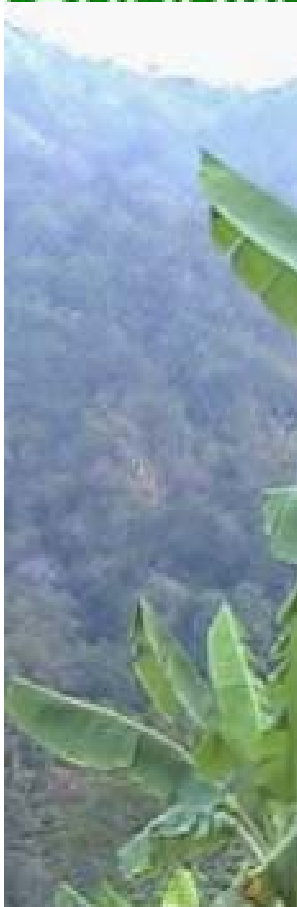


CHittagong Hill Tracts improved nAtural Resources Management

CHARM



Stephan Mantel, Abdul Alim, Khandaker Mainuddin, Jose Ramon Olarieta, Mozaharul Alam, Fida Malik Khan, Farhana Ahmed



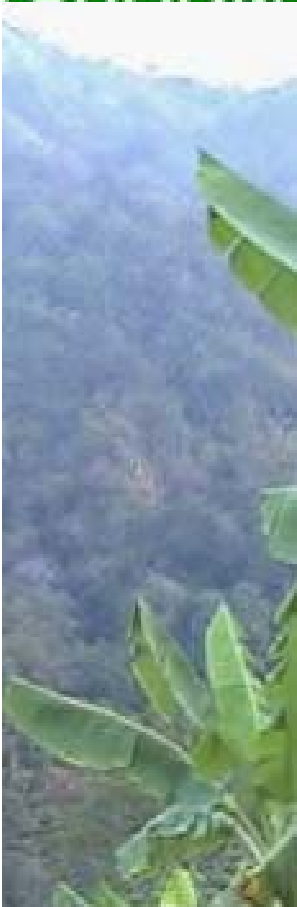
About presentation

- ➡ CHARM project
- ➡ Chittagong Hill Tracts history & NRM issues
- ➡ CHARM methodology
- ➡ Results
- ➡ Conclusions

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CHARM project and Chittagong Hill Tracts NRM issues

CHittagong Hill Tracts improved nAtural Resources Management

CHARM

Cooperation project EU-Bangladesh

Funding agency:

EU Asia Pro Eco-I programme

Primary partners:

Bangladesh Centre for Advanced Studies (BCAS)



Center for Environmental and Geographic Information Services (CEGIS)



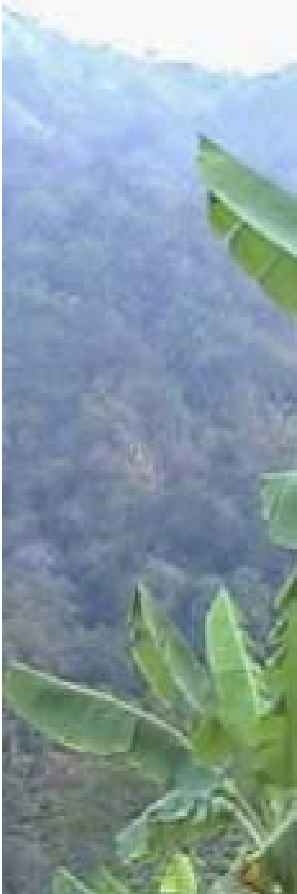
ISRIC – World Soil Information (The Netherlands)



University of Lleida (Lerida) (Spain)



and other cooperating partners in Bangladesh



The overall objective of the CHARM project is to establish sustainable land management in the Chittagong Hill Tracts (CHT)

CHARM will test and promote a sustainable land management planning technology.

The action aims at institutional capacity building and provision of an improved information basis for decision making.

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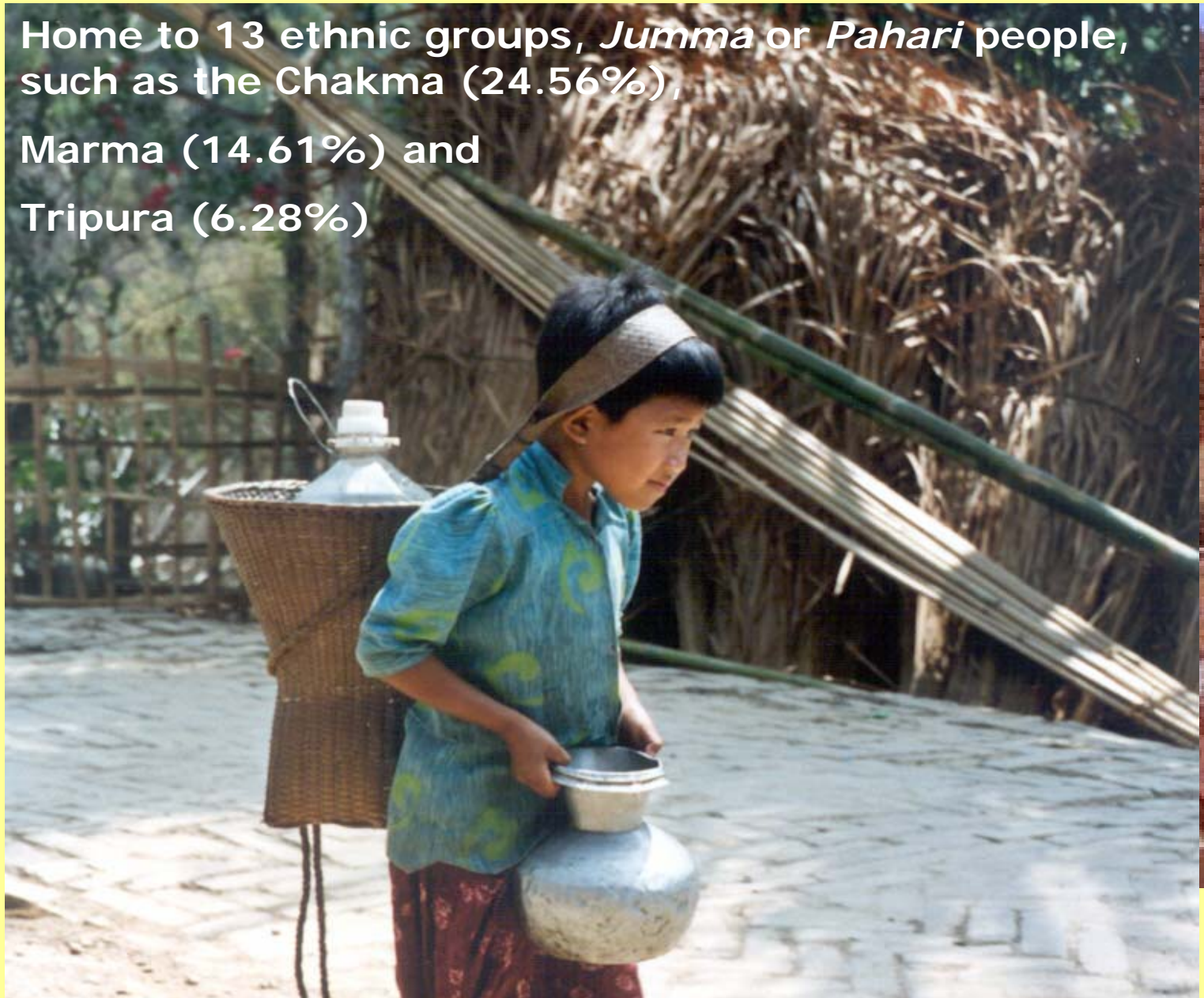
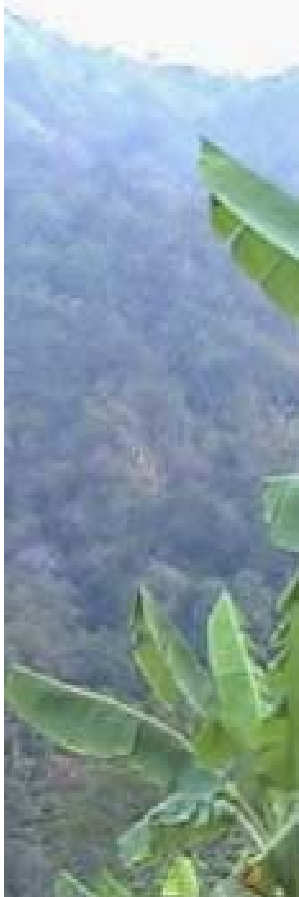


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CHITTAGONG HILL TRACTS A SHORT HISTORY

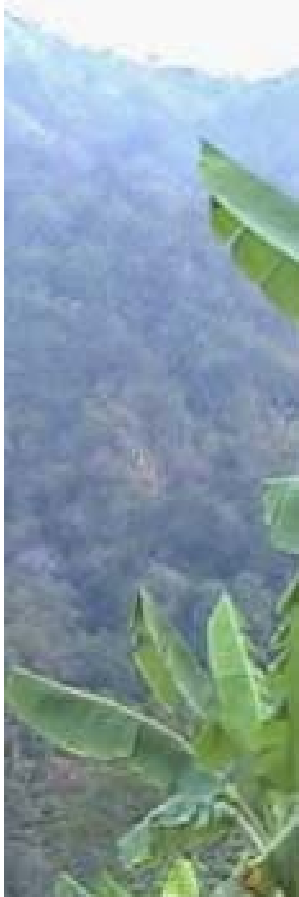
Home to 13 ethnic groups, *Jumma* or *Pahari* people, such as the Chakma (24.56%), Marma (14.61%) and Tripura (6.28%)



