

Regional Workshop on FORESTS AND DROUGHTS

The roles of trees and forests in building resilience against droughts

**Laskar Muqsudur Rahman, PhD
BANGLADESH**

**ENVIRONMENTAL SCIENCE FOR SOCIAL CHANGE (ESSC)
ASIA FOREST NETWORK (AFN)
FAO Regional Office for Asia and the Pacific, Bangkok, Thailand**

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Regional Workshop on FORESTS AND DROUGHTS

The roles of trees and forests in building resilience against droughts

Presentation outlines

- 1. Climate, drought & drought prediction**
- 2. Forest types of Bangladesh**
- 3. Case study area**
- 4. Impacts of drought on trees & forests**
- 5. Other impacts**
- 6. Role of trees & forests in mitigating drought**
- 7. Community coping strategies**
- 8. External support received by community**
- 9. External support anticipated by community**
- 10. Government & NGOs initiatives**
- 11. Lesson learned to go ahead**



BANGLADESH

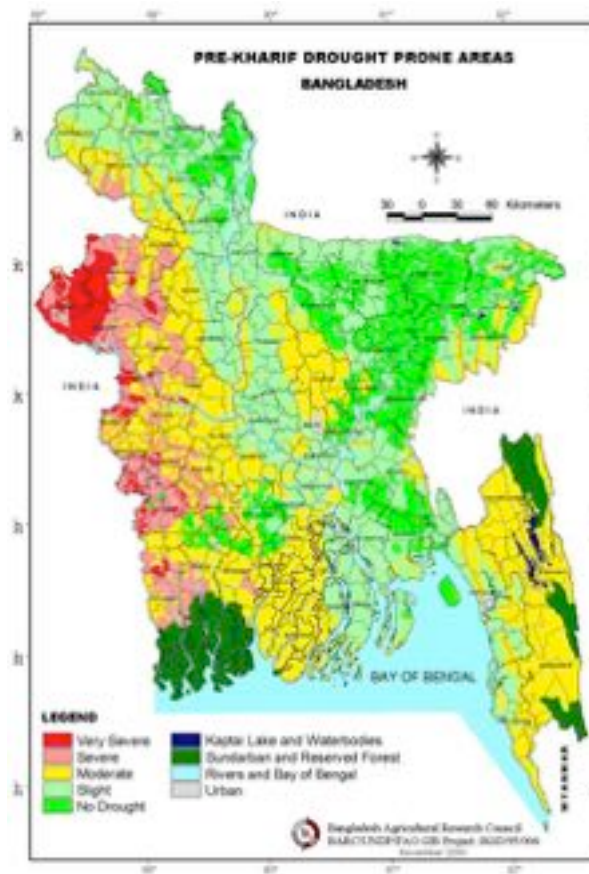
Population 159 million
Area 14.75 million ha

Climature

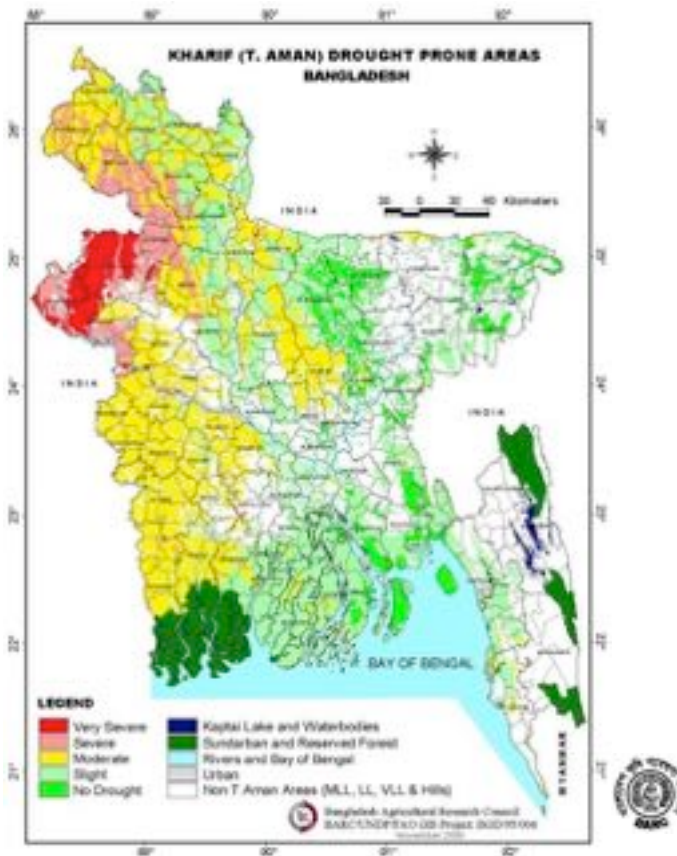
- Tropical monsoon climate
- Heavy seasonal rainfall, high temperatures, and high humidity.
- Floods, cyclones, tidal surges, sea-level rise, river erosion and drought.
- Three seasons: winter, summer & monsoon.
- Winter temperature ranges from 7 to 13°C to maximum 24 to 31°C.
- Summer temperatures range from 30 to 40°C.
- Rainfall varies from 1429 to 4338 mm.
- The minimum rainfall observed in the north western region of Bangladesh.



