

A new EuropeAID project to study the environmental and social impacts of bioenergy use



EUROPEAID
CO-OPERATION OFFICE

David Neil Bird
JOANNEUM RESEARCH

Task-38 Expert Consultation on Sustainable Biomass

Dubrovnik, 25 October 2007

CLUWRR



WINROCK
INTERNATIONAL
INDIA



CSIR



भारतीय प्रौद्योगिकी संस्थान दिल्ली
Indian Institute of Technology Delhi



Civil Engineering
and Geosciences

RE-Impact: Forestry based Bioenergy for Sustainable Development



Introduction

- Description
- Work Packages
- Host Country – Case Studies
 - Different scales
- Strategic Environmental Assessment (SEA)
- Land Use Incorporated into LCA Approach
 - Water
 - Greenhouse gases
 - Climatic forcing



Description

- Programme on Tropical Forests and other Forests in Developing Countries
- **R**ural **E**nergy Production from Bioenergy Projects: Providing regulatory and **impact** assessment frameworks, furthering sustainable biomass production policies and reducing associated risks
- Outputs
 - **Tools** to assess and visualise spatially the biofuel production impacts
 - Water, GHGs, Social, Biodiversity
 - **Case studies**
 - **Modular impact assessment guidelines**
 - **Policy support**
- Emphasis now on biofuels particularly Jatropha



CLUWRR



WINROCK
INTERNATIONAL
INDIA



JOANNEUM



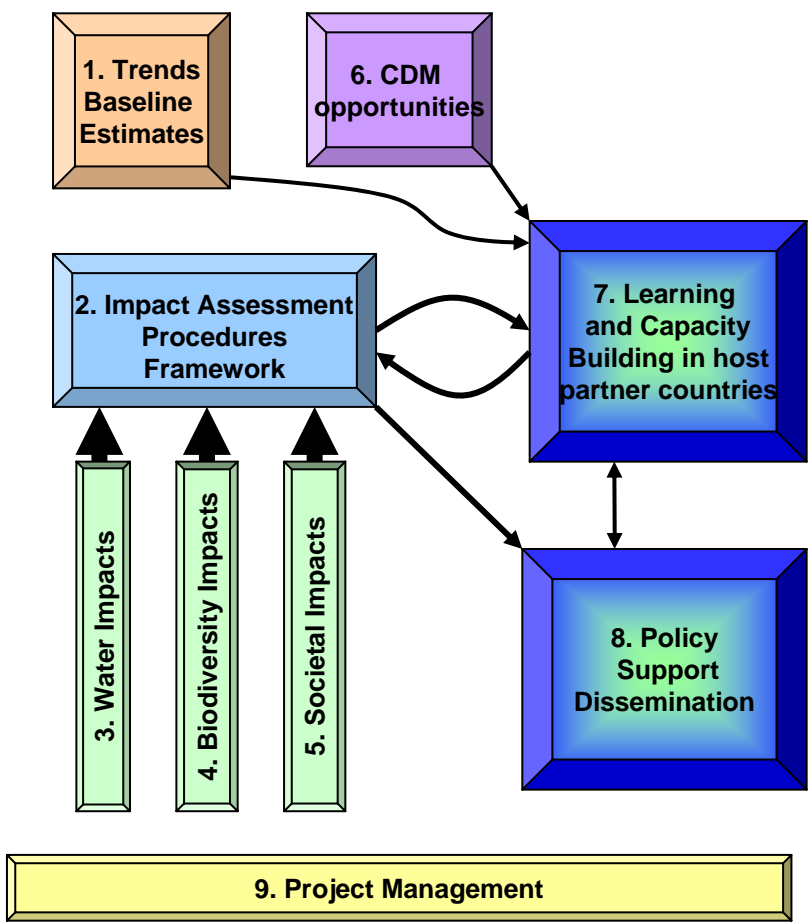
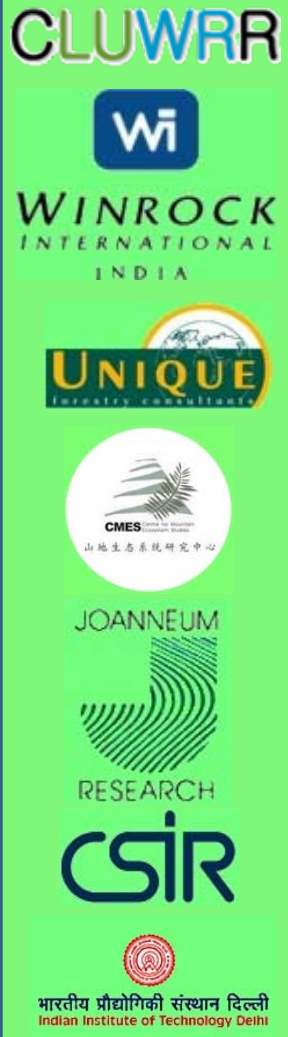
RESEARCH