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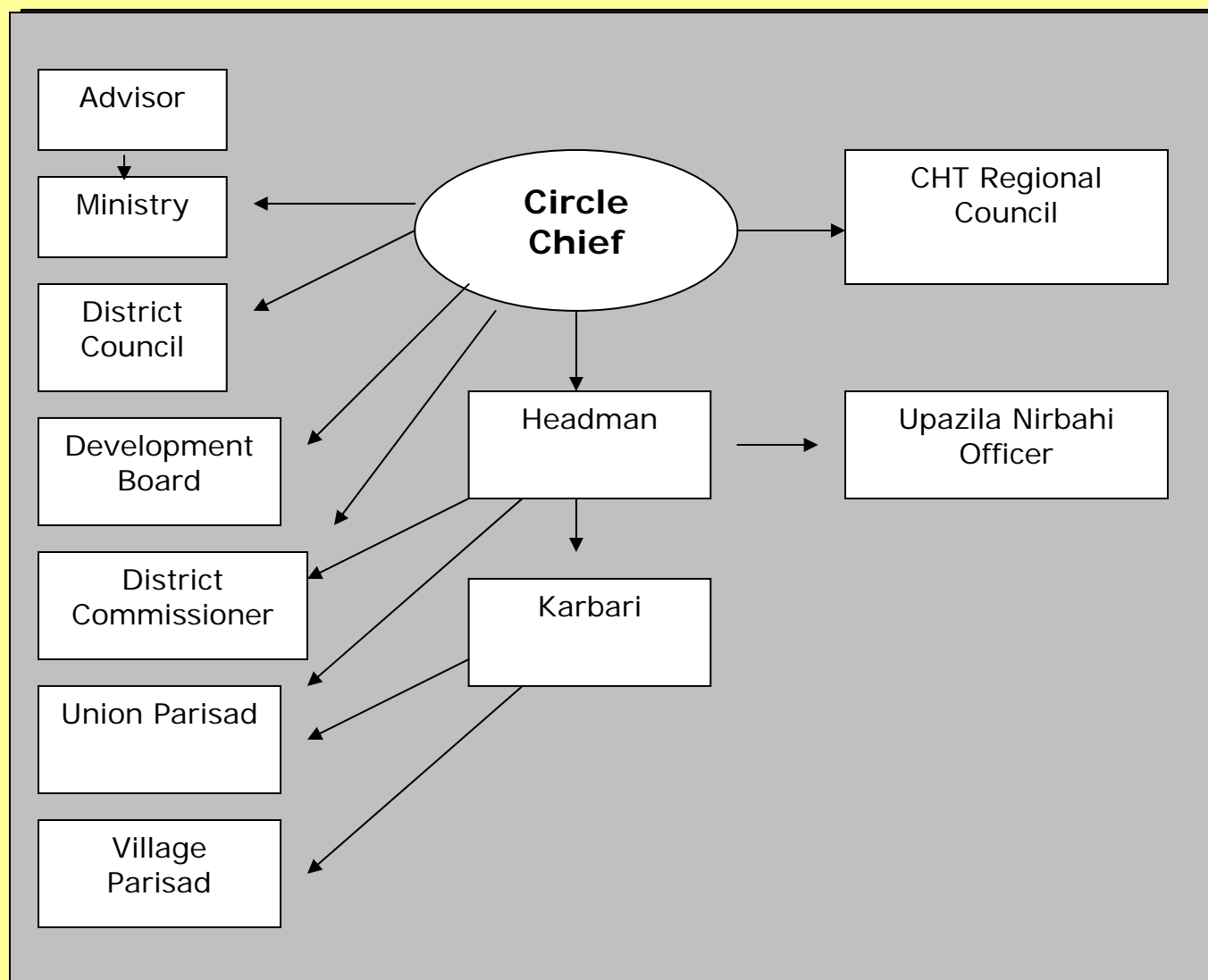


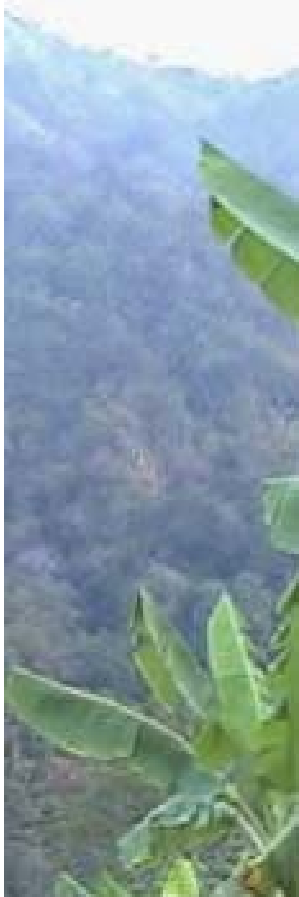
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CHT administration



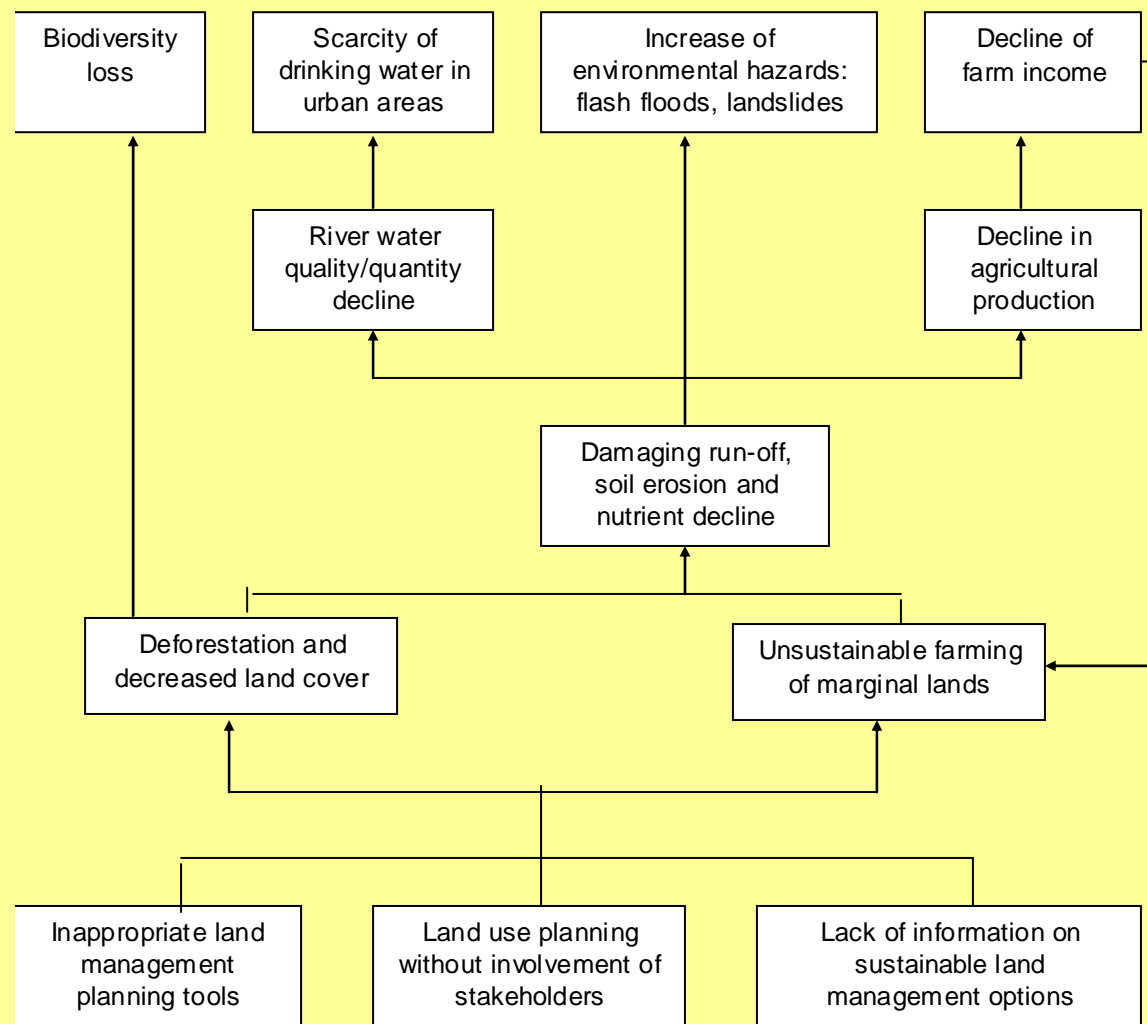


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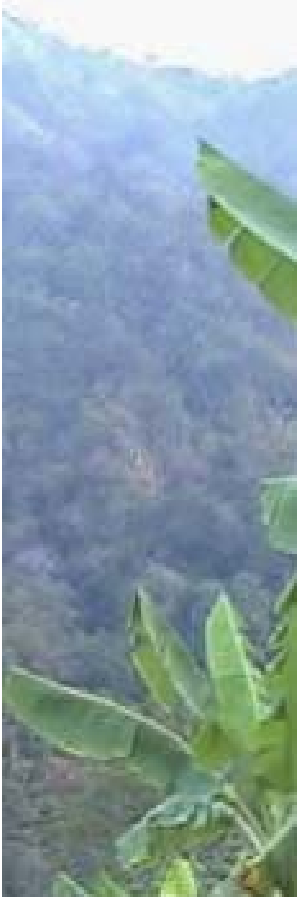


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Chittagong Hill Tracts NRM issues



Problem analysis: land management in the Chittagong Hill Tracts



Stakeholder consultation: Major environmental issues in the CHT

Issue: Deforestation

Jhum cultivation

Over extraction/ illegal logging

Inadequate forest management

Biodiversity and agro-bio diversity losses

Increased population pressure

Short rotations in *Jhum* cultivation

Forest fires

Large scale monoculture timber plantations

Water pollution and sanitation

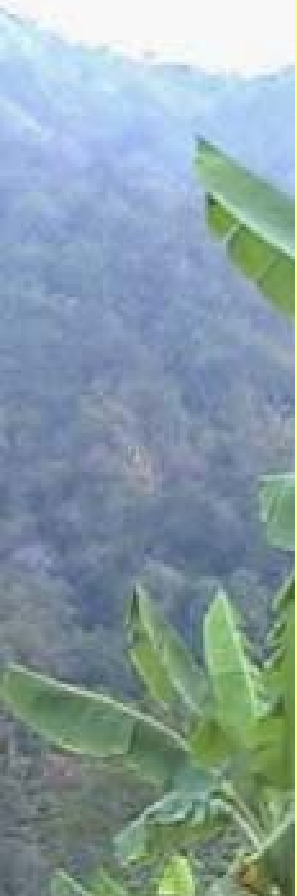
Pollution by agro-chemicals

Open defecation and unplanned sewage/ sludge disposal

Leakage of fuel from boat

Soil sedimentation

Seasoning/ hidden timber in the water bodies



Soil erosion and siltation

Jhum cultivation

Deforestation / inappropriate forest management

Inappropriate soil management

Unplanned rock collection

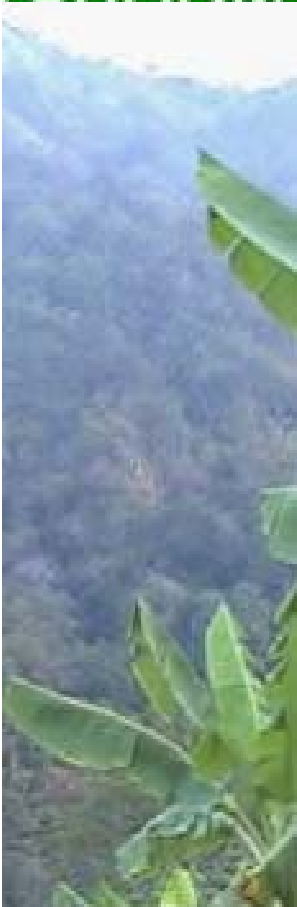
Land slides

Urbanization

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IMPROVING THE ENVIRONMENTAL BASELINE

- Assessment of the state of the environment of the CHT
- Inventory of current land management practices
- Assess regulations/laws affecting NRM decision making

STAKEHOLDER CONSULTATION /

CREATION OF PLATFORM CREATION FOR EXCHANGE

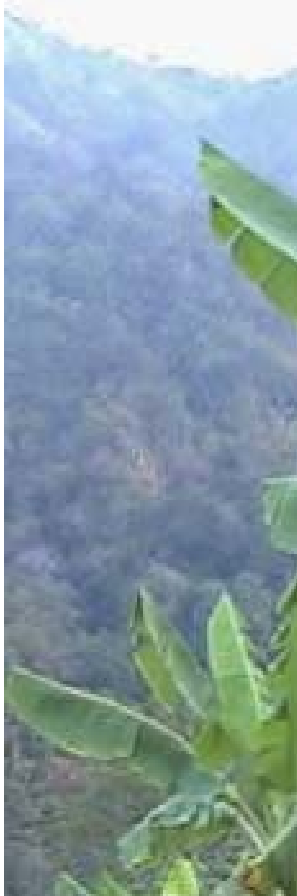
- NRM local and regional level workshops (FGD, household, union, district level, institutional)
- Inventory of information needs and decision making basis