Drought-prone Areas of Bangladesh



March - June

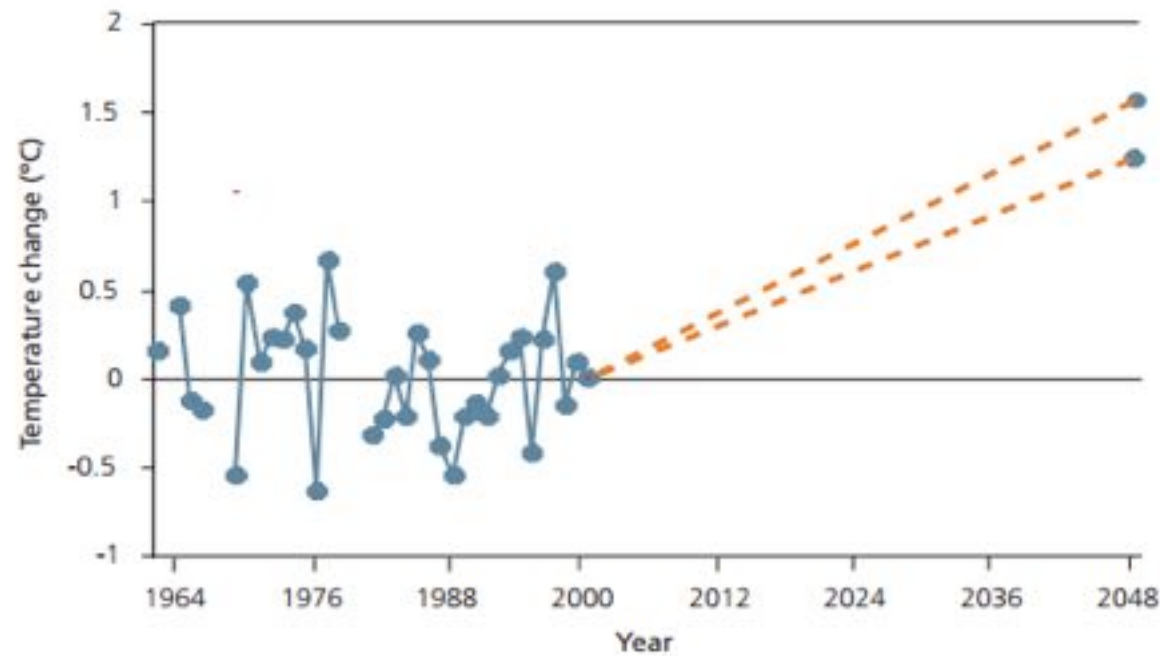


July - October

- ✓ Forest tree species grow luxuriously from around April to around July
- ✓ Plantation work is carried out during June-July
- ✓ Therefore, drought during this period affects tree growth & plantation work

DROUGHT PREDICTION, BNAGLADESH

GCM analysis indicates that the average temperature of Bangladesh will increase by 1.4°C (± 0.16) by 2050.

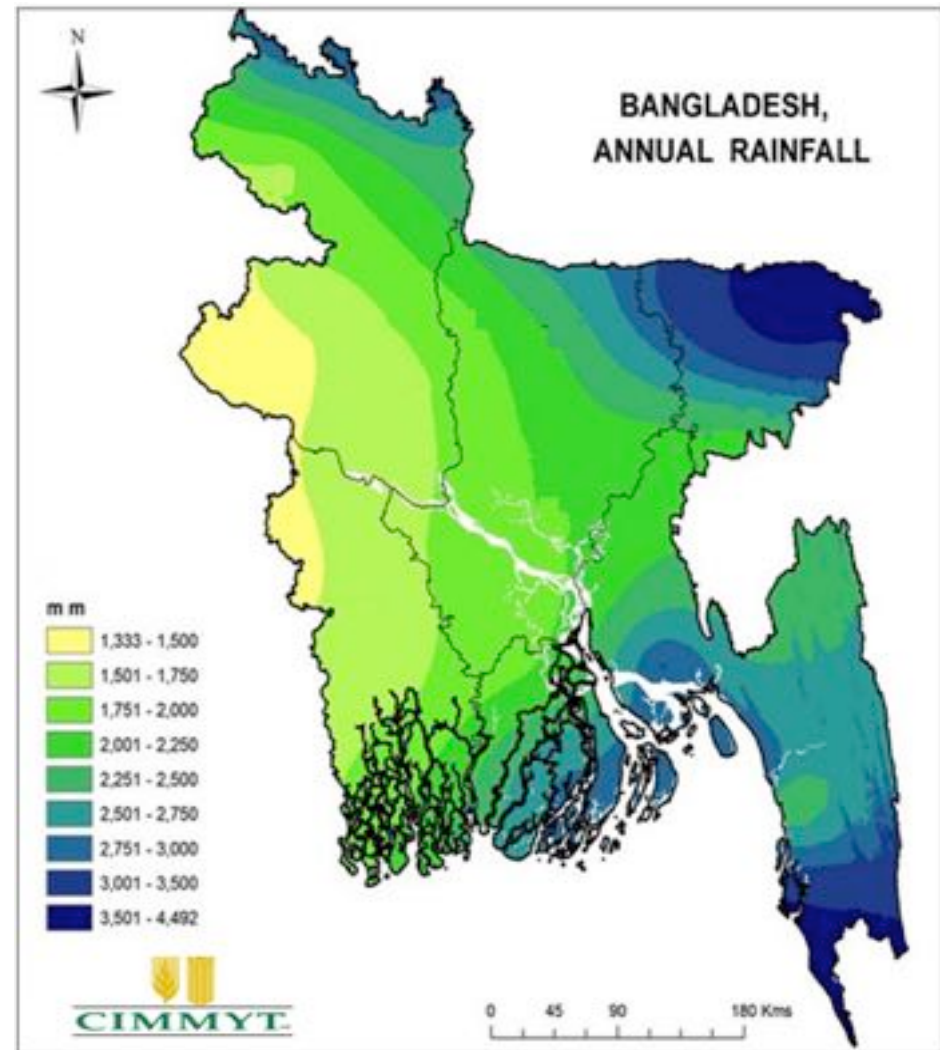


Annual average maximum temperature variations (1964-2003) and temperature projected to 2050 for Barind Tract of Bangladesh (the linear line is just to show the future anticipated temperature) (Ramamasy and Baas 2007)

