

The Research, Monitoring and the Development (RMD) Wing

This Wing consists of following `Circles` of the Forest Directorate:

- i. **Research Circle**
- ii. **Monitoring Circle**
- iii. **Soil Conservation Circle**
- iv. **Development (Training) Circle**

Present Location of the Offices

P-16, India Exchange Place Extn., K.I.T Building, 3rd Floor, Kolkata-74

- i. Office of the PCCF, RMD
with APCCF, R&M, CCF, M&E, CCF, R&D and CCF, Soil Consvn.
- ii. Office of the Conservator of Forests, Research
- iii. Office of the Conservator of Forests, Monitoring
- iv. Office of the Divisional Forest Officer, Monitoring(S)

Aranya Bhawan, LA-10A, Salt Lake-106

- i. Office of the Conservator of Forests, Development Circle

FIELD OFFICES:

- i. Office of the Conservator of Forests, Soil Consvn. (N) at Siliguri
- ii. Office of the DFO, Silviculture (N) at Siliguri
- iii. Office of the DFO, Monitoring (N) at Siliguri
- iv. Office of the DFO, Kurseong Sol Consvn at Kurseong
- v. Office of the Director, Forester`s School, Kurseong
- vi. Office of the DFO, Silviculture(Hills) at Darjeeling
- vii. Office of the DFO, Soil Consvn at Jalpaiguri
- viii. Office of the DFO, Silviculture (S) at Medinipur
- ix. Office of the Director, Forestry Training Centre, Hizli, Kharagpur.

FIELD CAMP OFFICES

- i. Salugara Lab., Siliguri
- ii. Ghoomti, Kurseong
- iii. Teesta Bazaar (damaged)
- iv. Lloyds Bot. Garden, Darjeeling
- v. Delo Biodiversity Park, Kalimpong
- vi. Lataguri Nursery
- vii. Rajabhatkhawa
- viii. Digha

The Research Wing

1. Mandate:

- i. **Augmenting the productivity** of Plantations through **Tree Improvement** and **silvicultural practices**
- ii. Supplying **quality planting materials** (QPM) either as seeds or clonal saplings
- iii. Updating **protocols on nurseries and plantations**,
- iv. **Growing stock estimation** of Forests (with the help of the 85 Sample Plots measurements)
- v. Recommending right **Thinning** regime in plantations.
- vi. *Developing suitable **in situ conservation** and **ex situ conservation strategy***
- vii. Conservation of **Medicinal Plants** and its marketing to benefit the forest fringe dwellers

b. Immediate Goals:

1. Effecting progressive shift towards clonal plantations and increased use of Quality seeds
2. Developing an effective marketing strategy for medicinal plants collected by the FPC members
3. Developing an effective conservation strategy for selected tree species that are declining

c. Strategy to Achieve the Goals:

- Setting up of large **clonal orchards on selected plantation species at the Permanent Research plots**
:
 - i. Salugara (Siliguri),
 - ii. Lebong (Darjeeling),
 - iii. sonada (Darjeeling)
 - iv. Sukna(Kurseong Sub Div)
 - v. Lataguri (Jalpaiguri)
 - vi. Atiamochar (Coochbehar)
 - vii. Hura (Purulia),
 - viii. Arabari (Medinipur),
 - ix. Beliatore (Bankura),
 - x. Nonnengaria (Jhargram)



Setting up large research Plots: Salurara Plot



Clonal hedges: Salugara



Rooting the Eucalyptus clones:Arabari Young Clonal hedge of Diospyrus grafted Amla: Beliatore

- Raising 'single species' **Seed stand plantations** in different areas on an annual basis
- **In situ conservation**: i. Ghoombhanjan Biodiversity Park (Darjeeling) and Delo Park (Kalim.)
ii. Medicinal Plants Conservation Areas (14 nos.)
iii. Preservation plots (32 nos.)
- **Ex situ conservation** :
i. **Bot. Garden**: The Lloyds Bot. Garden (Darjeeling),
ii. **Arboretums**: Sukna, Kunia (Jalp.), Atiamochar (Coochbehar) and Jhargram
iii. **Herbal gardens** (6 nos.)-Amlachati (Jhargram), Digha, Takdah (Darjeeling), Rajabhatkhawa (Alipurduar), Salugara (new) and Bolpur (new)
- Collaborating with **NGOs** on streamlining medicinal plants marketing for the benefit of FPCs
- Demarcating **conservation areas** for specific species of concern where large number of wild forms are available (Eg: *Syzigium* spp., *Cinnamomum* spp. , orchids)
- Increased **collaboration with Universities and other Research Institutions**