PILOT FOR PARTICIPATORY PLANNING

- Stakeholder exchange on NRM issues
- Assess role of improved information exchange in NRM planning and decision making

NRM INFORMATION SYSTEM

- Provision of easy access to all data to stakeholders



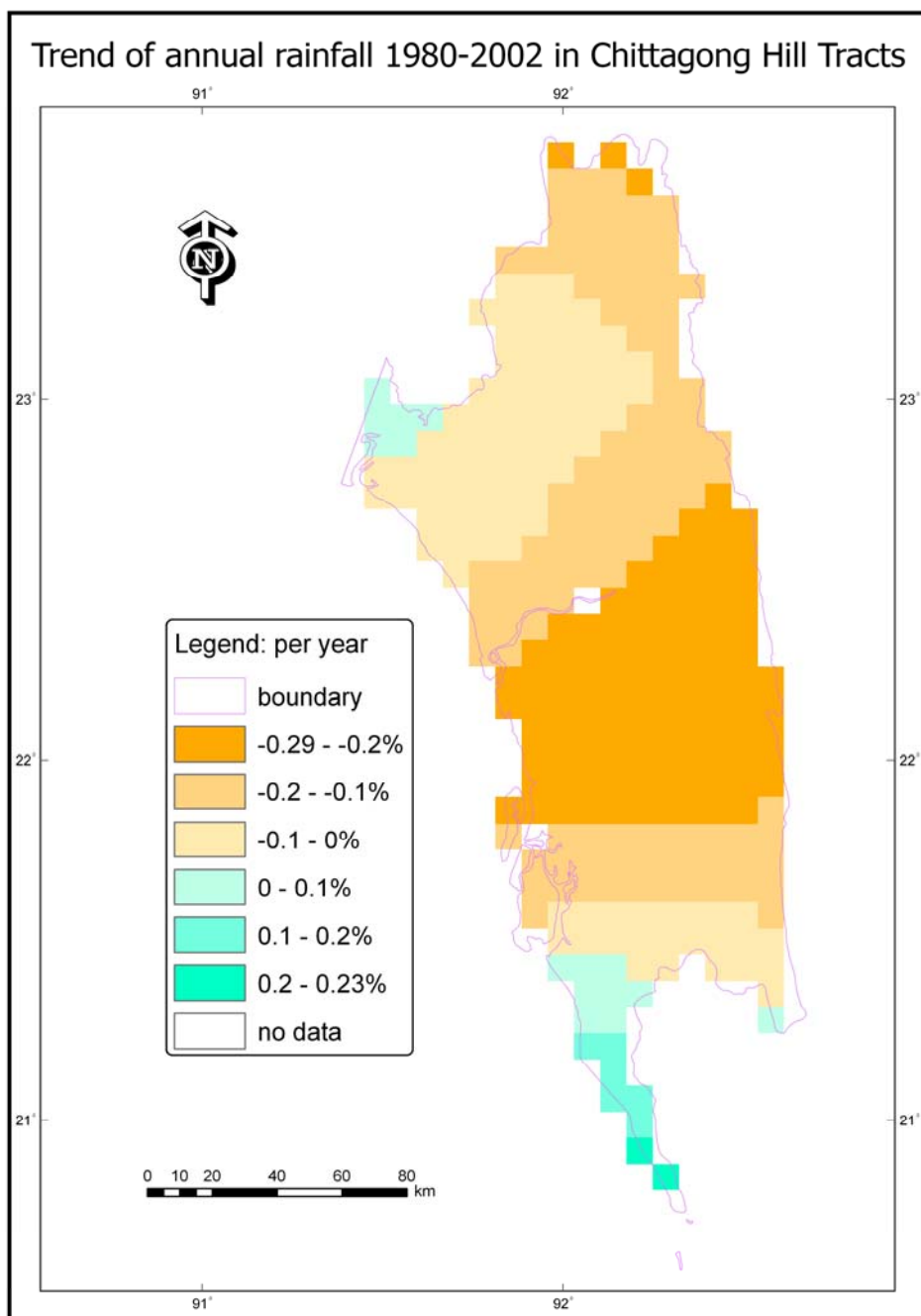
ASIA PRO ECO



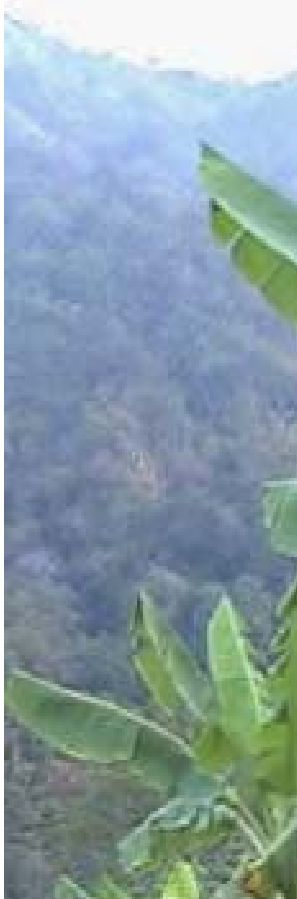
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IMPROVING THE ENVIRONMENTAL BASELINE

En



baseline data



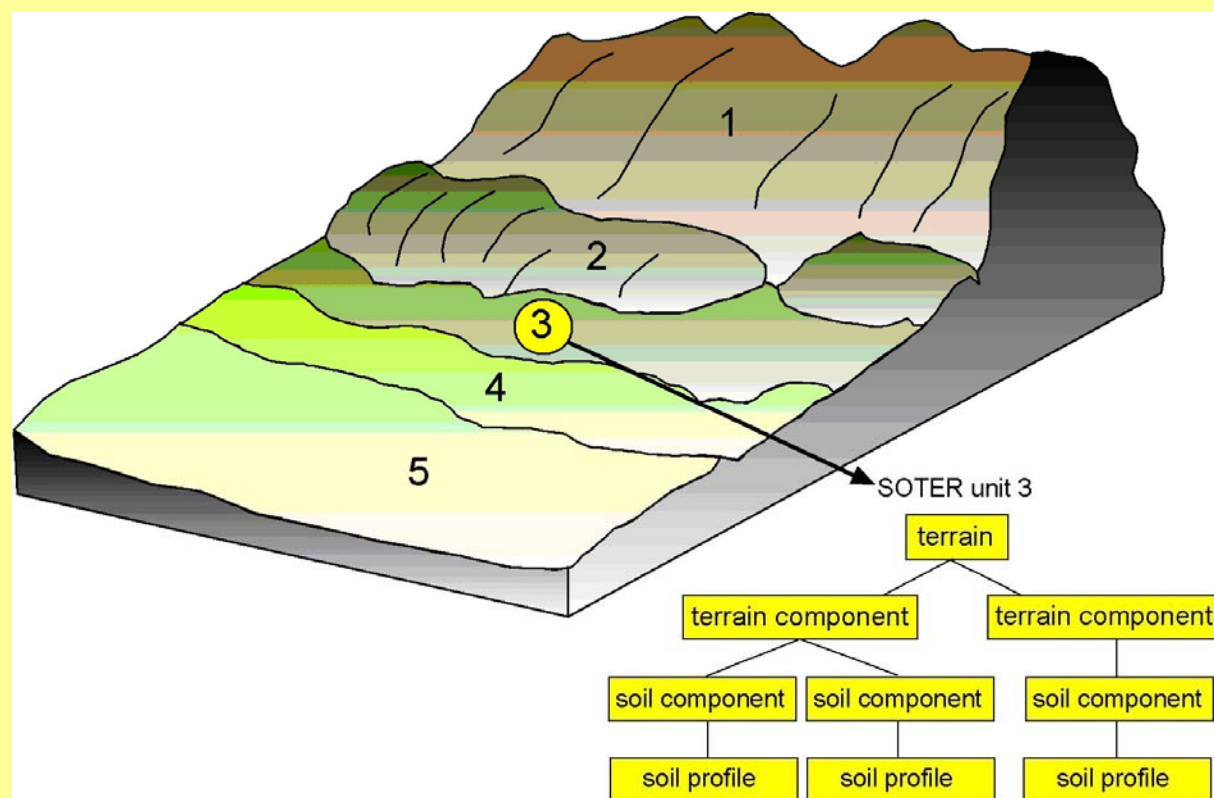
Relative change rate of biomass production (annual sum NDVI)

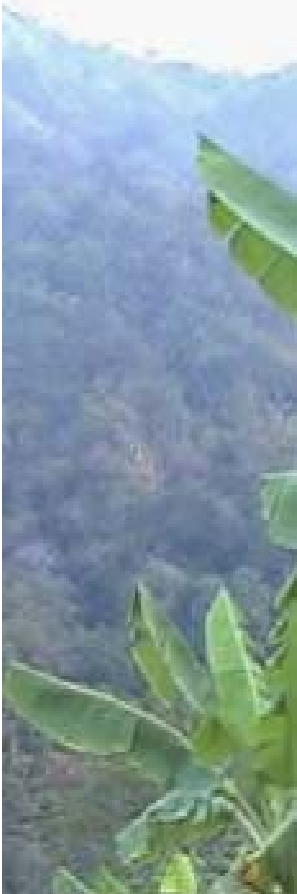
period	mean negative NDVI change (%)	land area (%)	mean positive NDVI change (%)	land area (%)
1981 - 1982	-7.6	54.4	5.8	45.6
1982 - 1983	-7.3	65.0	5.0	35.0
1983 - 1984	-7.9	49.0	6.6	51.0
1984 - 1985	-5.3	50.0	7.5	50.0
1985 - 1986	-4.9	22.6	5.4	77.4
1986 - 1987	-5.5	67.0	3.6	33.0
1987 - 1988	-6.1	67.0	5.4	33.0
1988 - 1989	-5.0	32.0	6.3	68.0
1989 - 1990	-4.0	53.3	4.7	46.7
1990 - 1991	-4.9	41.8	5.3	58.2
1991 - 1992	-3.7	37.2	5.6	62.8
1992 - 1993	-6.3	77.1	3.9	22.9
1993 - 1994	-4.7	52.3	5.3	47.7
1994 - 1995	-5.3	39.0	5.6	61.0
1995 - 1996	-4.2	37.2	5.4	62.8
1996 - 1997	-9.8	94.4	4.4	5.6
1997 - 1998	-5.6	20.4	7.9	79.6
1998 - 1999	-6.9	71.5	3.7	28.5
1999 - 2000	-6.3	43.6	6.1	56.4
2000 - 2001	-4.0	75.0	2.7	25.0
2001 - 2002	-2.4	29.1	3.3	70.9
2002 - 2003	-2.8	67.5	2.3	32.5
Average	-5.48	52.1	5.07	47.9



SOTER

SOTER units with their subdivisions (components) in a landscape





Creation of Soil and terrain database:

Aim:

Make existing soil and landform information available to inform land users to support decision on:

Where is the good land? What is it good for?

Is land degradation an issue? What are the hazards?

Stratification for land management recommendations

What investment is needed (capital, equipment, labour, management)?