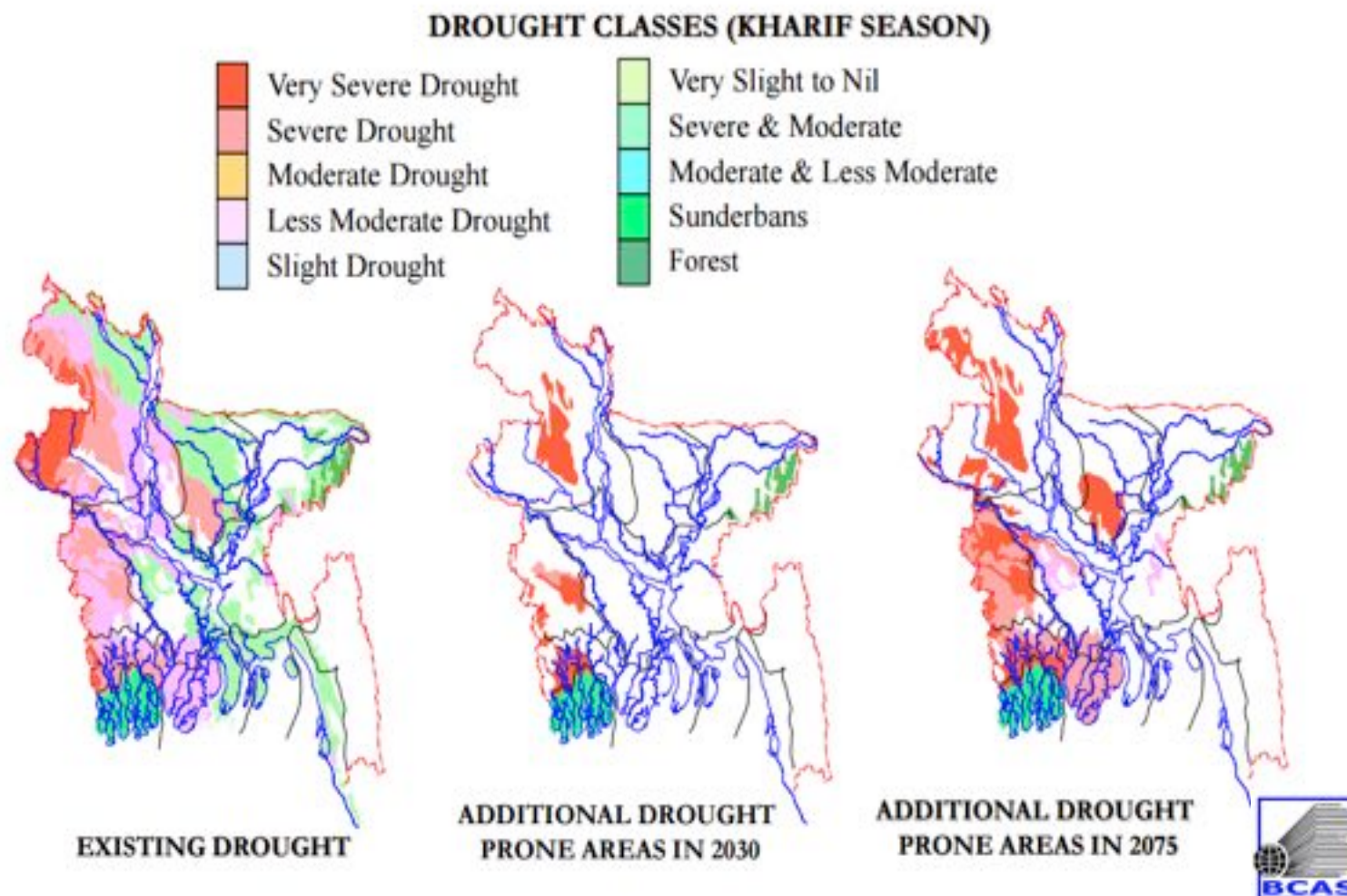
RAINFALL PREDICTION, BNAGLADESH

- It is predicted that there will be 5-6% increase in rainfall by 2030
- But, the Barind Tract will suffer from frequent drought due to erratic rainfall distribution

(Alam *et al.* 2012)



Existing drought situation and situation in 2030 and 2075, Bangladesh (Kharif Season : June to October)



The moderately drought-affected areas will be turned into severely drought-prone areas by 2075.

Forests Types of Bangladesh

Total forest area 2.53 million ha
Almost 17.5 % of the country's total
landmass

Forest Types	million ha	%
Unclassed State Forests	0.73	5.08
Hill Forests	0.67	4.65
Mangrove Forests	0.60	4.09
Village Forests	0.27	1.83
Coastal Afforestation	0.18	1.24
Inland Sal Forests	0.12	0.83
TOTAL	2.53	17.49



Major Forest Types include:

Hill Forests 0.57 million ha (4.65%)