2. Augmenting Productivity in Plantations

- Use of improved clones or quality seeds from Plus trees or Candidate Plus trees

Plus trees → 1093 Plus trees belonging to **76 species**

Candidate Plus Trees → 412 trees belonging to **75 spp.**

Region	Plus trees		Candidate Plus trees	
N Bengal Hills	504	76	117	33
N Bengal Plains	479	31	102	26
SW Bengal	110	20	103	15
TOTAL	1093	76	412	75



Plus tree: Lali

Seed stand of Teak

Plus tree: Gurjan

- **Introduction of improved varieties** from outside.
Acacia from Australia, Karnataka, **Teak** from Kerala, **Gamar** from Assam (under trial)

Six strains of Eucalyptus viz. 3,4,6,7,71 & 83 from ITC tested by Res. Wing and now used by the WBFDC.

- **Indigenous development of improved strains** through progeny selection from the **Plus trees**.
Eg: Acacia, Teak, Gamar, Champ etc.
- **Use of Quality seeds from the designated Seed stands**

: 239 seed stands in the State over a total of 573.43 ha. and have 42116 trees over 70 species

Region	Net area	Species
NB Hills	34 ha	<i>Taxus</i> sp., <i>Quercus</i> sp., <i>Michelia</i> sp., Lampate (<i>Duabanga</i> sp.), Katus (<i>Castanopsis</i> sp.), Sissoo, Toon
NB Plains	20 ha	<i>Michelia</i> champaka, Benteak (<i>Lagerstromia hypoleuca</i>), Mahogoni, Sidha (<i>L. lanceolata</i>), Gokul (<i>Ailanthus</i> sp.), Lali (<i>Amoorarohutuga</i>), Hartoki (<i>Term. chebula</i>)
SW Bengal	8.5 ha	Haldi, Piasal, Mahogoni, Amla, Red Sanders, Behara, Strychnos

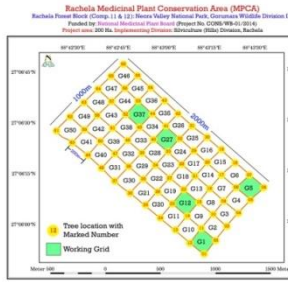
- **Use of Clones: Clonal orchards:** (9 ha) of clonal orchards of *Eucalyptus* spp. (*Arabari*), *Taxus* sp. (*Sonada-Darj.*), *Chikrassi* (*Salugara*), *Jarul* (*Salugara*)

3. Medicinal Plants Conservation

- **14 MPCAs** (Medicinal Plant Conservation Areas) as *in situ* conservation Centre have been set up with areas ranging from 100-400 ha.
 - Designated in 2008:**
Tonglu, Dhotrey, N. Sevoke (Darj.), Sursuti (Jalp.), North Rajabhatkhawa (Alipurduar), Gharpanchkot (Purulia) and Bonny Camp (Sunderbans)
 - Designated in 2014:**

Phalut, Panchnoi(Darj),Rachela (Kalimpong), Bichabhanga(Jalp.), Susunia (Bankura) and Kankrajore (Jhargram)

iii. **Designated in 2020:** Jhalda (Purulia),



Grids at MPCA



MPCA gate: Tonglu



Survey work at MPCA

• **Herbal Gardens as ex situ conservation programme**

Several Herbal gardens were established over the years; now for the sake of effective maintenance and ensuring proper regional representation avoiding duplication, gardens in Sukna, Sonada, Lataguri etc were discontinued and following are maintained:

Sl.No.	Garden	Locality (Dist/subDiv)	Division in charge	Area	No. of species
1	Amlachati	Jhargram	Silvi(S),Medinipur	65 ha	~700
2	Digha	E. Medinipur	Silvi(S)	1 ha	~150
3	Takhda	Darjeeling	Silvi(Hills), Darjeeling	0.5 ha	~45
4	Rajabhatkhawa	AlipurDuar	Silvi(N), Siliguri	0.5 ha	~ 40
5	Salugara*	Siliguri	Silvi(N)	1 ha	~ 60
6	Bolpur*	Birbhum	Birbhum , Siuri	1 ha	~ 70

*under preparation



Amlachati herbal garden, Jhargram



medicinal plants beds

• **Multiplication of selected medicinal species that are threatened:**

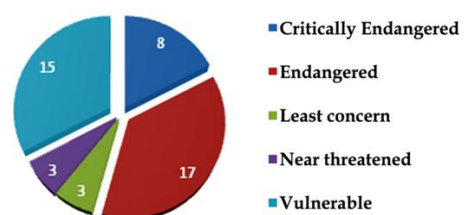
- i. Threat status of 43 species identified so far of which eight are listed to be Critically endangered(CRN): 8 CRN + 17 EN+ 15 V + 3 NT



Ginseng

Aconitum

Threat status of 46 priority species



- a. **Critically Endangered spp:** *Ampellocissus barbata* (Lianna), *Lumnitzera racemosa* (Mangrove), *Panax pseudoginseng* (Ginseng -Herb), *Picrorhiza kurroa* (Perennial herb), *Podophyllum hexandrum* (Gymosperm -Per. herb), *Swertia chirayita* (Herb), *Taxus walliachiana* (Tree), *Persea glaucescens* (tree), *Aconitum*
- ii. Augmenting and re-stocking of Med. Herbs : As intercrops and medicinal tree plantations (in the Nine Divisions of South-west Bengal (435 ha)

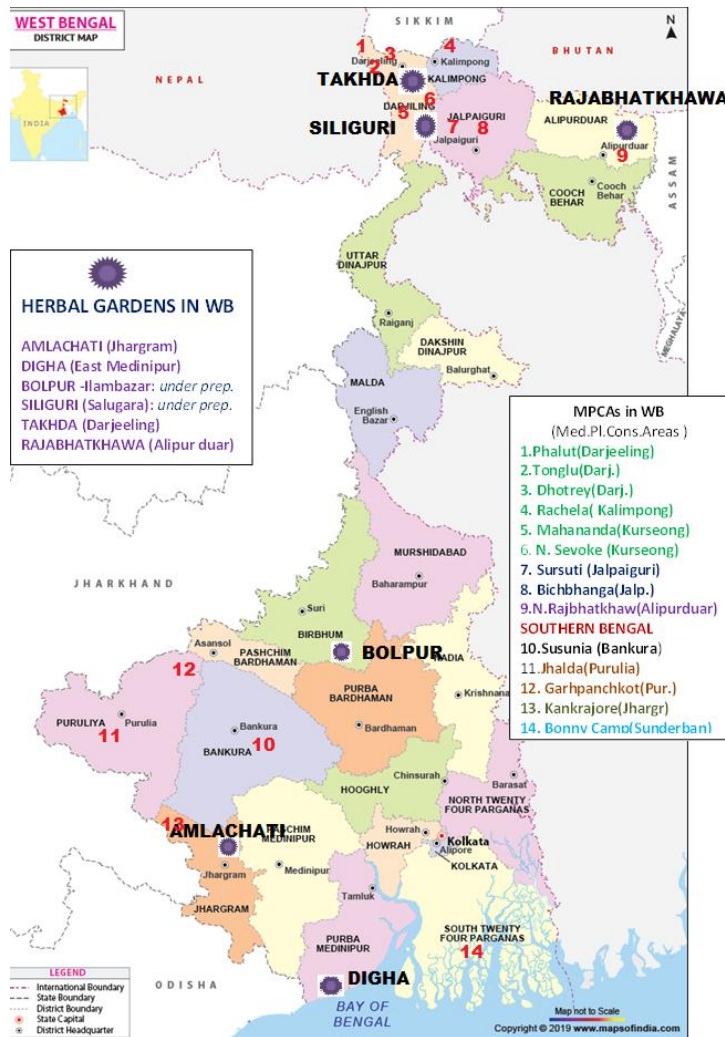


Medicinal plantations



Medicinal Plants storage godown

- **Streamlining marketing of Med. Plants**
 - i. Storage Godown and Drying Platforms: **Ten** in SW Bengal Divisions to store med. plants to streamline marketing – Lodhasuli (Jhargram), Khargpur,
 - iii. Tagging up with NGOs/ other organizations to facilitate marketing