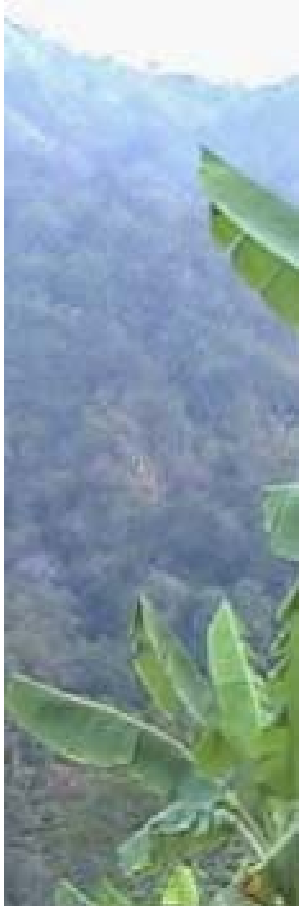
What are the risks? How to manage them?

Geological map on Landsat 2003

Problems

Mismatch various maps with base map:

- Soil associations map 1:250,000
- Detailed soil maps of upazillas 1:50,000
- Geology

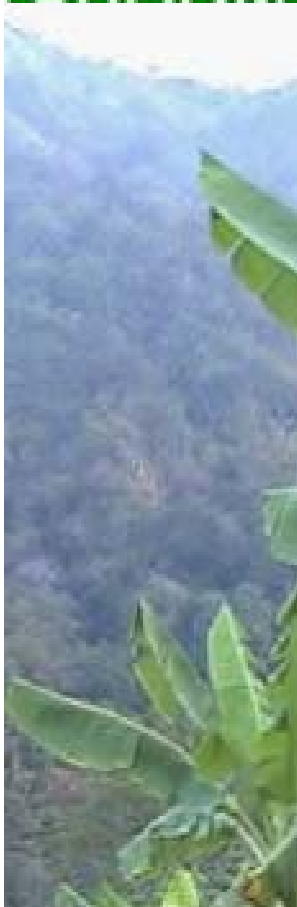


Chimbuk Hill West



Loamy soil on siltstone

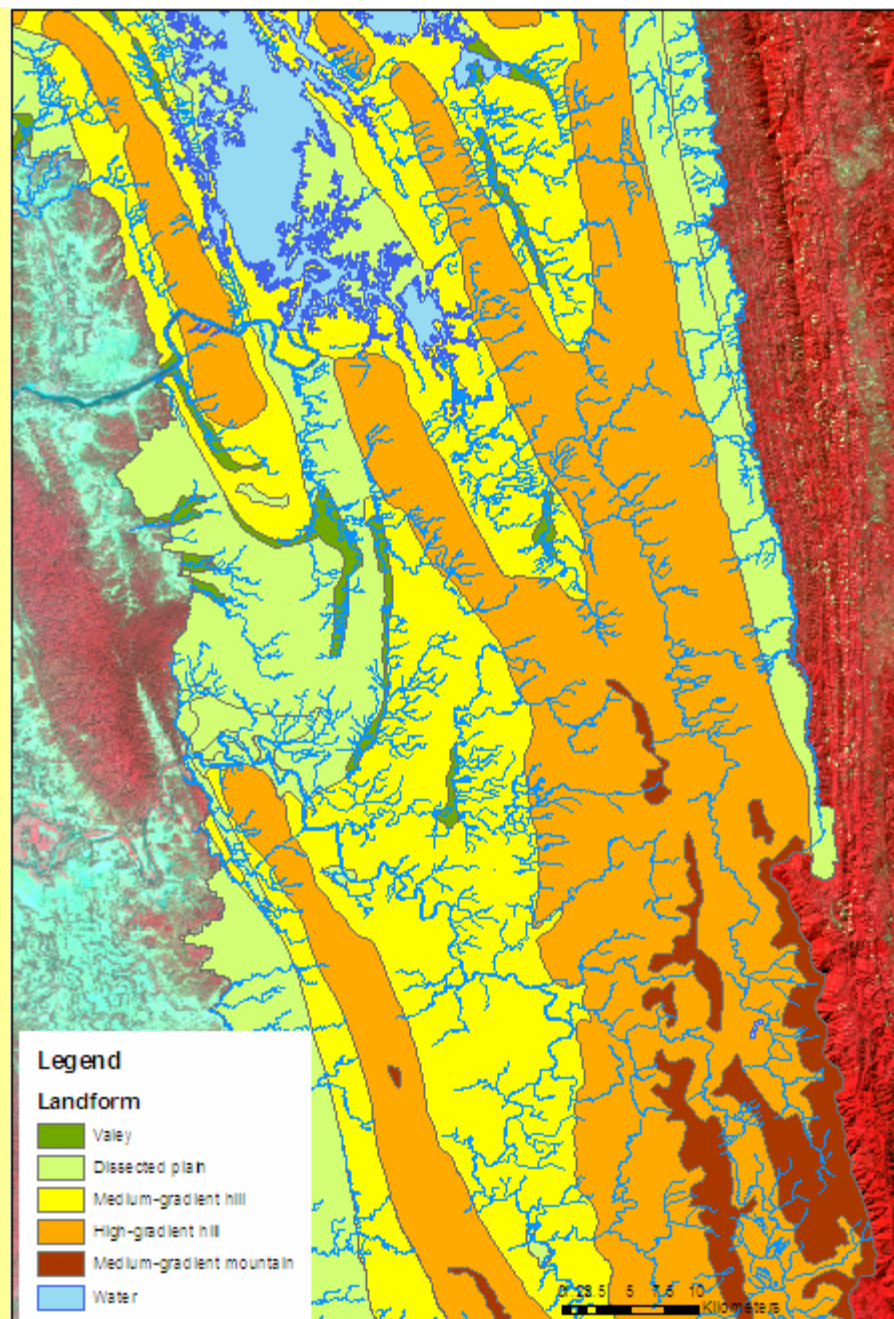
Field checks

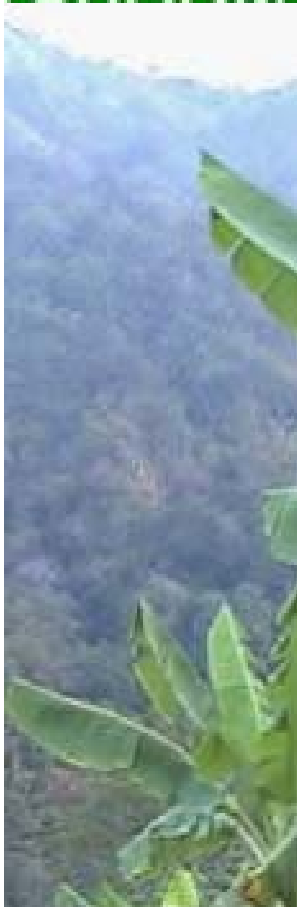


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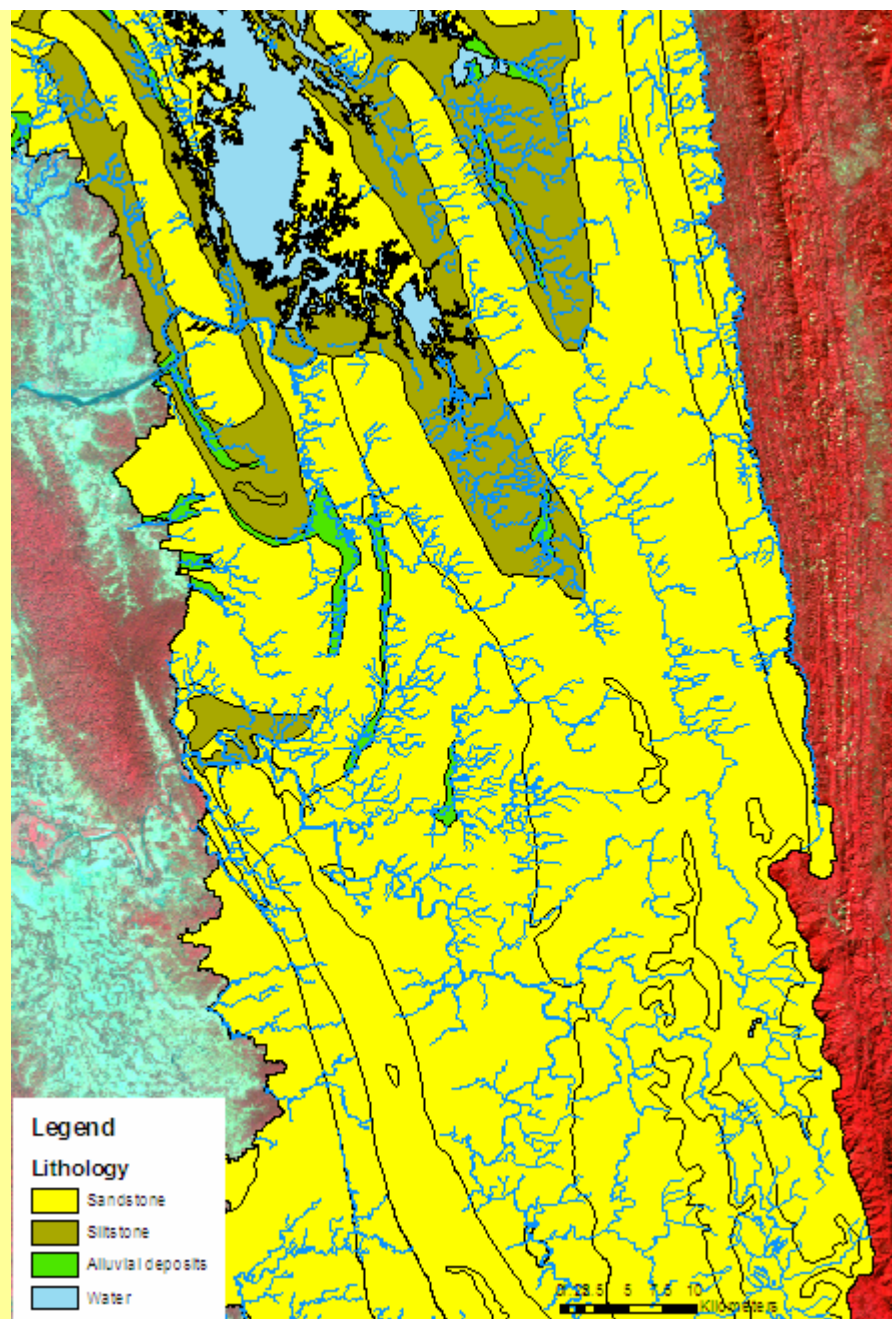