CSIR



भारतीय प्रौद्योगिकी संस्थान दिल्ली
Indian Institute of Technology Delhi

Work Packages



through International Networks
IUFRO, UNFCCC, IPCC
and Biofuel Conferences



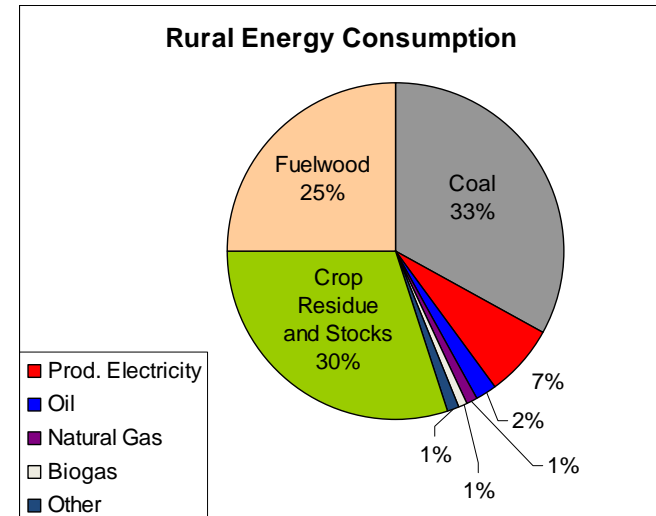
South Africa

- National Scale
- Rural Electrification
 - More beneficial than local level sustainable projects
 - Biomass is targeted as liquid fuel not electrification
- Bioenergy
 - Relatively little experience (3 - 4 years)
 - Commercially rather than policy driven
- Jatropha
 - Introduced 2 years ago but
 - Dept. of Agriculture froze production due to concerns on
 - Social impacts
 - Biodiversity impacts
 - Hydrological impacts
- RE-Impact to use South African Strategic Environmental Assessment framework



China

- 27% of world energy demand
 - Increased demand for biofuels
- World's largest importer of vegetable oils
- Rural Energy Production
 - Rural population 60% of total population (800 million)
 - 70 million people without electricity



JOANNEUM



RESEARCH





China

Energy Objectives

- Solid Biomass
 - 2010: 1 M tonnes/year
 - 2020: 50 M tonnes/year
- Biogas
 - 2010 : 11 G m³/year
 - 2020 : 18 G m³/year
- Ethanol
 - Sugar cane, Cassava etc
 - 2020 : 10 M tonnes/year
- Biodiesel
 - Jatropha, rapeseed etc, restaurant waste etc
 - 2020 : 10 M tonnes/year

CLUWRR



WINROCK
INTERNATIONAL
INDIA



JOANNEUM



CSIR



भारतीय प्रौद्योगिकी संस्थान दिल्ली
Indian Institute of Technology Delhi



China

- Risks

- Food security
- Forest destruction
- Insufficient technical assistance
- Incomplete market system
- Environmental impacts
 - Jatropha in SE China, water shortages
- Biodiversity impact
- Social impacts
 - Land availability

- Provincial Level Assessment



JOANNEUM



RESEARCH



India

- National programme to convert “wasteland” to Jatropha plantations
 - 30 M ha – 20% diesel by 2011-2012
- Energy security (2020)
- Energy independence (2030)
- Improved rural livelihoods
- Watershed level
 - Suktel River Basin
Chhattisgarh, NE India



