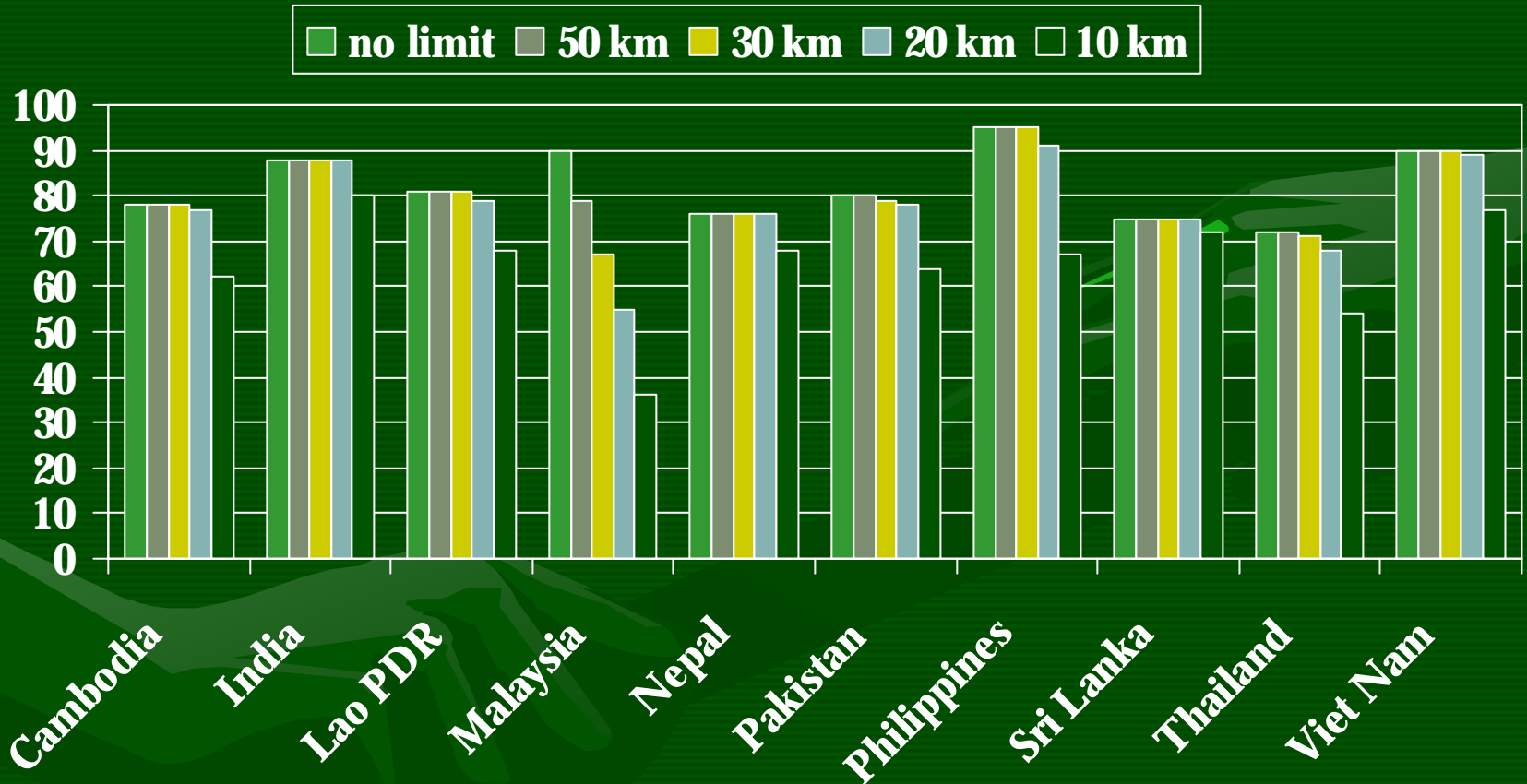


# Above-Ground Woody Biomass