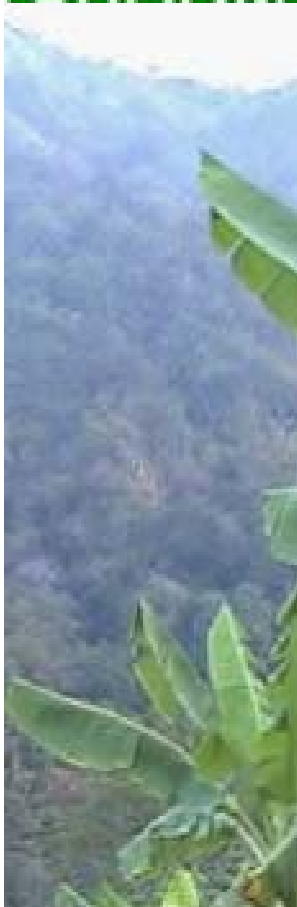


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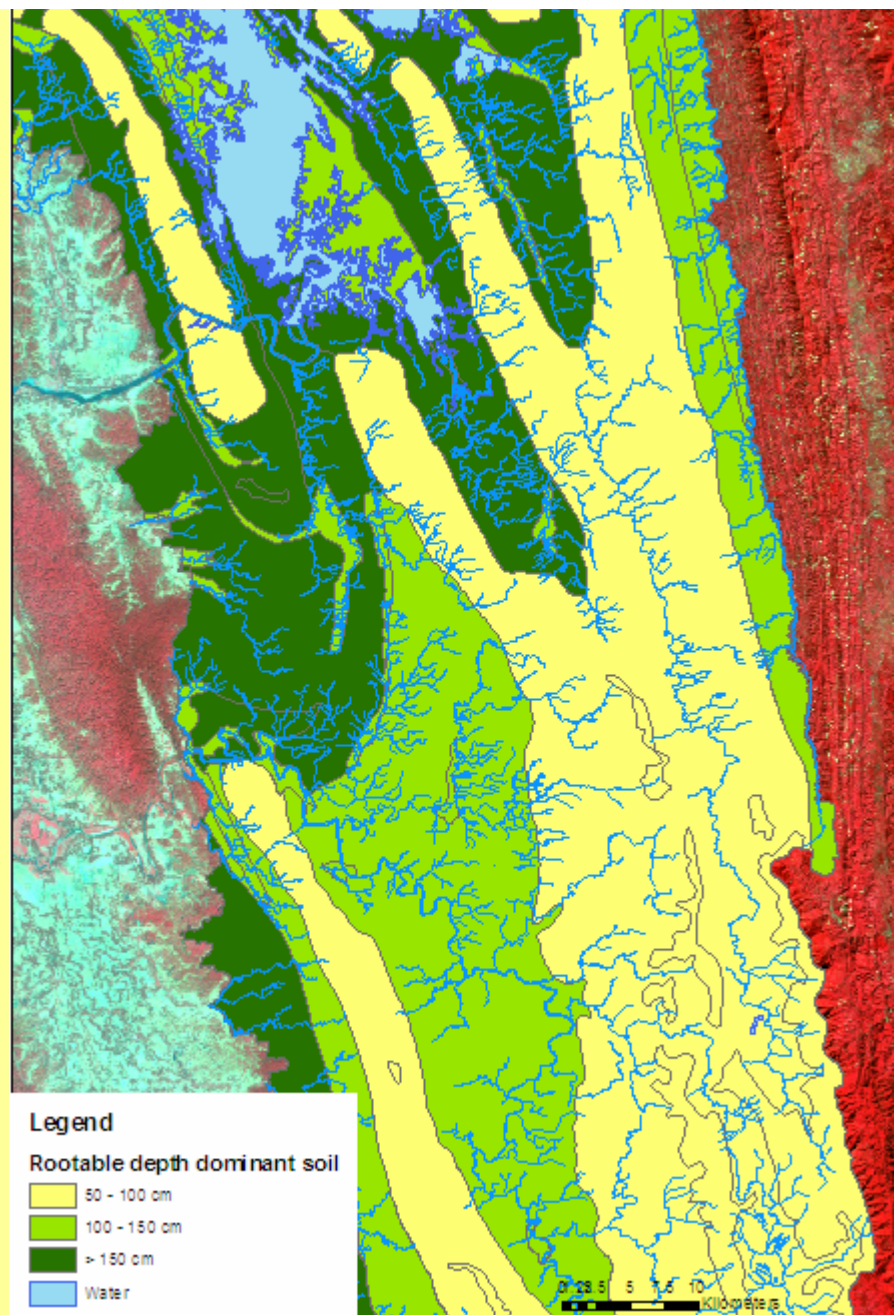


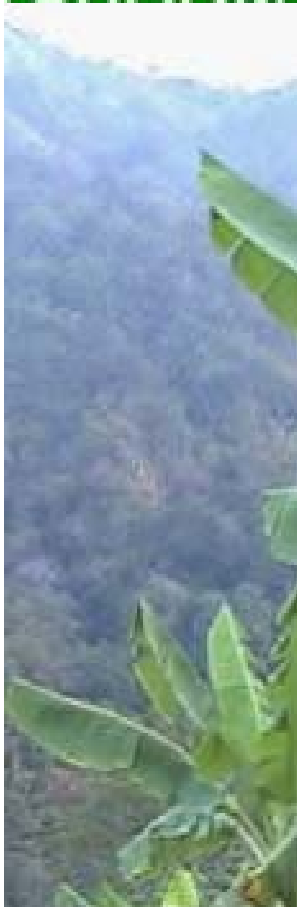


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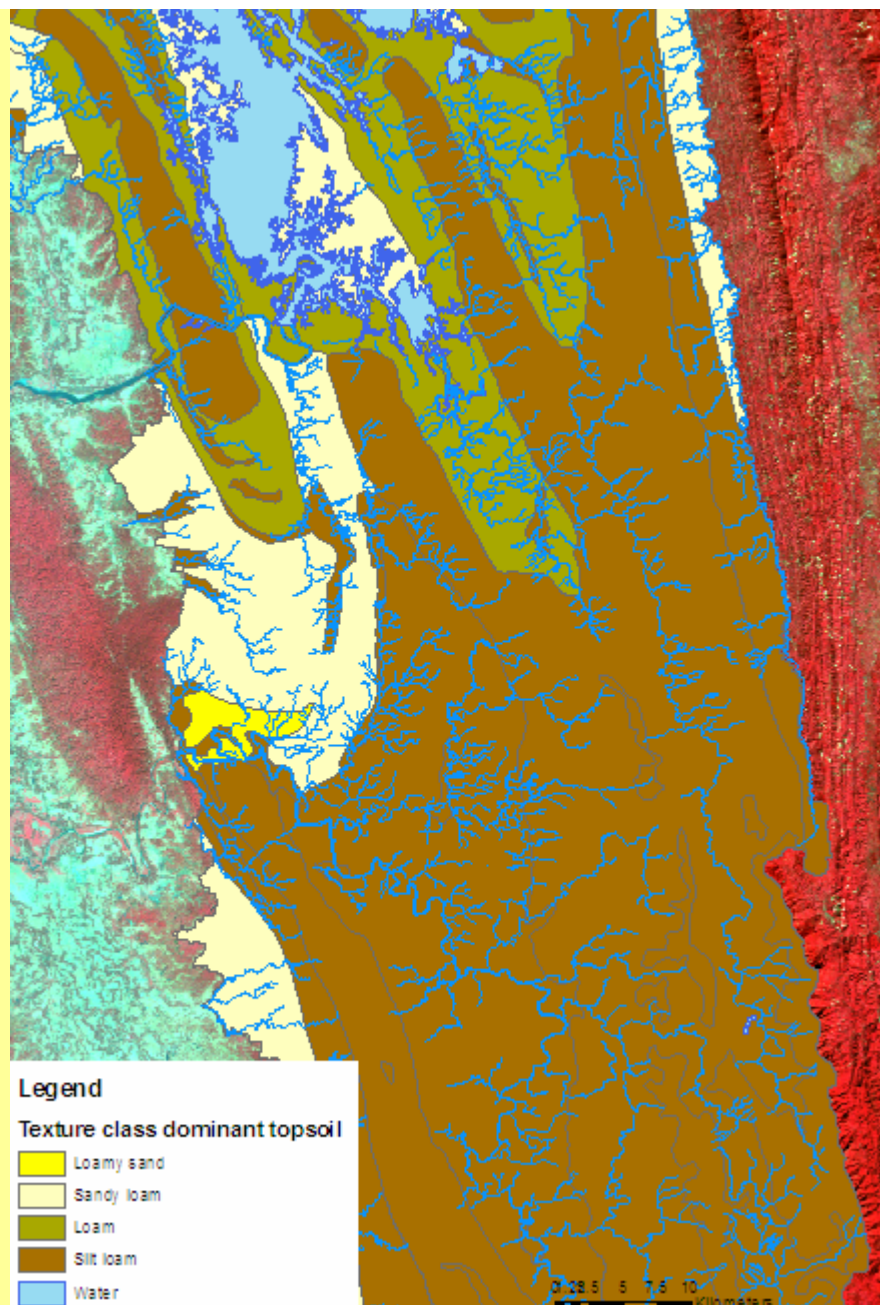


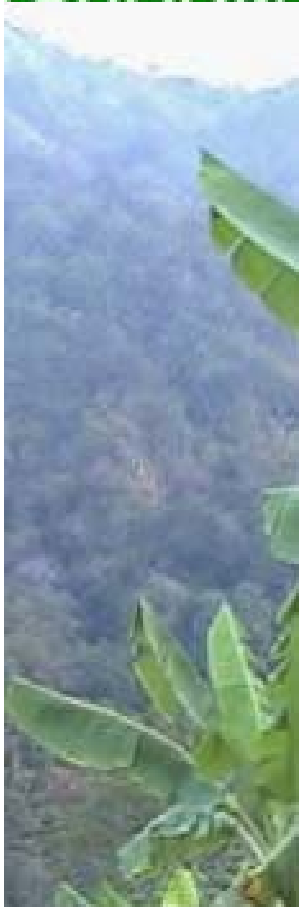


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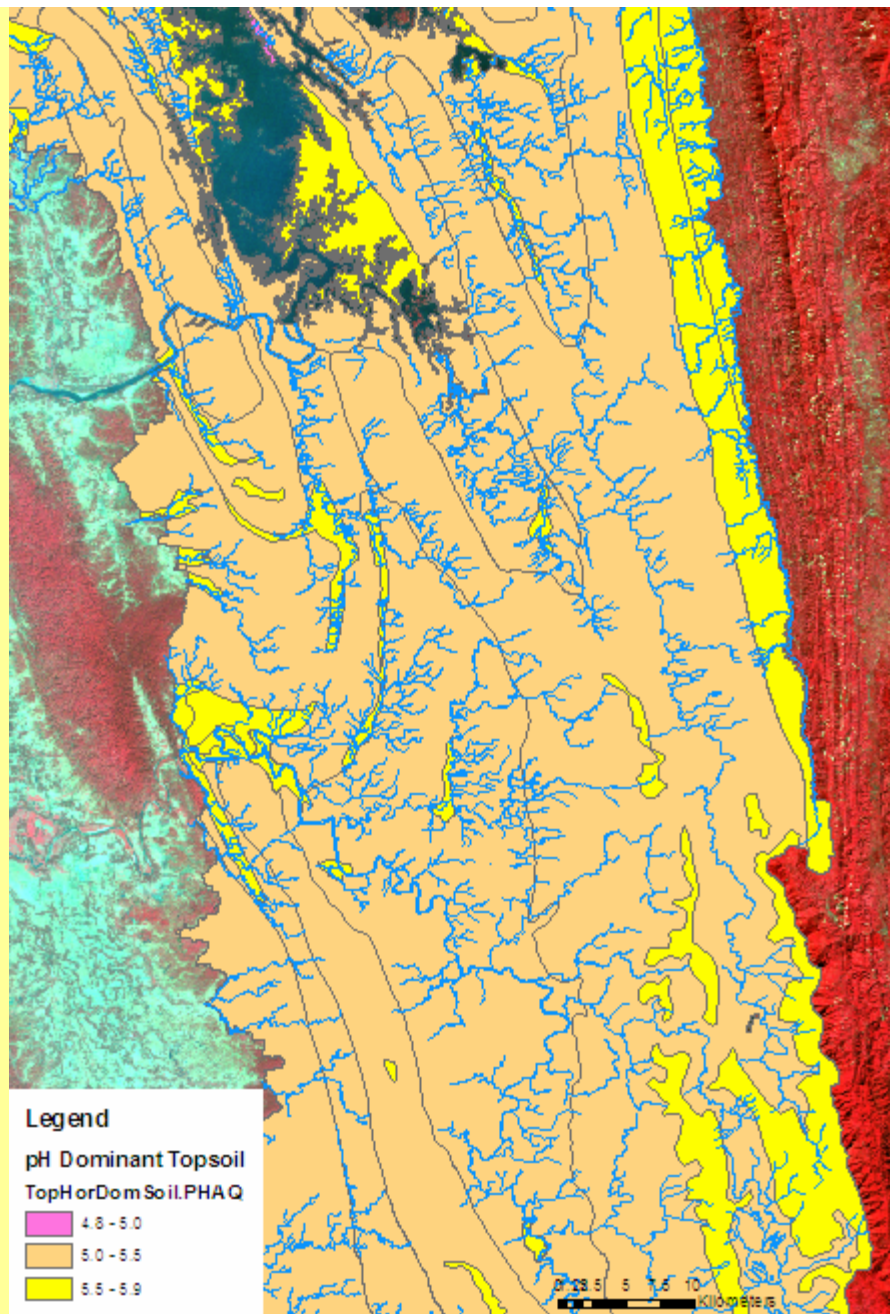