CLUWRR



WINROCK
INTERNATIONAL
INDIA



JOANNEUM



RESEARCH

CSIR



भारतीय प्रौद्योगिकी संस्थान दिल्ली
Indian Institute of Technology Delhi





Suktel Watershed

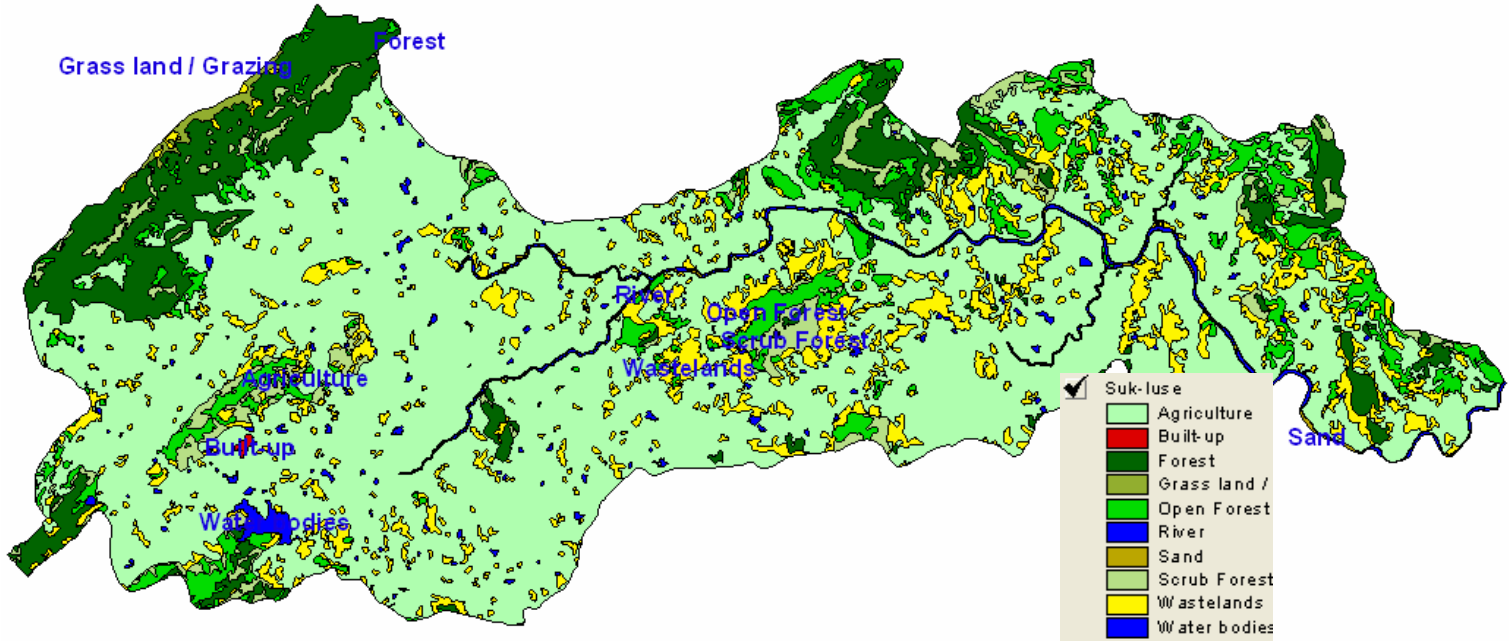
CLUWRR
Wi
WINROCK
INTERNATIONAL
INDIA

UNIQUE
forestry consultancy

CMES
山地生态系统研究中心

JOANNEUM
RESEARCH

CSIR
भारतीय प्रौद्योगिकी संस्थान दिल्ली
Indian Institute of Technology Delhi



Uganda

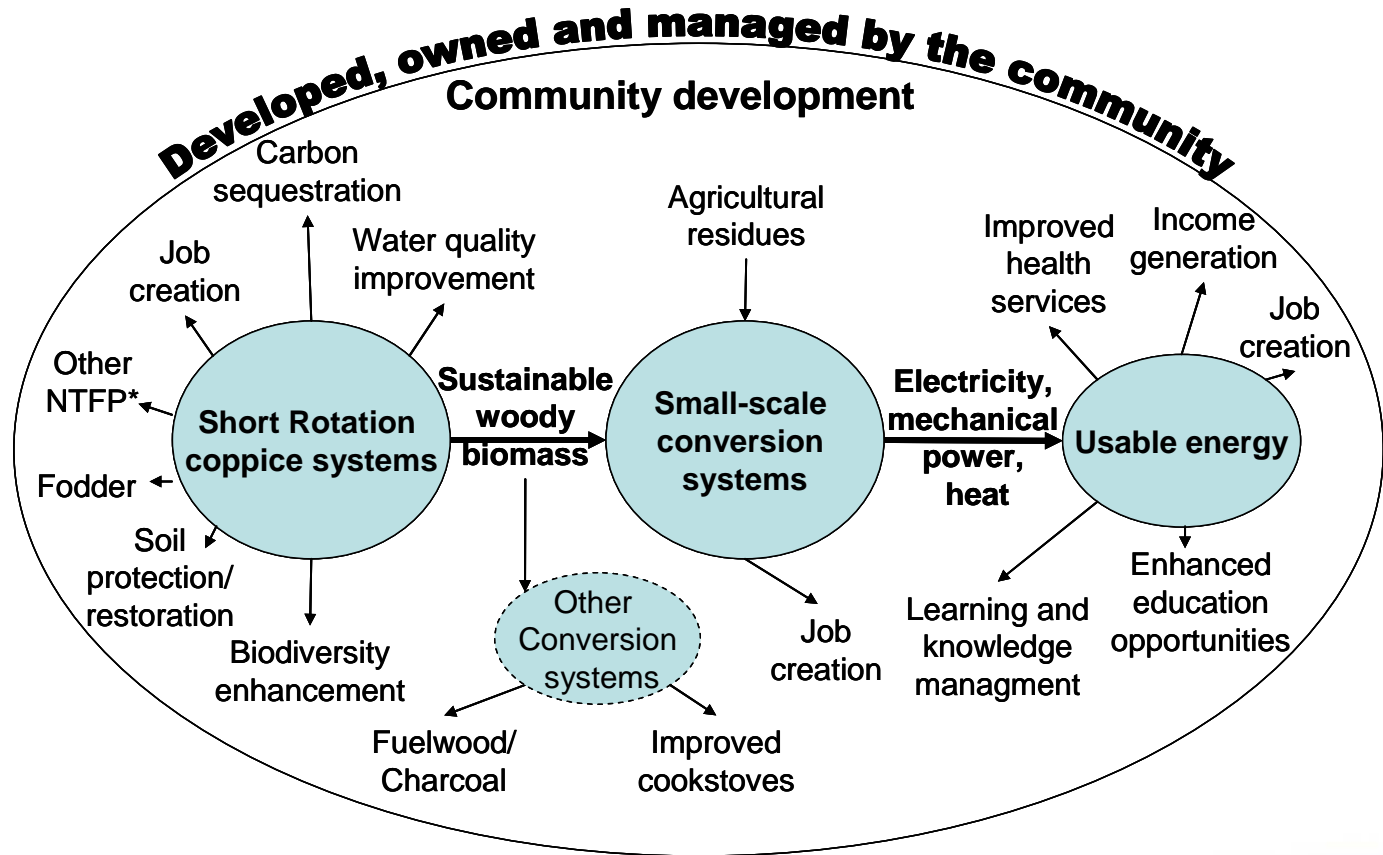
- Power Situation

- 400 MW total installed capacity
- Low Lake Victoria water levels limit hydro production (daily shortages of 50 MW)
- 50 % of current electricity from fossil fuel based thermal power
- 0.26 US\$/kWh thermal power draining revenues and increasing tariffs to 0.23 US\$/kWh for low voltage consumers
- Demand projections suggest additional power demand beyond 2012 even with projected Karuma and Bujagali hydro power projects
- Diversification of local renewable power production required