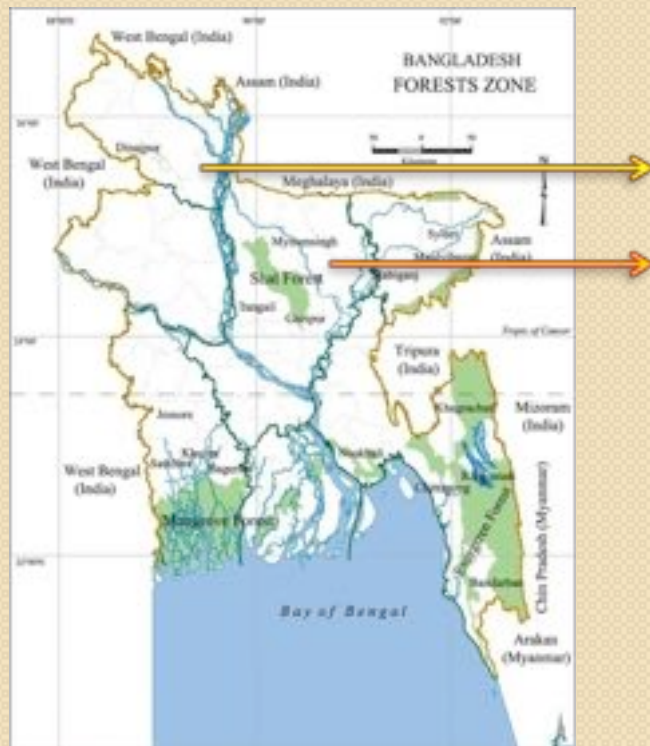
Forest Types of Bangladesh

Mangrove Forests 0.60 million ha (4.09%)



Forest Types of Bangladesh

Sal Forests 0.12 million ha 0.83%
(*Shorea robusta*)



Forest Types of Bangladesh

Public forests are unevenly distributed in the country

Village Forests (VF)

Scattered throughout the country

ONLY 0.27 million ha (1.83%)

Although small in size, but VF provides at least 70% of the total national demand



Forests can contribute to human livelihood in many ways

Household use (subsistence)

Timber

Fuelwood

Wild foods (animal and plant)

Medicinal plants

Other NTFPs

Grazing for animals

Forest-based agriculture

Nutrient subsidies for agriculture

Food security

Depend on forest foods when crops fail to meet seasonal needs or to provide dietary supplements

Income generation

From sale of any products listed above or sale of agricultural or livestock production dependent on forests.

Income from forest-based labour

Estimated Number of Forest Dependent People in Bangladesh

There is about 19 million forest dependent people in the country, of which about 5.5 million depend on village forests .

Forest ownership	Forest Area (million ha)	Forest Dependent People (Million)
Forest Department managed forests	1.53	10.40
Unclassed State Forests (USF)	0.73	3.43
Privately owned Village Forests (VF)	0.27	5.50
Total	2.53	19.33

Source: Ahmed, F.U. (Pers. Com. 2 May 2015)





Rationale of the Case Studies

- ✓ Historically more emphasis has been given to flood than drought in most of the research and reports. Because, droughts have silent impact to the society.
- ✓ Although the role of trees and forests in combating climate change has been recognized but, impact of droughts on trees and forests is yet out of focus.
- ✓ Most studies on droughts in Bangladesh concentrate on agriculture.
- ✓ And studies on impacts of drought on trees & forests are scanty in the country.

Case study area

Study sites:

Three drought prone upazila

Tanore in Rajshahi
Nachole in C. Nawabganj &
Niamatpur in Naogaon district were
selected for case study.

Climate:

Monsoon rainfall 1581 mm
Summer temp. 25°C-35°C, 41°C
Winter temp. 9°C-15 °C, 5°C

Methodology:

Exploratory visits,
150 households interviewed
3 FGDs
Literature review &
Expert surveys



Case study

Occupation:

- ❖ 87.3% households engaged in agriculture
- ❖ Nearly 5.3% are service holders
- ❖ 2.6% percent are businessmen
- ❖ Homestead forestry is the secondary occupation

Land holding status:

- ❖ 83.3% households are small farmers (>0.08 ha to 0.14 ha, minimum of 0.02 ha homestead)
- ❖ 13.3% medium households (of >0.14 hectare to 0.20 ha, minimum of 0.02 ha homestead)

Education:

- ❖ Primary school (31.6%)
- ❖ Below SSC (52.6%)

Economic status:

People in the study area are poor to very poor:

- ❖ Poor (63.3%): annual income equivalent to US\$629-1006
- ❖ Very poor (12.6%): annual income equivalent to US\$251-629

Contribution of homestead forest:

- ❖ Village forest contributes 12 to 33% to their annual income.



Households observed that during drought conditions:

Extent of damage	Nos. of Respondents			Total Respondents (%)
	Tanore	Niamatpur	Nachole	
Newly planted trees wilt and die	34	43	47	124 (82.7)
Stems and twigs die	23	31	35	89 (59.3)
Slow seedlings growth	18	21	7	46 (30.6)
Leaves drop	16	9	6	31 (20.6)
Leaves turn colour	23	19	34	76 (50.6)
Root dry and seedlings die	12	17	21	50 (33.3)
Dying start from top shoot & outermost branch	3	4	7	14 (9.3)
Flowers fail to open & less fruit production	6	3	2	11 (7.3)
Poor seed year	3	4	1	8 (5.3)
Germination of seed is poor	7	4	3	14 (9.3)
Nursery work is difficult	5	7	11	23 (15.3)
Plantation work is difficult	6	12	3	21 (14.0)
Incidence of insect pests & diseases	33	41	17	91 (60.6)
Incidence of forest fire		2		2 (1.3)
Large trees are usually drought tolerant, sometimes parts of some tree become affected	40	43	37	120 (80)

Impacts of drought on forest

In forest plantations

Young tree wilts



Leaves turn yellow



Impacts of drought on forest

Drought affects trees

Top shoot burns



Leaf burns



Impacts of drought on forest

Drought may cause sudden death of large tree

Albizia procera

A large deciduous tree
Sujanagar, Pabna



Impacts of drought on forest

Drought weaken trees and favours insect pest & diseases

Dalbergia sissoo

Sissoo trees dying from fungal diseases

In northwestern region of Bangladesh

Low water table caused by climate change seen as reason



Die-back



Wilt symptoms thought to be associated with fusarium root disease. Bogra, Bangladesh



Kongkon Karmaker
The Daily Star
Wednesday, August 12, 2009

Impacts of drought on forest

Drought affects tree growth

Tree-ring width and density increased dramatically about 100 years ago.