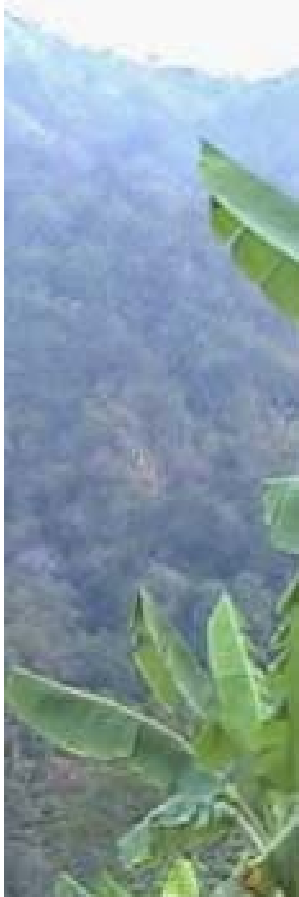


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INVENTORY OF LAND MANAGEMENT PRACTICES AND SUSTAINABLE ALTERNATIVES

Household survey over all CHT districts (n=45)

José Ramon Olarieta, UNIVERSITAT DE LLEIDA

Land use systems:

-Ploughland

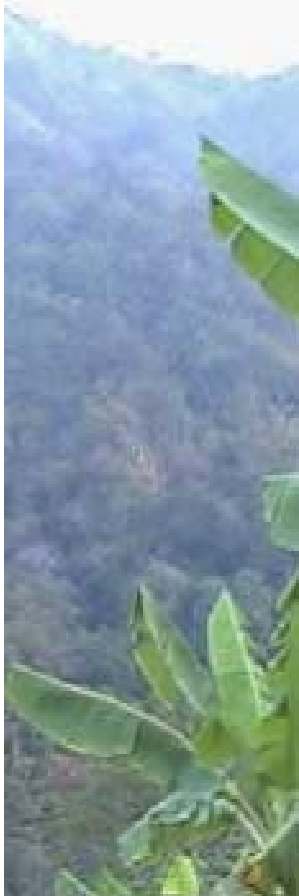
-Slash-and-Burn (*Jhum*)

-Fringeland (river terraces and valley bottoms)

-Fruit gardens

-Plantations (timber, rubber)

- Homesteads



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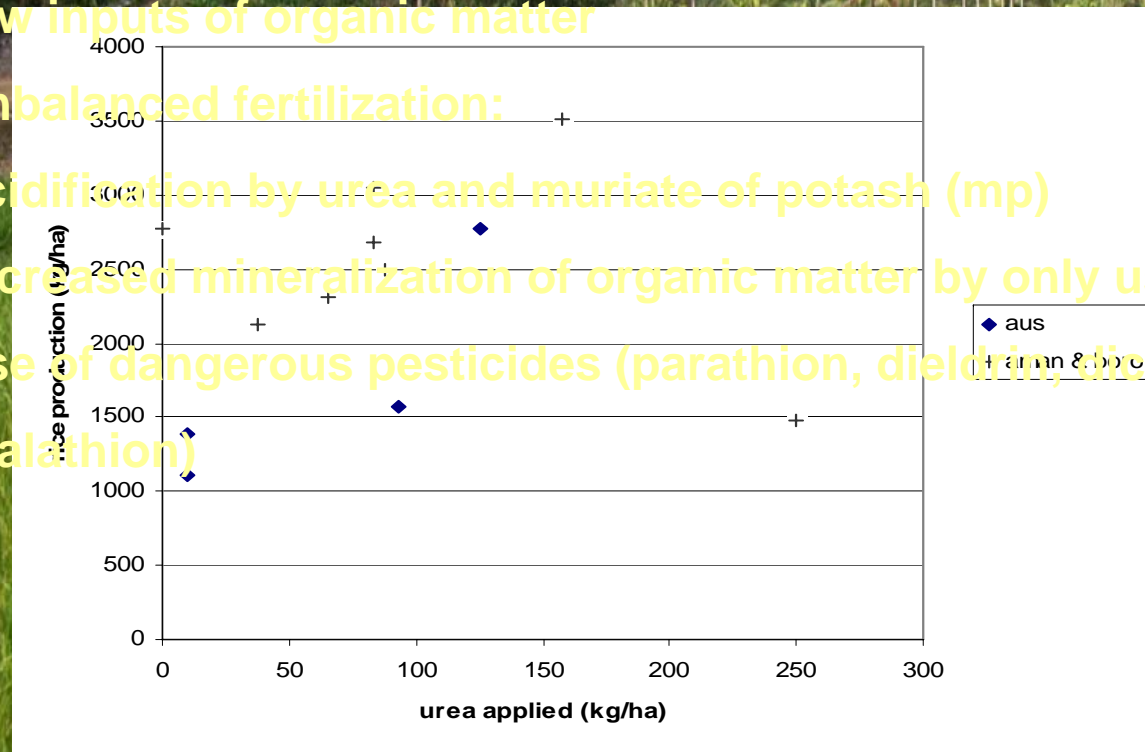


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- * **PLOUGHLAND** (valley bottoms, flat areas)
- over 80% use fertilizers (frequently only urea) and pesticides
- less than 20% use manure

Sustainability issues: PLOUGHLAND, RICE PRODUCTION

- low inputs of organic matter
- unbalanced fertilization:
- acidification by urea and muriate of potash (mp)
- increased mineralization of organic matter by only using urea
- use of dangerous pesticides (parathion, dieldrin, aldiclorvos, malathion)



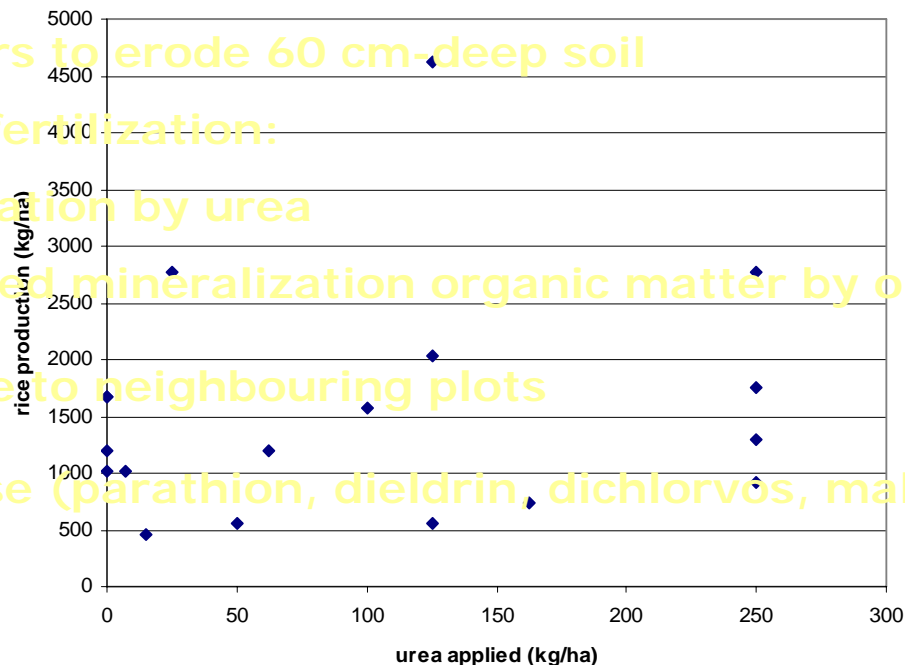


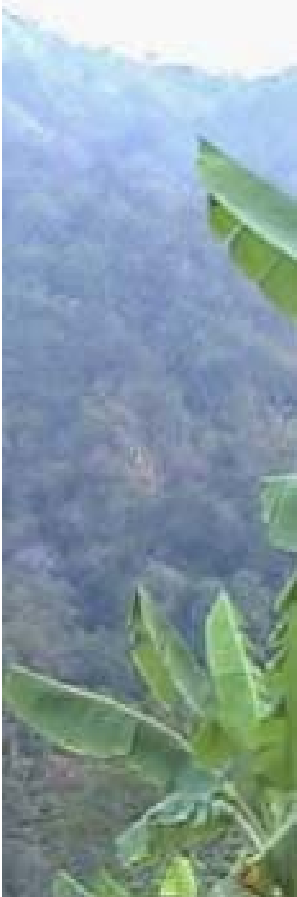
JHUM

- practiced on slopes up to 45° and even more
- rice intercropped with other species +
+ 4-5 years fallow + slash-burning continuous plot
- pesticides applied in 60%
- manure applied in 8%
- fertilizers applied in 70% (urea in 70% tsp and mp in 20-25%)

Sustainability issues JHUM, RICE PRODUCTION

- soil erosion: mean rate during cycle: 20-30 t/ha/yr (Gafur *et al.*)
200-400 years to erode 60 cm-deep soil
- unbalanced fertilization:
 - acidification by urea
 - increased mineralization organic matter by only using urea
- spread of fire to neighbouring plots
- pesticides use (parathion, dieldrin, dichlorvos, malathion)