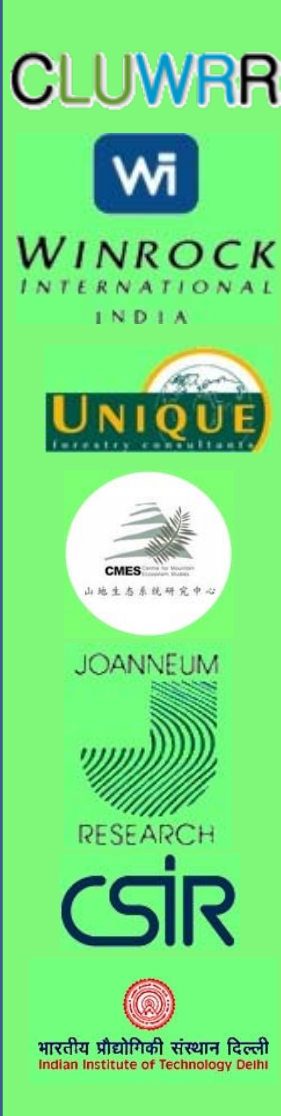


Uganda

Small-scale Wood Gasification Concept



*NonTimber Forest Products

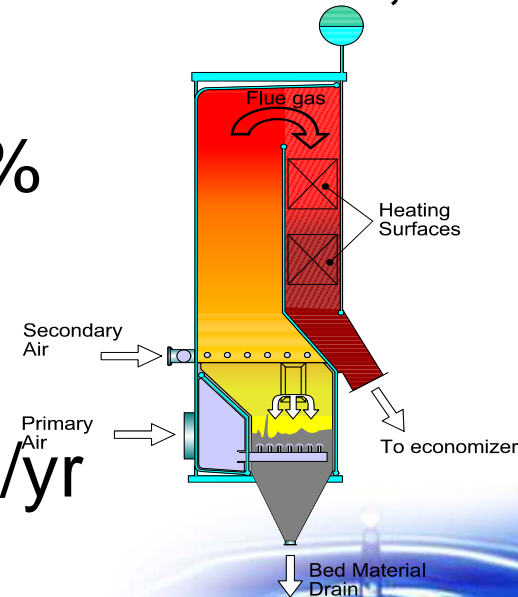




Uganda

Aldwych Biopower Project

- Power plant technology
 - Bubbling fluidized bed boiler with steam turbine
 - Steam turbine cycle operates at 485°C; 75 bar
 - Electrical Efficiency 29.54 % (without reheating)
 - 55 MW gross
 - 85 % load factor, 373 GWh/yr



CLUWRR



WINROCK
INTERNATIONAL
INDIA



JOANNEUM



RESEARCH

CSIR



भारतीय प्रौद्योगिकी संस्थान दिल्ली
Indian Institute of Technology Delhi



Uganda

Aldwych Biopower Project

- Dedicated biomass plantations
 - 25,000 ha *Eucalyptus* planted anew every rotation
 - 4,000 ha indigenous *Markhamia lutea* (photo)
 - risk diversification





Uganda

Aldwych Biopower Project

- Issues
 - Social
 - Water
 - Biodiversity
 - GHG balances
- Replicability

CLUWRR



WINROCK
INTERNATIONAL
INDIA



JOANNEUM



RESEARCH

CSIR

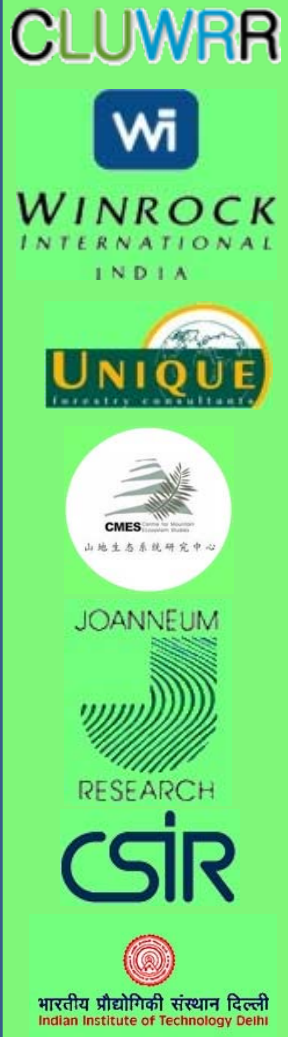


भारतीय प्रौद्योगिकी संस्थान दिल्ली
Indian Institute of Technology Delhi





Strategic Environmental Assessment (SEA)