November 14, 2011 by Bob Berwyn
<http://summitcountyvoice.com/2011/11/14/global-warming-causes-growth-spurt-in-some-arctic-forests/>

Impacts of drought on forest

Drought increases risks of fire hazards through increasing combustible materials



(Mostly accidental & for malicious reason)

Other impacts of Drought

Economic

- Damage of agricultural crops
- More money on irrigation
- Households cannot sell boats and fishing gears
- Livestock rearing & fish culture hampered

Environmental

- Lower water levels in tube-wells, ponds, canals & rivers
- Air pollution due to dust
- Land degradation
- Destruction wildlife habitat

Social

- Anxiety about economic losses
- Health problems related to drought
- Social impacts arising from water crisis, lending-borrowing money & selling belongings



Drought: Economic problem



More money for irrigation



Crop loss



Navigation route become long



Drought: Economic problem



Crop loss reduces employment opportunity

Drought: Economic problem



Damage of vegetable garden

Drought: Economic problem



Small boats & fishing gears cannot be sold



Drought: Economic problem



Some times households have to sell their trees at distress price.

Drought: Environmental problem



Dry river



Dry creeks



**Little low quality
water in the pond**

Drought: Environmental problem



Dry pond-No fish



No grass for livestock

Drought: Environmental problem

Water crisis due to lowering of water table
Women have to walk even up to 2 km



Drought: Environmental problem



Hand pumps become out of order

(60-70 m deep)

**Women & children rush to the
deep tube-well to fetch water**

(>150m depth)

Because, decline in groundwater level

About 35 percent of hand pumps (60-70 m deep) are now out of order

Drought: Environmental problem



Land degradation

In halation of soil dust may cause lung diseases



Drought: Environmental problem

Reduced water reduces recreational facilities.



Drought: Environmental problem

Degradation of wildlife habitat



Drought: Social problem



Anxiety due to crop loss

Social Conflict



**Arising from breaking queue,
lending or borrowing money,
sale of belongings on partial payment etc.**



Predicted future implication of intense drought

Climate change has begun to alter the composition and structure of forests globally.

Drought stress in tropical forests can have a major impact on global carbon, water, and energy cycles.

Presently forests worldwide capture about a quarter of carbon emissions. A 2.5°C rise in temperatures would eliminate the net carbon sequestering function of global forests.

Rising temperatures could reverse the role forests in mitigating climate change, turning them into net sources of greenhouse gases.

Drought is next to heat and artificial regeneration may be difficult for restocking in the coming years in the face of intense drought.

Drought adaptation

Coping methods	<i>Nos. of Respondents</i>			Total Respondents (%)
	Tanore	Niamatpur	Nachole	
Mulching	9	11	14	34 (22.6)
Soil working	14	17	13	44 (29.3)
Watering	23	17	31	71 (47.3)
Bottle-drip irrigation			11	11 (7.3)
Bottle-feed irrigation			8	8 (5.3)
Vacancy filling	11	18	23	52 (34.6)
Re-excavation of pond	9	13	12	34 (22.6)
Re-filling of dried out pond	6	7	10	23 (15.3)
Dug ditches and mini-ponds to retain rain water	1	1	2	4 (2.6)
Excavation of pond	8	5	4	17 (11.3)
Participatory deep tube-well	4	7	5	16 (10.6)



Weeding



Mulching



Light tillage



Light tillage or dry soil mulch can act as capillary break & reduce the evaporation rate.

Compost mulching



Compost prevents sun's heat to reach the soil.

It improves soil fertility and its ability to soak up and retain soil moisture.

Hardening off seedlings

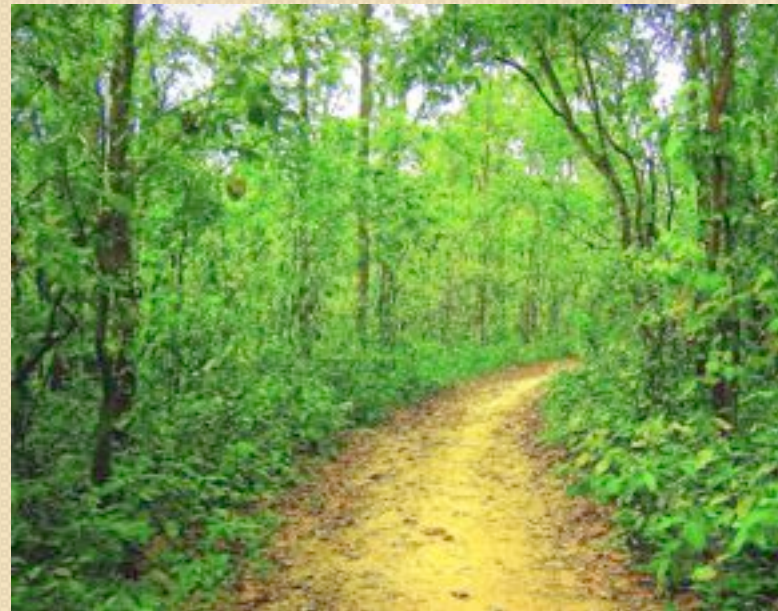


Seedlings are left outside to become accustomed to strong sunlight, and less-frequent watering over a 7-10 day period to toughen seedlings up for transplanting at plantation sites.