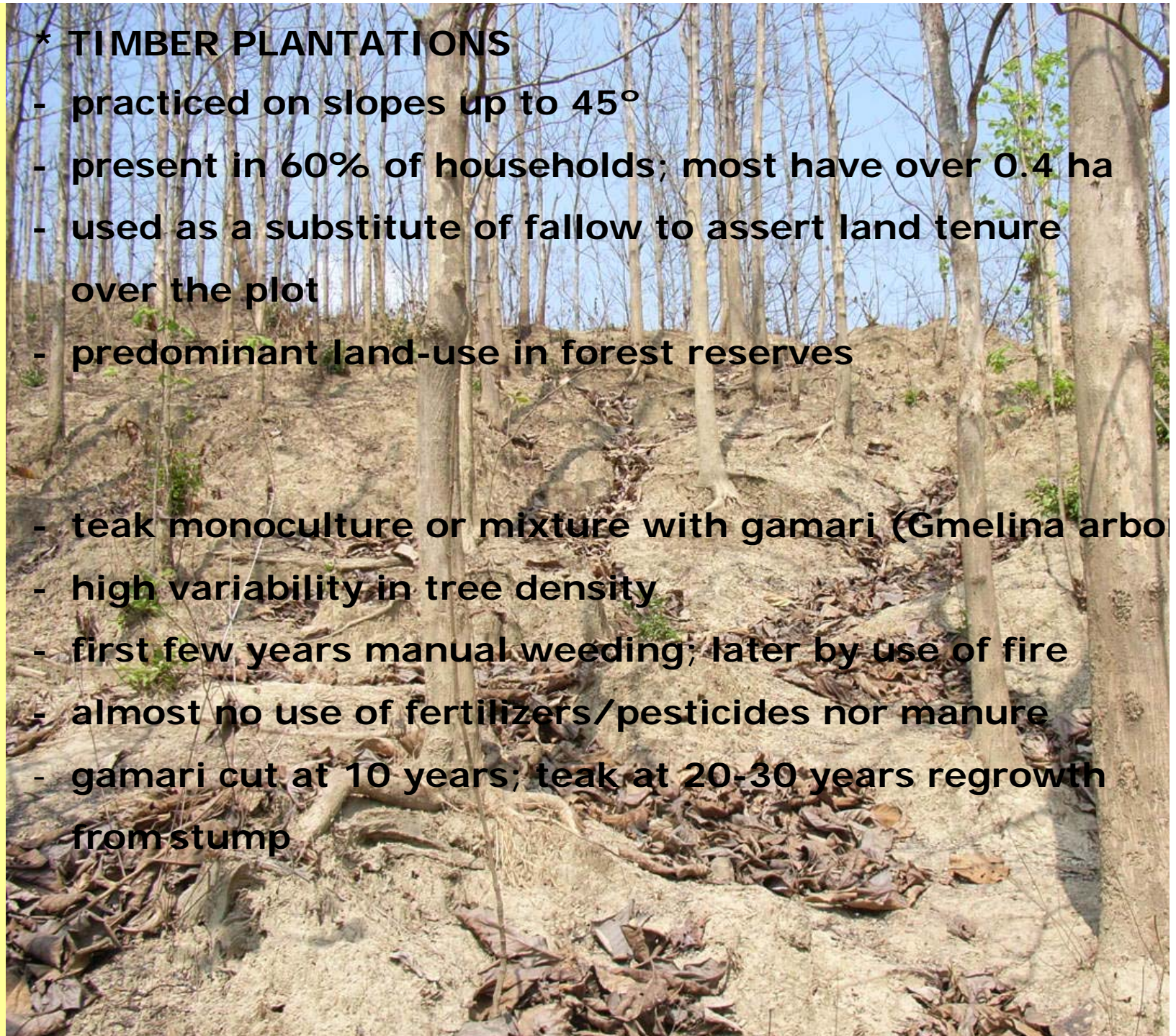
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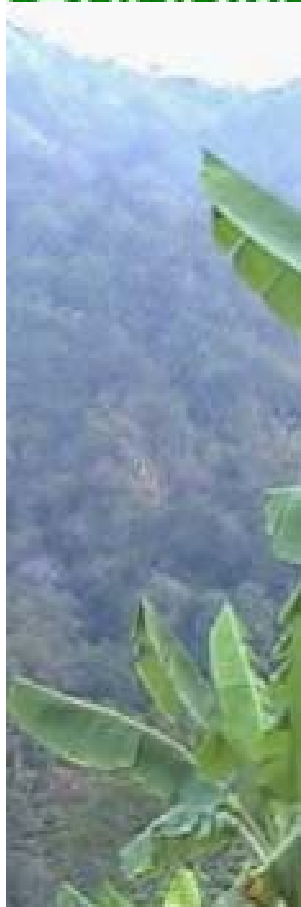


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* **TIMBER PLANTATIONS**

- practiced on slopes up to 45°
- present in 60% of households; most have over 0.4 ha
- used as a substitute of fallow to assert land tenure over the plot
- predominant land-use in forest reserves
- teak monoculture or mixture with gamari (*Gmelina arborea*)
- high variability in tree density
- first few years manual weeding; later by use of fire
- almost no use of fertilizers/pesticides nor manure
- gamari cut at 10 years; teak at 20-30 years regrowth from stump





SUSTAINABILITY ISSUES:

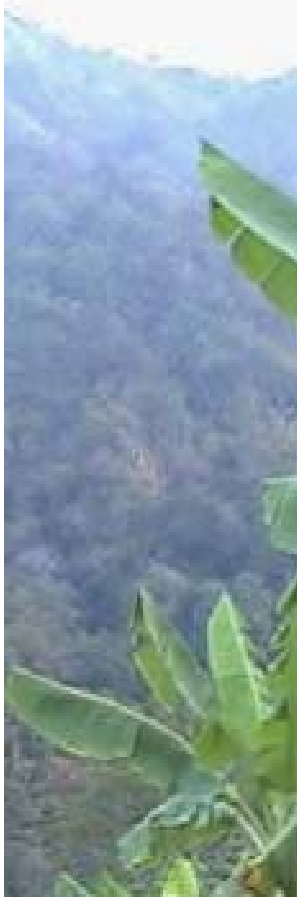
- large exports of basic cations; calcium limiting in the short-term
- little input of organic matter to soil due to:
 - use of fire
 - quick decomposition of litter
 - no undergrowth
- intense soil erosion: - 20-270 t/ha/yr
 - 100 years to erode a 60 cm- deep soil
- increased runoff:
 - increased stream flows in rainy season
 - decreased stream flows in dry season.

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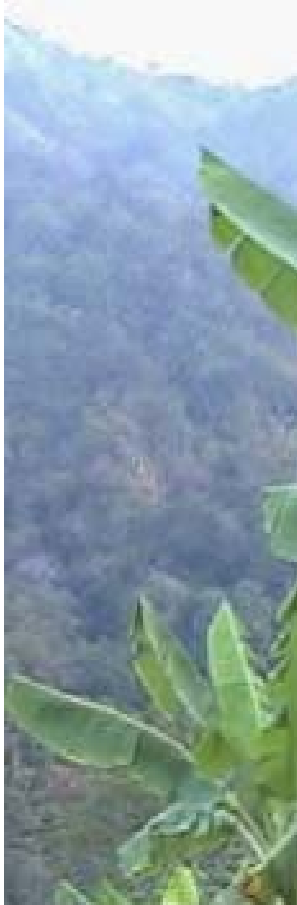
STAKEHOLDER CONSULTATION / CREATION OF PLATFORM CREATION FOR EXCHANGE



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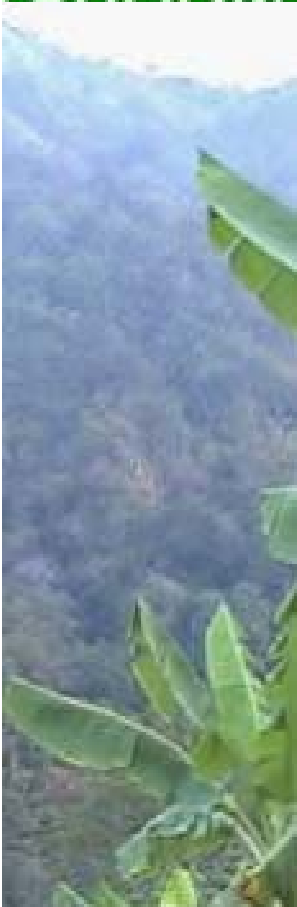
INFORMATION NEED ASSESSMENT

- Questionnaire Survey
 - At Household Level (about 450 households)
- 37 Focus Group Discussions (11 Different Groups)
 - UP Chairman and Members
 - Headmans
 - Karbari
 - Traditional Farmer (Tribe)
 - Plain Land Farmer (Tribe)
 - Plain Land Farmer (non-tribe)
 - Mixed Farmer
 - Traders
 - Horticulturist
 - Forest resource users
 - Fishermen
 - Women group
- 6 Consultation meetings at Upazila Level





CHARM



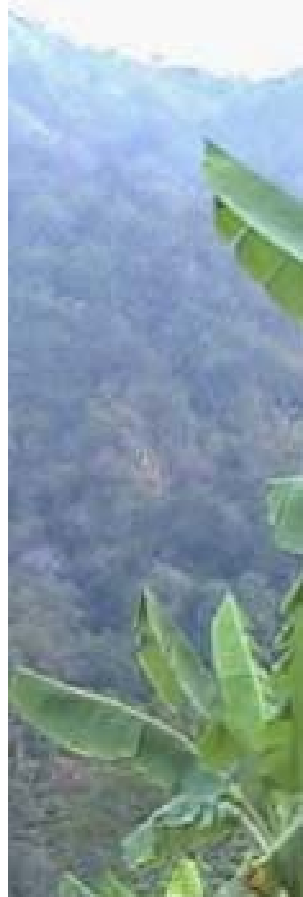
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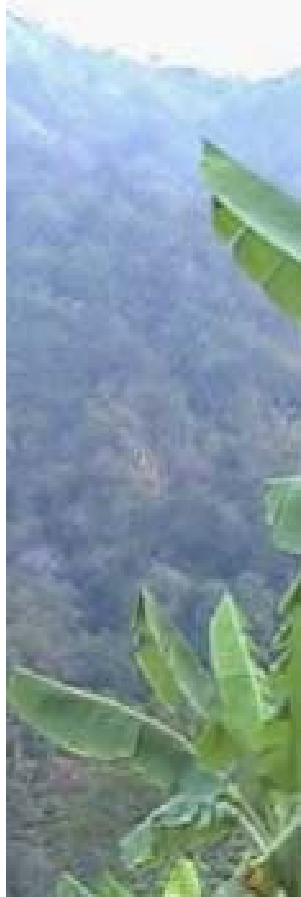
Example: Information Need

Stakeholder Group (Household Survey)	Information Need
Soils	<ul style="list-style-type: none"> • Water characteristics • Land suitability for different crops
Water availability	<ul style="list-style-type: none"> • Surface water availability • Ground water availability
Land cover/land use	<ul style="list-style-type: none"> • Cultivable land • Cropping patterns
Agriculture	<ul style="list-style-type: none"> • Introduction of improved varieties • Appropriate technology • Irrigation requirements • Availability of seed • Updated information on market prices of different agro products • Best Agriculture practices in CHT and similar areas elsewhere



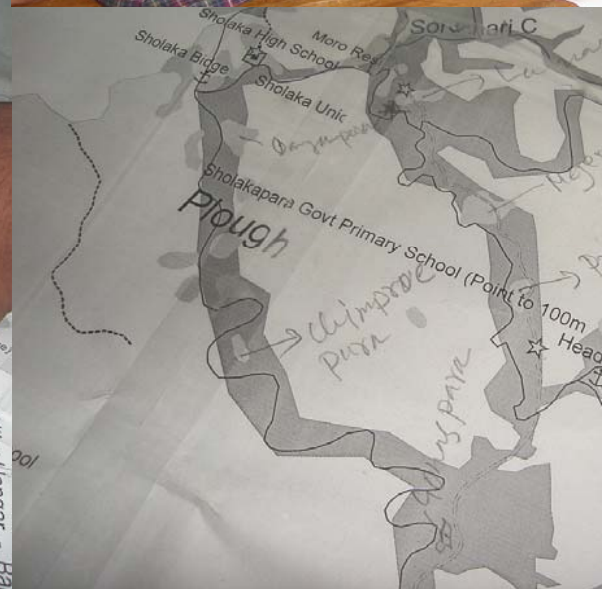
**From Household Survey:
 Percentage Distribution of Responses for Consideration or Deciding Land Selection
 and Crop Management**