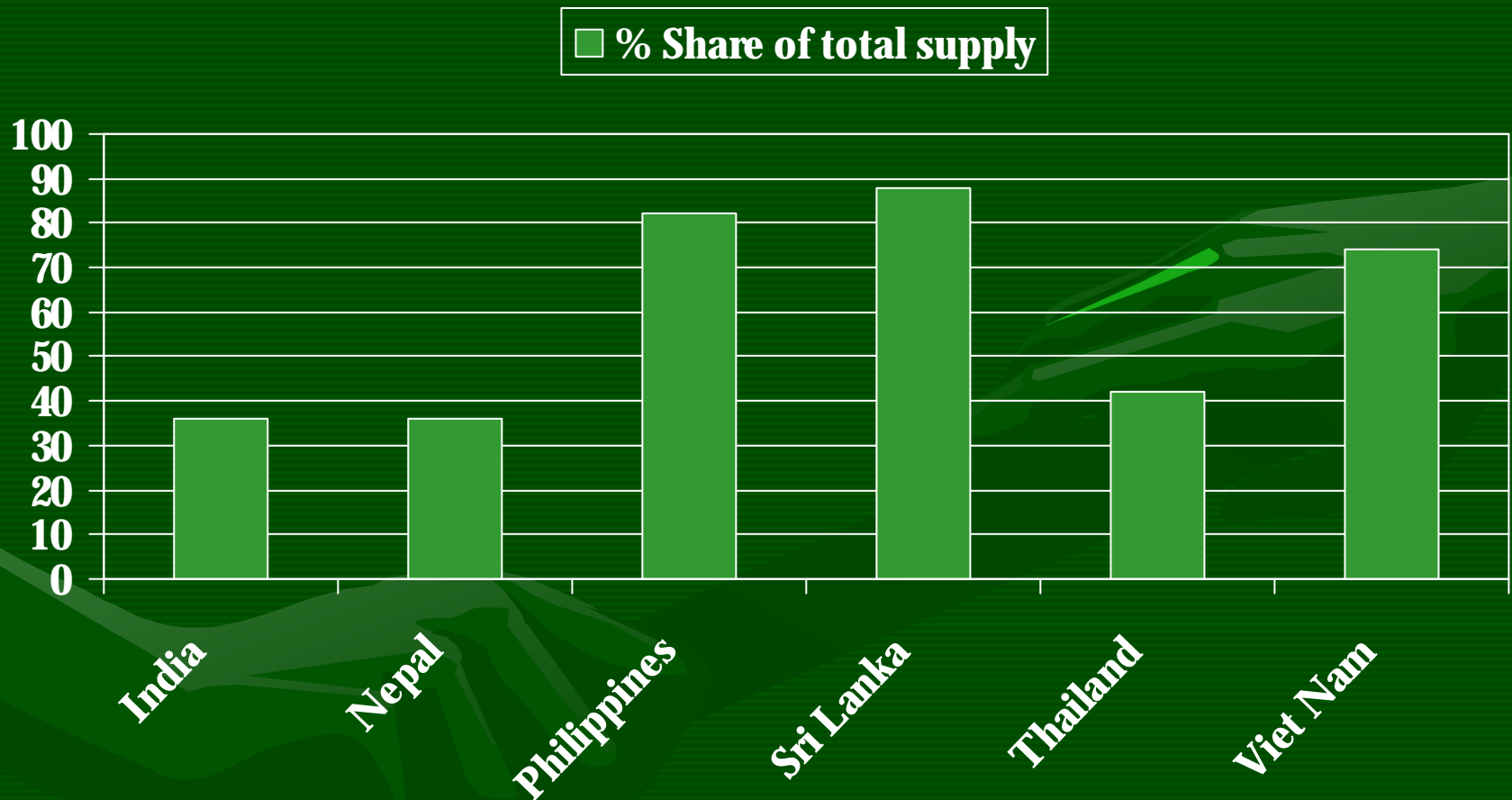


# Accessibility Factors for Forests

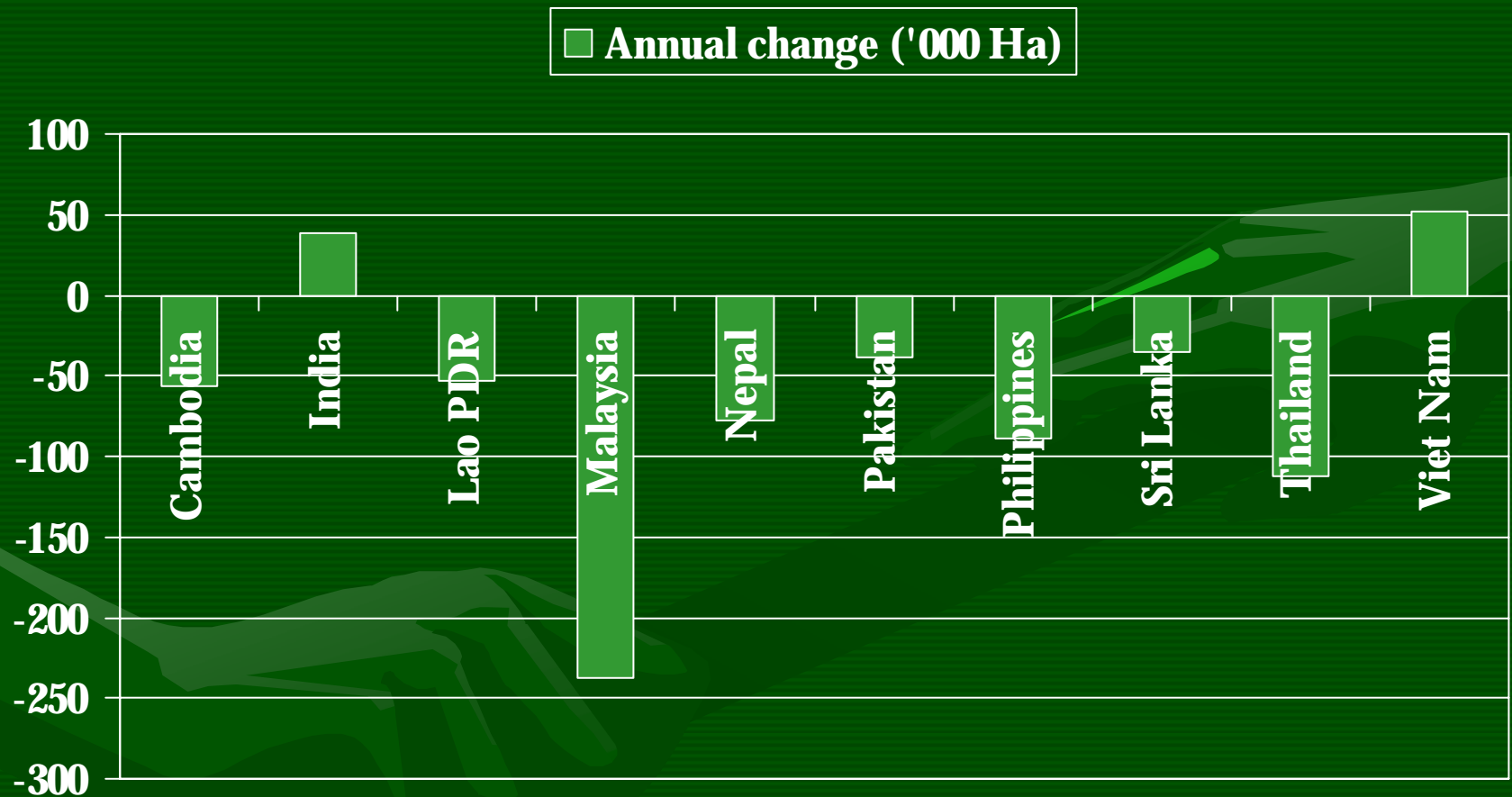
## Forest available for wood supply by distance limits to road infrastructure