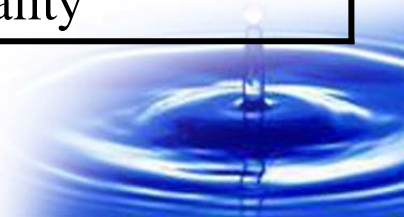
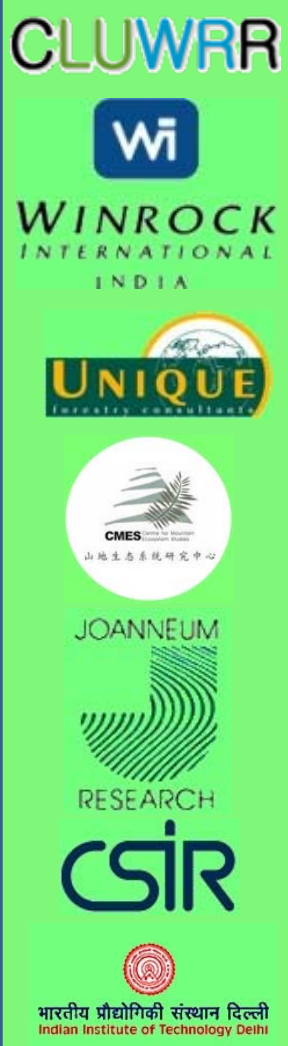
STAGES IN THE DEVELOPMENT CYCLE

COMPONENTS OF IEM



Strategic Environmental Assessment (SEA)

EIA	SEA
Often reactive to single development proposal	Should inform many development proposals
Effect of development on the environment	Effect of environment on development
Specific project	Areas, regions or sectors
Direct impacts and benefits	Cumulative impacts
Mitigation of impacts	Maintaining chosen level of environmental quality



Strategic Environmental Assessment (SEA)

	Water	Bio - diversity	Climate change	Socio-economic
Global				
National				
Local				

CLUWRR
Wi
WINROCK INTERNATIONAL INDIA
UNIQUE forestry consultants
CMES Center for Mountain Ecosystem Studies
山地区生态系统研究中心
JOANNEUM RESEARCH
CSIR
भारतीय प्रौद्योगिकी संस्थान दिल्ली
Indian Institute of Technology Delhi





Strategic Environmental Assessment (SEA)

Sustainability Framework for understanding trade-offs in decision-making for forestry based bio-energy projects in developing countries:
Key decision-making criteria (DRAFT FOR COMMENT)

SCALE	WATER	BIODIVERSITY	CLIMATE CHANGE (GHG EMISSIONS/sequestration)	SOCIO-ECONOMICS
GLOBAL	<ul style="list-style-type: none"> Change in large system ecological processes and social services Change in transboundary water systems 	<ul style="list-style-type: none"> Change in biodiversity <ul style="list-style-type: none"> Species extinction Biome loss Etc 	<ul style="list-style-type: none"> Net climate forcing (i.e. change in global radient balance), which depends on GHG efficiency, albedo etc 	MDGs <ul style="list-style-type: none"> Poverty alleviation Global food security Global political stability Impacts on global food and fuel markets
TRANSBOUNDARY				
NATIONAL	<ul style="list-style-type: none"> Change in ecological reserve for rivers Change in total streamflow and available water to downstream users 	<ul style="list-style-type: none"> Change in biodiversity <ul style="list-style-type: none"> Species extinction Intactness of habitat Introduction of alien invasive species Etc 	<ul style="list-style-type: none"> National GHG (e.g. change in total national carbon emissions, carbon emissions per capita etc) 	<ul style="list-style-type: none"> Macro-economic indicators (e.g. GDP, GNI, balance of payments) National food security Employment
PROVINCIAL / STATE				
LOCAL GOVERNMENT	<ul style="list-style-type: none"> Change in seasonality of streamflow Change in security of supply Change in depth to groundwater Change in water quality 	<ul style="list-style-type: none"> Change in ecosystem services provided by biodiversity <ul style="list-style-type: none"> Provisioning (food, wood) Regulating impacts (floods, drought) Regenerative capacity (supportive services) Soil degradation 	<ul style="list-style-type: none"> Ability to access and use CDM funds 	<ul style="list-style-type: none"> Household income Equity of distribution (who are the winners & losers across class, gender, age & urban-rural distinctions, for the full product lifecycle) Household food security (producing food vs earning money) Risk of failure / Vulnerability Human health impact (e.g. poisons from Jatropa)
TERTIARY CATCHMENT				
COMMUNITY				
HOUSEHOLD				

Notes:

- The scale categories (global to household) reflect a continuum of transition and are not "hard" boundaries.
- Under the South African National Water Act, an "ecological reserve" is identified. This is the minimum flow to be maintained in a river.