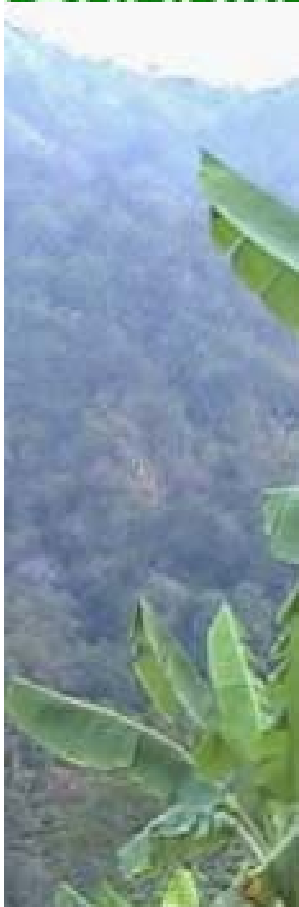
Consideration	Percentage			
	Bandarban	Rangamati	Khagrachari	All
Quality of soil	30.5	24.9	44.6	32.9
Land suitability	27.1	17.0	5.8	17.8
Quality of seed	1.6	22.7	7.2	9.9
Quality of tree	-	2.1	-	0.7
Communication facilities	10.8	9.6	4.9	8.7
Marketing facilities	-	3.7	8.0	3.5
Water Availability	13.3	8.0	14.2	11.9
Own decision	4.6	4.6	10.4	6.3
Experiences of neighbors	-	3.1	-	1.0
Protection of production crops	-	1.2	0.3	0.5
Lack of money	3.8	0.3	-	1.6
Others	8.3	2.8	4.6	5.2
Total	100.0	100.0	100.0	100.0



PILOT AREA STUDY FOR PARTICIPATORY PLANNING AND TEST OF CONCEPTS

Presentation of results and update of information





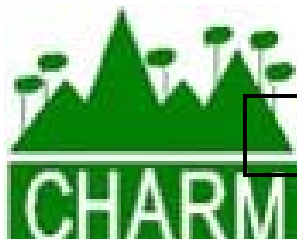
Example agriculture:

Type	Problem	Recommendations
Others Agricultural practices (Vegetables, Tobacco, Paddy, Sugercane, Spices, fruit)	Lack of Fertilizer supply	Proper policy
	HYV seed, Insect, Climate change, Lack of Communication, Market price, and access.	HYV seed from BADC (Govt)
	Soil fertility has decreased	Stop Tobacco cultivation
	Lack of supply of fertilizer	Wood tree in HH,
	High cost of fertilizer	Horticulture development in Medium HH in low slope area.
	Lack of financial resources to buy fertilizer	Training on different crop production including pesticide and fertilizer use, pest management
	Lack of water for irrigation during boro season	Scientific research on cultivation of crop
	No supply of ground water source	Create water reserve by damming the charas

Follow-up/implementation requires

Institutional support

Open mind and willingness to negotiate on land use



UNCLASSIFIED STATE FOREST LANDS

Stratification

Assess fragile ecosystems (mountain forests)

Conservation and production priorities

fragile

Not fragile

DETERMINE ALL AREAS WITH HIGH POTENTIAL EROSION RISK
select all land systems with high erosion risk (USLI > 180)

high erosion risk

DETERMINE IF LAND HAS SUFFICIENT LAND COVER
select lands with sufficient land cover (C factor < 0.15)

high C factor

low soil erosion risk

low C factor

DETERMINE IF LAND IS FORESTED
select lands with landcover herbs, shrubs, bush

No forest

other land

DETERMINE WHETHER THERE ARE IMPORTANT
DOWNSTREAM INFRASTRUCTURES (e.g. KAPTAI)

YES

DETERMINE RUGGEDNESS OF THE LAND SYSTEM
land area with slope < 25%

50% of the

not rugged

rugged

SLOPE > 45%
yes
no

DETERMINE RUGGEDNESS OF THE LAND SYSTEM
50% of the land area with slope < 40%

very rugged

rugged
Reserved forest area

Regular production/reforestation

SUSTAINABLE PRODUCTION/REFORESTATION OR SOIL CONSERVATION AND LAND REHABILITATION POSSIBLE IN PART OF THE LAND DUE TO ENVIRONMENTAL LIMITATIONS (USFLP)
Unclassed state forest area

REFORESTATION OR SOIL CONSERVATION AND LAND REHABILITATION POSSIBLE WITH LIMITED PRODUCTION COMPONENT (USFRLP)

SOIL CONSERVATION PRACTICES AND LAND REHABILITATION POSSIBLE WITH LIMITED PRODUCTION (USFRLP)

REFORESTATION AND REGREENING FOR WATERSHED REHABILITATION FOR PROTECTION (USFRP)

CONSERVATION OF WATERSHEDS AND CRITICAL ECOSYSTEMS (USFWC)

LAND REHABILITATION WITH POTENTIAL FOR REGULAR PRODUCTION PURPOSES (USFRH)

LAND WITH POTENTIAL FOR REGULAR PRODUCTION PURPOSES AND SUSTAINABLE PRACTICES (USFPL)

Regular production (non-forested)

Regular production (forested)

Soil conservation for watershed protection

Land rehabilitation & SWC

Conservation & land rehabilitation

Settlements

Waterbodies

SOTER units

No Data

0 12.5 25 50 75 100 km



ations

Production priorities

Protection and conservation priorities

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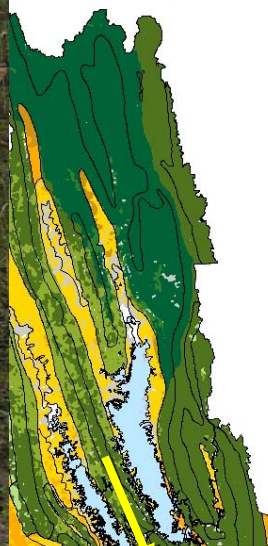


Timber plantations - Conservation practices:

- SLASH ROWS ACROSS THE SLOPE



production priorities



* FRUIT GARDEN

conservation practices:

- planting bamboo on the borders with lake kaptai to control mass movements

Legend

Reserved forest are

- Regular product
- Production/refor
- Reforestation &
- Soil conservatio
- Conservation of

Unclassed state for

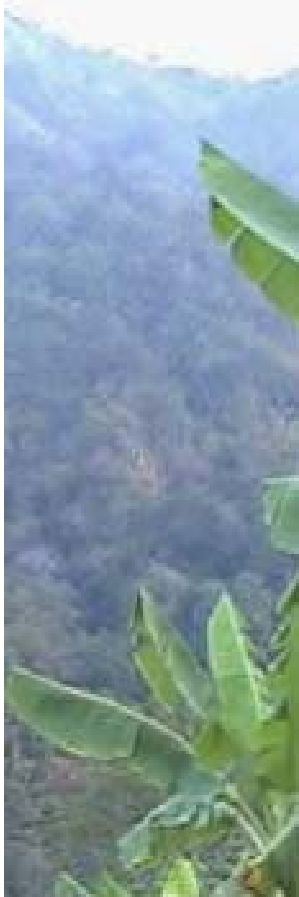
- Regular product
- Regular product
- Soil conservatio
- Land rehabilitat
- Conservation &

- Settlements
- Waterbodies
- SOTER units
- No Data

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Construction of information system and user testing for improved easy access to NRM information -> user testing

CHARM Information System

CHittagong Hill Tracks improved nAtural Resources Management

EXECUTING AGENCIES:

- CEGIS
- BCAS
- ISRIC
- Universitat de Lleida

FUNDING AGENCY:

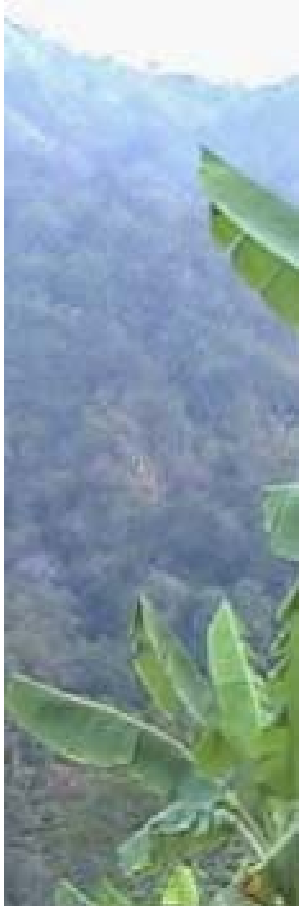
- ASIA PRO ECO
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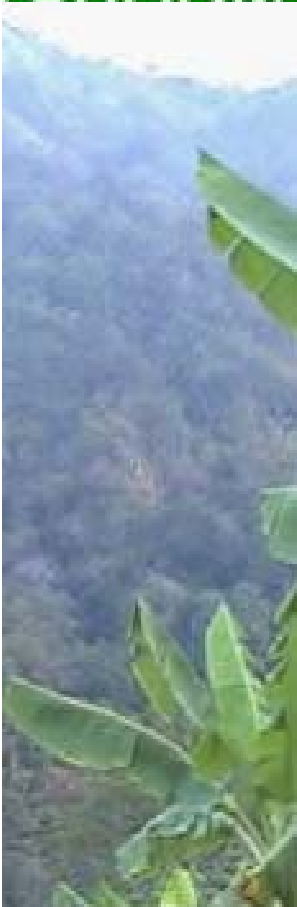




CONCLUSIONS (1/2)

General CHT land management issues

- Jhum will remain a fundamental land-use system: food security for farmers means producing their own staple crop
- regional production will not be sufficient to cover demand
- cash crops are not an alternative for majority of farmers: only farmers with other sources of income change to cash crops
- marketing / accessibility likely to remain limiting in the near future
- Improving forest management is an urgent issue



CONCLUSIONS (2/2)

Capacity for improved NRM management

- Data made available and easily accessible
- Translation of formulated info needs to available information is not straightforward (scale/context dependant)
-
- Participatory planning and planning tools tested, but true planning requires enhanced institutional capacity, and political will to resolve the land tenure issue (start pilot?)
- Improved decision making requires harmonization of formal and traditional authorities



First step in building capacity made

Follow-up implementation strategy:

Further training of NGO's and line agencies

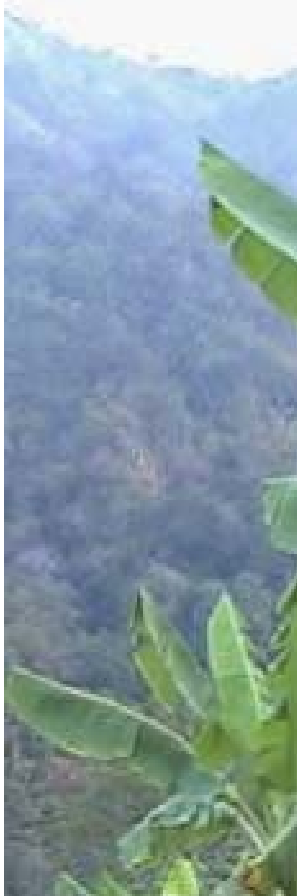
Formalization of the stakeholder platform for exchange

Participatory field testing of alternative land management strategies and measurement of their impact

ASIA PRO ECO

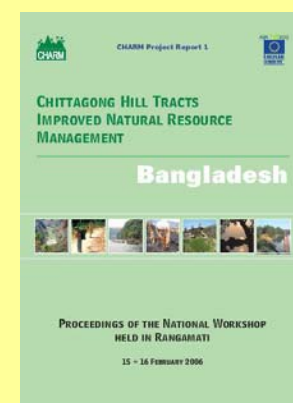


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Reports will progressively be made available