# Estimates of Woodfuels from Non-Forest Areas



# Changes in Forest Areas



# Analysis of Woody Bioenergy Stock

Row No	ITEMS	Units	Lao PDR	Malaysia	Data Source/Comments
2	<b>WOODFUELS STOCK POTENTIAL</b>				
3	<b>Potential supply from forests (<i>all types</i>)</b>	<b>MMT</b>	<b>87.67</b>	<b>820.35</b>	<i>MULTIPLY: (Row 8 X Row 9)</i>
4	* Data for assessment of supply in forests				
5	* Gross above ground woody biomass	MMT	391.00	3949.00	<i>From FRA 2000 Report</i>
6	* For timber supply - <i>in volume units</i>	M CUM	359.00	2288.00	<i>From FRA 2000 Report</i>
7	* For timber supply - <i>in mass units</i>	MMT	262.07	1670.24	<i>0.73 MT/CUM</i>
8	* Net above ground woody biomass	MMT	128.93	2278.76	<i>SUBTRACT: (Row 5 - Row 7)</i>
9	* Accessibility ( <i>10 km distance from road</i> )	Percent	68.00	36.00	<i>From FRA 2000 Report</i>
10	<b>Potential supply from non-forest areas</b>	<b>MMT</b>	<b>n.d.</b>	<b>n.d.</b>	<i>No data for all countries</i>
11	<b>TOTAL WOODFUELS SUPPLY POTENTIAL</b>	<b>MMT</b>	<b>n.d.</b>	<b>n.d.</b>	<i>SUM: (Rows 3 + 10)</i>

# Analysis of Woody Bioenergy Production

Row No	ITEMS	Philippines	Thailand	Data Source/Comments
12	<b>WOODFUELS PRODUCTION POTENTIAL</b>	<b>MMT/year</b>		
13	<b>Forest woody biomass production</b>	<b>15.10</b>	<b>8.91</b>	<i>SUM: (Rows 14 + 15) [A]</i>
14	Production forests	13.50	8.61	<i>From country reports</i>
15	Plantation forests	1.60	0.22	<i>From country reports</i>
16	<b>Non-forest woody biomass production</b>	<b>70.00</b>	<b>19.72</b>	<i>SUM: (Rows 17 to 22)</i>
17	Croplands ( <i>include agroforestry</i> )	8.00	13.10	<i>From country reports</i>
18	Tree crops ( <i>e.g.; fruit orchards</i> )	8.00	6.42	<i>From country reports</i>
19	Home gardens	n.d.	n.d.	<i>From country reports</i>
20	Grass lands	2.00	n.d.	<i>From country reports</i>
21	Degraded & wastelands ( <i>e.g.; shrub/brush lands</i> )	32.00	n.d.	<i>From country reports</i>
22	Other lands ( <i>include roads &amp; riverbanks</i> )	20.00	0.20	<i>From country reports</i>
23	<b>Other sources</b>	<b>n.d.</b>	<b>n.d.</b>	<i>SUM: (Rows 24 to 27)</i>
24	Forest conversion	n.d.	n.d.	<i>No data for all countries</i>
25	Logging residues	n.d.	n.d.	<i>No data for all countries</i>
26	Recovered wood	n.d.	n.d.	<i>From country reports</i>
27	Wood processing wastes	n.d.	n.d.	<i>SUM (Rows 28 + 29)</i>
28	* Black Liquor	n.d.	n.d.	<i>No data for all countries</i>
29	* Wood wastes ( <i>shavings, sawdust, etc.</i> )	n.d.	n.d.	<i>From country reports</i>
30	<b>Total woody biomass production</b>	<b>85.10</b>	<b>28.63</b>	<i>SUM (Rows 13+16+23)</i>
31	<b>Less: Wood consumption for non-fuel uses</b>	<b>n.d.</b>	<b>n.d.</b>	<i>No data for all countries</i>
32	<b>TOTAL WOODFUELS PRODUCTION POTENTIAL</b>	<b>n.d.</b>	<b>n.d.</b>	<i>SUBTRACT:(Row 30 - Row 31)</i>