CLUWRR



WINROCK INTERNATIONAL INDIA



JOANNEUM



RESEARCH



भारतीय प्रौद्योगिकी संस्थान दिल्ली
Indian Institute of Technology Dehi



Life Cycle Assessment

- Consider Land as a Factory

- Inputs

- Water
- Carbon dioxide
- Fertilizers
- Fossil fuels
- Light

- Outputs

- Water
- Biofuel feedstock
- Food
- Biodiversity
- Greenhouse gases
- Reflected light

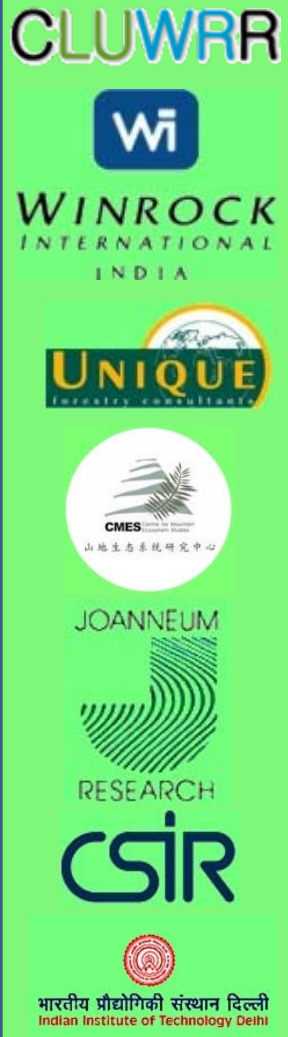
- Timing



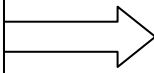
JOANNEUM



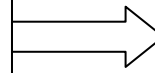
Life Cycle Assessment



Agricultural Land



Feedstock Land

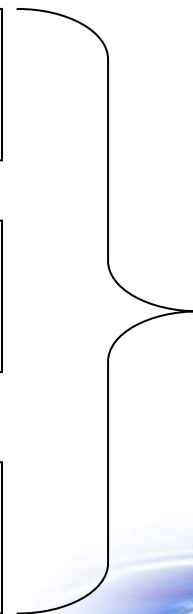


Other land

New cropland

Existing cropland

Improved usage



Climatic Forcing

- Greenhouse gases
 - Emissions \Rightarrow heating
 - Removals \Rightarrow cooling
- Albedo
 - Lighter \Rightarrow cooling
 - Snow covered fields (winter)
 - Grasslands (dry season)
 - Darker \Rightarrow heating
 - Coniferous forests (winter)
 - Irrigated fields, crops (dry season)
- $\text{CO}_2\text{e} \Leftrightarrow$ Albedo



CLUWRR



WINROCK
INTERNATIONAL
INDIA



JOANNEUM



RESEARCH

CSIR





Climatic Forcing

CLUWRR

Wi

WINROCK
INTERNATIONAL
INDIA

UNIQUE
forestry consultants

CMES Centre for Mountain Ecosystem Studies
山地生态系统研究中心

JOANNEUM

RESEARCH

CSIR

भारतीय प्रौद्योगिकी संस्थान दिल्ली
Indian Institute of Technology Delhi





Climatic Forcing

CLUWRR
Wi
WINROCK
INTERNATIONAL
INDIA

UNIQUE
forestry consultants

CMES
Centre for Mountain
Ecosystem Studies
山地生态系统研究中心

JOANNEUM
RESEARCH

CSIR

भारतीय प्रौद्योगिकी संस्थान दिल्ली
Indian Institute of Technology Delhi





EUROPEAID
CO-OPERATION OFFICE

Thank you for your attention

CLUWRR



WINROCK
INTERNATIONAL
INDIA



CSIR



भारतीय प्रौद्योगिकी संस्थान दिल्ली
Indian Institute of Technology Delhi