Prevention of forest fire



Prescribed/Control burning



Construction of fire line-cum-inspection path

People recognized 20 tree species that thrive well in drought condition

Sl	Scientific name	Local/English name	Family	Major use
1	<i>Aegle marmelos</i>	Wood apple	Rutaceae	Fr, M
2	<i>Areca catechu</i>	Betel nut	Areaceae	T, Fu
3	<i>Artocarpus heterophyllus</i>	Jackfruit	Moraceae	T, Fr, Fu
4	<i>Averrhoa carambola</i>	Carambola	Oxalidaceae	Fr
5	<i>Azadirachta indica</i>	Neem	Meliaceae	M
6	<i>Bambosa spp.</i>	Bamboo	Poaceae	Rural construction
7	<i>Borassus falbellifer</i>	Palmyra Palm	Areaceae	Fr, T, O
8	<i>Citrus grandis</i>	Pomelo	Rutaceae	Fr
9	<i>Cocos nucifera</i>	Coconut	Areaceae	T, Fr, Fu
10	<i>Dalberzia sisoo</i>	Sisoo	Fabaceae	T, Fu
11	<i>Litchi chinensis</i>	Lychee	Sapindaceae	Fr
12	<i>Mangifera indica</i>	Mango	Anacardiaceae	Fr, T
13	<i>Moringa oleifera</i>	Moringa	Moringaceae	V, M, Fu
14	<i>Neolamarckia cadamba</i>	Kadam	Rubiaceae	T, Fu
15	<i>Phoenix sylvestris</i>	Date Palm	Areaceae	Fr
16	<i>Phyllanthus emblica</i>	Emblic myrobalan	Euphorbiaceae	Fr, M
17	<i>Syzygium cumini</i>	Jam	Myrtaceae	Fr, T
18	<i>Terminalia arjuna</i>	Arjun	Combretaceae	M
19	<i>Vachellia nilotica</i>	Gum arabic	Leguminosae	Fu, O
20	<i>Ziziphus jujuba</i>	Jujube	Rhamnaceae	Fr

Fr= fruit; Fu=fuel; M=medicinal; O=others; T=timber; V=Vegetable

Community received following external supports:

Support available	<i>Nos. of Respondents</i>			Total Respondents (%)
	Tanore	Niamatpur	Nachole	
Deep Tube-wells (DTWs)	1	2	1	4 (2.6)
Hand Tube-wells (HTWs)	3	2	4	9 (6.0)
Communal irrigation facilities	7	10	9	26 (17.3)
Excavation/Re-excavation of canal	1	1		2 (1.3)
Excavation/Re-excavation of pond	2	2		4 (2.6)
Afforestation	2			2 (1.3)
Health services		11		11 (7.3)
Electricity (new connection)		1		1 (0.7)
Tree planting campaign	5		2	7 (4.6)
Cross dam in canal	1			1 (0.7)

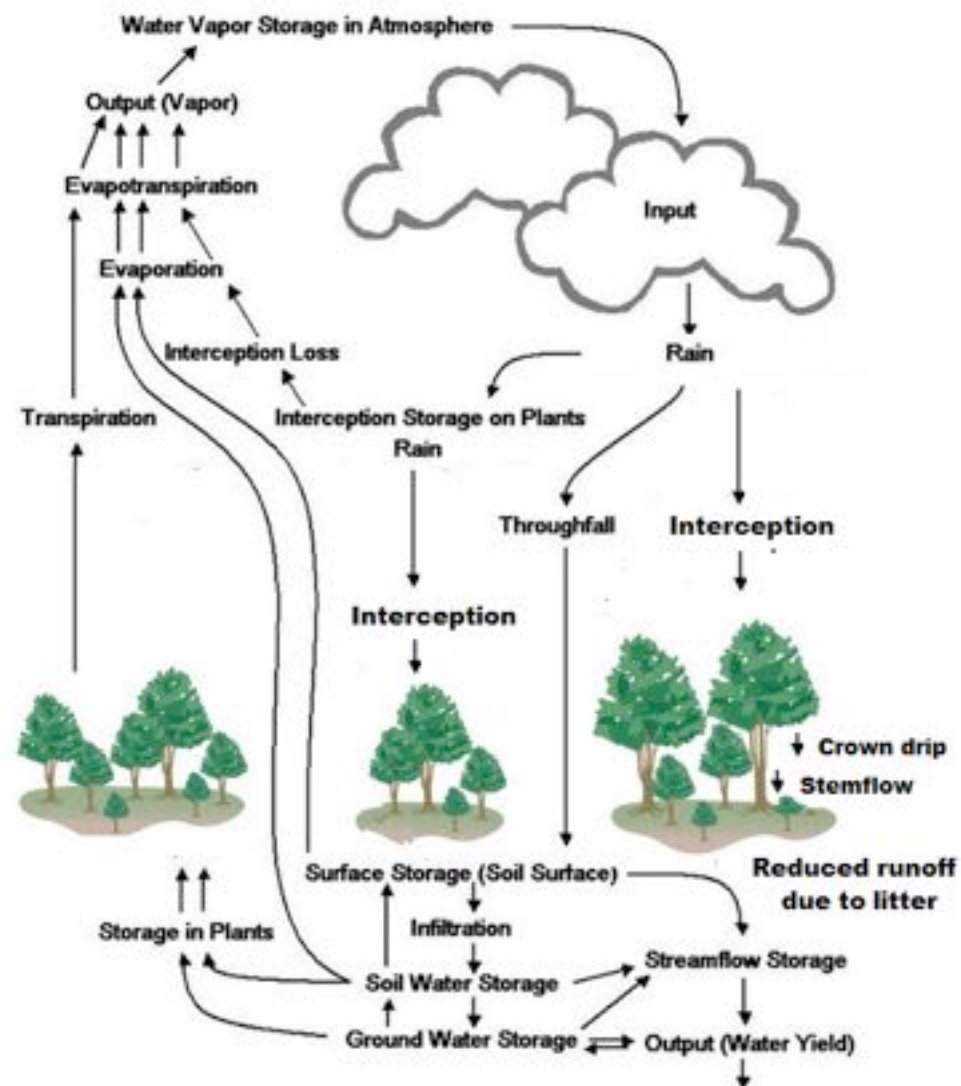
Community anticipates the following external supports:

Anticipated Support	<i>Nos. of Respondents</i>			Total Respondents (%)
	Tanore	Niamatpur	Nachole	
Safe water supply	6	9	13	28 (18.6)
Health services	7	13	6	13 (8.6)
Irrigation	3	13	5	21 (14.0)
Increase depth of the existing DTWs	2	7	5	14 (9.3)
Electricity	8	18	17	43 (28.6)
Motor pump	3	7	1	11 (7.3)
Soft cash loans	9	8	5	22 (14.6)
Harvest of rain water	10	13	11	34 (22.6)
Fair price of products	7	2	9	18 (12.0)
Deep Tube-well	17	19	5	41 (27.3)
Massive afforestation	7	5	2	14 (9.3)
Excavation/Re-excavation of pond	16	31	8	55 (36.7)
Excavation/Re-excavation of canal	5	5		10 (6.6)
Excavation/Re-excavation of other water reservoirs (e.g. kharis)	7	11	13	31 (20.6)
Hand tube-well	16	23	4	43 (28.7)
Water supply pipe lines	3	2	5	10 (6.7)
Dam in canal	2			2 (1.4)
Free quality seedlings	19	17	22	58 (38.6)
Provision of Advice Center	4	7	14	25 (16.6)

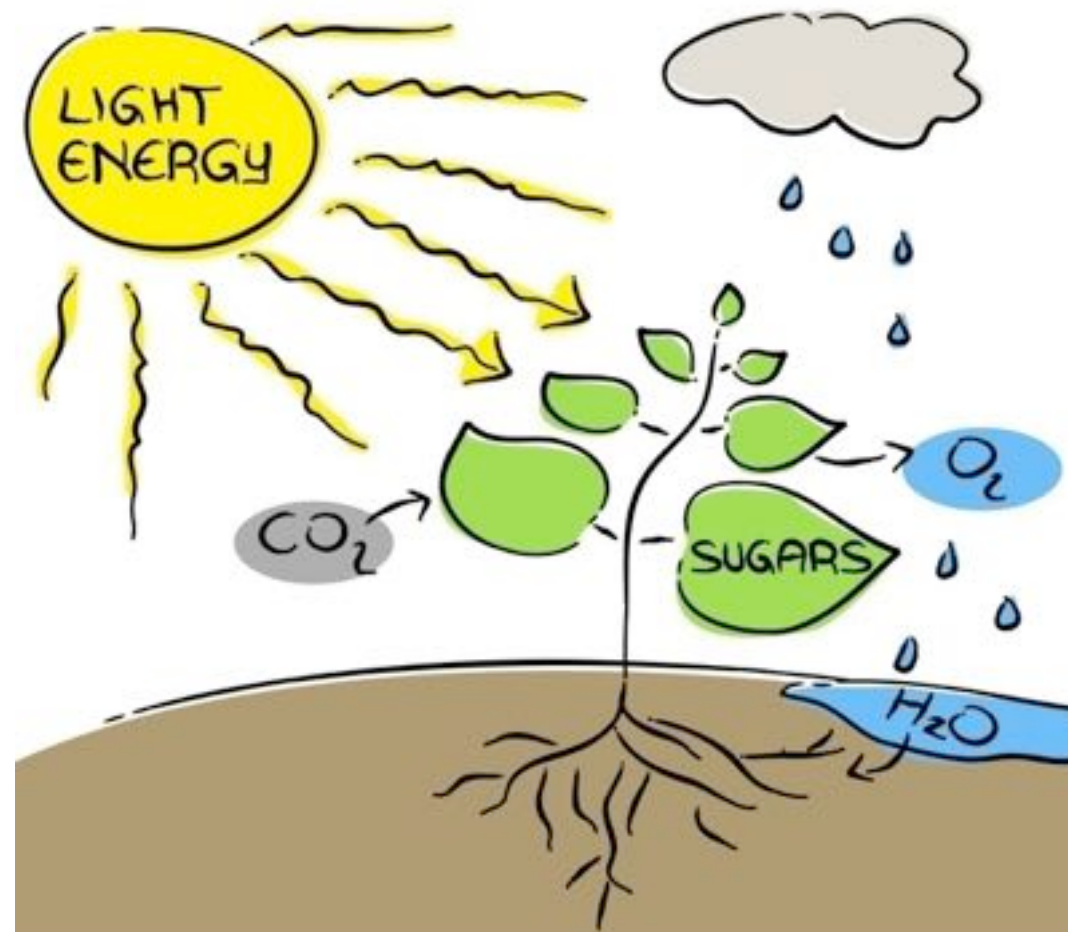
The role of trees & forest in mitigating drought



Forest hydrological cycle



The roles of trees and forests in combating climate change (Photosynthesis)





Natural Drought



Anthropogenic deforestation

- ❖ To adapt & mitigate drought certain measures are required.
- ❖ To stop deforestation alternatives are required.