# Analysis of Woody Bioenergy Consumption

R	Item	MMT/ year	Data Source/Comments
33	<b>WOODFUELS PRIMARY CONSUMPTION</b>		
34	Direct combustion for heating applications	6.37	<i>SUM (Rows 40 + 54)</i>
35	Charcoal production	0.19	<i>Equal to Row 48</i>
36	Power generation	n.a.	<i>Equal to Row 57</i>
37	Liquid/gaseous fuel production (e.g.; producer gas)	n.a.	<i>Equal to Row 60</i>
38	<b>TOTAL WOODFUELS PRIMARY CONSUMPTION</b>	<b>6.46</b>	<i>SUM (Rows 34 to 37)</i>
39	<b>WOODFUELS FINAL CONSUMPTION</b>		
40	<b>Fuelwood</b>	<b>6.27</b>	<i>SUM (Rows 41+44 - 47)</i>
41	All Households	6.22	<i>SUM (Rows 42+43) [A]</i>
42	* Urban households	n.d.	<i>From country reports</i>
43	* Rural households	n.d.	<i>From country reports</i>
44	Processing Industries	0.04	<i>From country reports</i>
45	Service establishments & other enterprises	0.01	<i>From country reports</i>
46	Institutions	n.d.	<i>From country reports</i>
47	Agriculture	n.d.	<i>From country reports</i>
48	<b>Charcoal</b>	<b>0.19</b>	<i>SUM (Rows 49+52+53)</i>
49	All Households	0.07	<i>SUM (Rows 50 + 51) [A]</i>
50	* Urban households	n.d.	<i>From country reports</i>
51	* Rural households	n.d.	<i>From country reports</i>
52	Processing Industries	0.02	<i>From country reports</i>
53	Service establishments & other enterprises	0.1	<i>From country reports</i>
54	<b>Other primary woodfuels (sawdust)</b>	<b>n.d.</b>	<i>SUM (Rows 55 + 56)</i>
55	All Households	n.d.	<i>From country reports</i>
56	Other sectors	n.d.	<i>No data</i>
57	<b>Power generation</b>	<b>n.d.</b>	<i>SUM (Rows 58 + 59)</i>
58	Black liquor for pulp & paper industry	n.d.	<i>From country reports</i>
59	Woodwaste-recovery power plants	n.d.	<i>From country reports</i>
60	<b>Other secondary woodfuels</b>	<b>n.d.</b>	<i>SUM (Rows 61 + 62)</i>
61	Producer gas	n.d.	<i>From country reports</i>
62	Other secondary gaseous/liquid woodfuels	n.d.	<i>No data</i>
63	<b>TOTAL WOODFUELS FINAL CONSUMPTION</b>	<b>12.49</b>	<i>SUM(R 40+48+54+5 60)</i>

# Policy and Institutional Issues

- ✓ **fragmentation of responsibilities and lack of coordination among institutions involved;**
- ✓ **insufficient communication, cooperation and participation of these institutions and private stakeholders such as forest owners, farmers, communities, agro-industries and NGOs;**
- ✓ **lack of agriculture, forestry and energy policies and cross-sectoral approaches to promote the integration and diversification opportunities of wood and agro-energy activities;**

# Capacity-Building Issues

- ✓ **lack of human resources trained in bioenergy;**
- ✓ **insufficient attention to wood energy and agro-energy in forestry / agriculture/ energy / engineering curricula;**
- ✓ **insufficient tools, methods and models for project development, evaluation and monitoring, particularly regarding bioenergy supply; and**
- ✓ **weak information and statistical data on resources, production, trade and consumption of biomass for energy purposes.**

# Technical and Economic Issues

- ✓ **lack of data on the quantity, quality and potential of bioenergy sources and conversion technologies;**
- ✓ **poor understanding of the energy balances of bioenergy production systems and of their potential and limits to reduce greenhouse gas emissions;**
- ✓ **poor understanding of the interrelations between wood and agro-energy systems;**
- ✓ **insufficient information about costs, advantages and disadvantages of using wood and agrofuels;**

# Areas for Future Work

- **statistics on wood and agro energy;**
- **biofuels resources and supply/demand outlook;**
- **information on energy from crops, residues and wastes;**
- **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;**

## Areas for Future Work

- **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;**
- **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.**