To this end Government has taken some initiatives

Structural



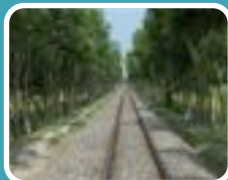
- Excavation of canal & pond
- Re-excavation of canal & pond
- Dredging of rivers

Non-structural



- Training
- Building awareness
- Drought monitoring
- Early warning

Social protection



- Participatory forestry & co-management of PAs
- Distribution of seedlings & ICS
- Improvement of living condition, rural landscape
- Alternative income generation activities (AIGs}

Government initiatives



Pre-paid system



Irrigation

Government initiatives

Re-excavation of derelict canal & pond



River dredging

Government initiatives

Employment Opportunity through Food for Work Programme



Government & NGO initiatives

Sinking hand pump



NGO initiatives

Promotion of Solar panel



NGO initiatives

Promotion of Biogas Plant
Reduce fuelwood consumption



SOCIAL PROTECTION FOR CONSERVATION OF FORESTS



Participatory social forestry



SOCIAL PROTECTION FOR CONSERVATION OF FORESTS

Participatory social forestry



Every year Prime Minister hands over Cheque to participant who receives the maximum amount.



SOCIAL PROTECTION FOR CONSERVATION OF FORESTS



Seedling distribution



Training & Awareness Building

SOCIAL PROTECTION FOR CONSERVATION OF FORESTS



Promotion of ICS: Improved cooking stove

**Reduce fuelwood consumption 50-70%
&
Safe for health**



Traditional cooking stove

SOCIAL PROTECTION FOR CONSERVATION OF FORESTS

ALTERNATIVE INCOME GENERATING ACTIVITIES (AIGS) TO REDUCE PRESSURE ON FORESTS



Handicraft making

SOCIAL PROTECTION FOR CONSERVATION OF FORESTS

AIGs



Weaving



Branding local cloth

SOCIAL PROTECTION FOR CONSERVATION OF FORESTS

AIGs

Livestock, poultry & fish cultivation



SOCIAL PROTECTION FOR CONSERVATION OF FORESTS

AIGs

Nursery raising



SOCIAL PROTECTION FOR CONSERVATION OF FORESTS

AIGs



Bamboo cultivation

SOCIAL PROTECTION FOR CONSERVATION OF FORESTS

AIGs

Vegetable cultivation



SOCIAL PROTECTION FOR CONSERVATION OF FORESTS

AIGs

Small business



SOCIAL PROTECTION FOR CONSERVATION OF FORESTS

AIGs

Selection of Eco-tour guide from local village



SOCIAL PROTECTION FOR CONSERVATION OF FORESTS

AIGs

Renting village eco-cottage



Village Eco-Cottage at Srimanagal, Moulvibazar



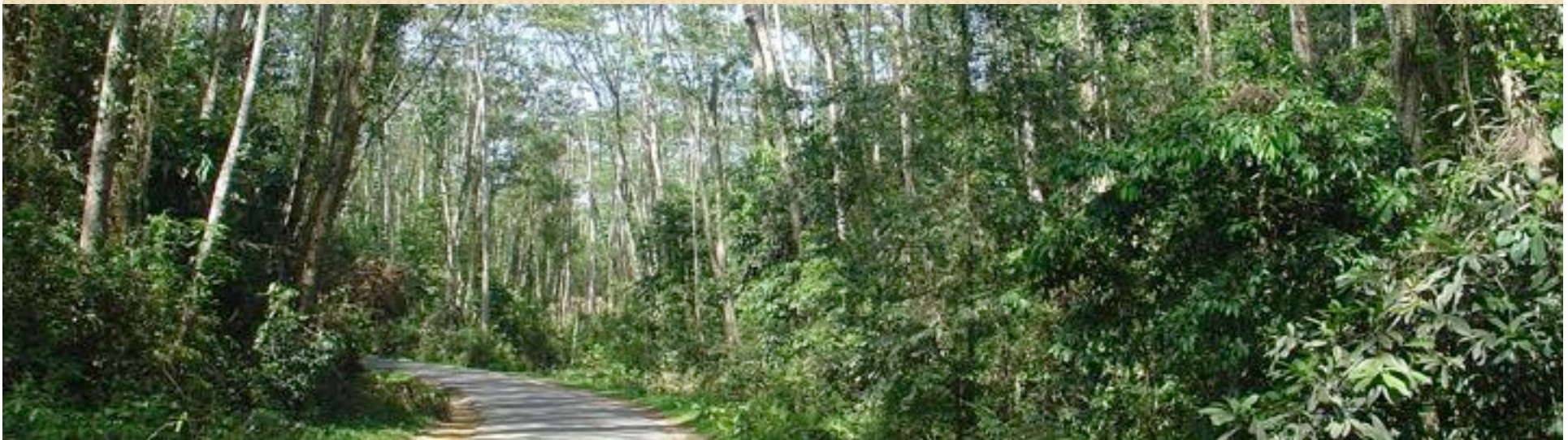
**Village Eco-Cottage near Munshiganj,
Sundarban**

Community is provided with
Revolving loan fund for AIGs



Co-management of forest protected areas (PAs)

- Co-management Councils (CMC) 65 Members
- Co-management Committee (CMC) 29 members
- Village Conservation Forum (VCF) : 30-100 villagers
- Peoples Forum (PF) is elected by VCF
- Community Patrol Groups (CPG) and Eco-Tour guides
- **CMC is responsible management of PAs with the guidance from FD**
- **CMC collect revenue**
- **50% of revenue from PAs back to CM Committee (CMC) to bear management cost.**



Co-management of forest protected areas (PAs)

Community people take part in forest maintenance



Co-management of forest protected areas (PAs)

Community identity theft in forests



Community Patrol Group



Lessons learned to go ahead

- **Stop deforestation through incentives and support**
- **Encourage development & use of surface water**
- **Promote climate-smart afforestation**
- **Scaling up of government & NGO initiatives**
- **Initiate more innovative approaches to deal with drought**
- **Validate community knowledge in the light of science**
- **Address limitations of capacity and capability of the community**
- **Ensure real political commitment & support of international community**



Thank
You