Medicinal Plants Conservation scenario in West Bengal

4. Biodiversity Studies

Biodiversity studies are conducted through the following:

- Preservation Plots** : These, mostly in high forests, are preserved in perpetuity to study the biodiversity changes and measurement are taken at 5 yrs. Intervals (by FRI/ ICFRE).
- Sample Plots** : laid out to study vol. increment in plantations thinned after five yrs interval to prepare yield table & vol. table(for Working Plans)
- Linear Sample Plots**: laid out in high forests to monitor the **ecological succession**, to study the growth rates and mortality of those trees (measurement taken at 5 yrs intervals).
- Ex situ/ in situ Conservation areas** : Lloyds Botanic Garden, Herbal gardens, arboretums etc.
- Setting apart permanent virtual plots**: in different parts of the State for monitoring at definite intervals, say, every five years; 38 such high forest plots have been identified

Region	Preservation Plots		Sample Plots		Linear sample Plots		Gridded Virtual Monitoring Plots	
	Number	Area (ha)	Number	Area (ha)	Number	Area (ha)	No.	Area
NB Hills	20	250.4	76	41.4	1	4.5	14	70 ha
NB Plains	2	16	3	0.6	2	4.4	10	100ha
SW Bengal	10	38.7	6	4.25	0	0	14	140 ha

5. Major Research Programmes

Research programmes are funded through the JICA , State Plans and CAMPA.

I. JICA funded Projects

Due to the flexibility in the utilization of funds and availability of funds in times of necessity, long term projects are to be ideally funded through it.

1. Tree Improvement in AKASHMONI (*Acacia auriculiformis*) in collaboration with Mysore Paper Mills, Bhadravati, Karnataka:

Year of commencement: 2018 and to be continued for future timber quality studies

Experiment: Six clones from Karnataka (four hybrid clones and two selections) and five from West Bengal are tried in multiple locations of Arabari (Medinipur), Hura (Purulia), Digha and Salugara(N. Bengal).

Observations: i. growth in Arabari and Hura are generally better viz a vis North Bengal

ii. Saline affected areas of Digha is not faring well

iii. Hybrids are showing increased vigour

iv. Variety from Khisma, Ranaghat and some of the Clones from Karnataka showing promise



Teak clone from Kerala after three months Acacia clone from Karnataka after nine months

2. Tree improvement in TEAK in collaboration with KFRI, Trichur, Kerala

Year of commencement: 2019 to be continued

Experiment: five clones from KFRI is tried in Sukhna, Lataguri, Atiamochar, Arabari, Kulipal and Beliatore

Observations: Overall growth is good except Arabari. Clones planted in Kulipal, Beliatore and Sukna showing promise

3. Comprehensive Soil mapping, compartment wise along with broad recommendations in collaboration with the Soil and Land Use Survey of India (SLUSI), GOI, Kolkata

Year: 2018 to be wound up by 2020

Experiment: comprehensive soil mapping (with respect to N, P , K , Ca, Mg , S, pH and organic carbon) of the forest areas North Bengal Plains covering the divisions of Baikunthapur, Jalpaiguri, Buxa Tiger Reserve, and Cooch behar barring the areas of Wild life where forest plantations are not done generally.

Observations: Final analysis of Baikunthapur completed. Soil testing of Jalpaiguri and Buxa completed and mapping is being done. In Baikunthapur, it was observed that soils are generally deficient in available Nitrogen in the top soil despite high organic matter content.



Soil map of Baikunthapur Division Inspection of the ramets

State of art Soil Lab :Salugara

4. Evaluation of present seed stands in the State in collaboration with Institute of Forest Productivity, Ranchi.

Year: 2018 to be wound up by 2020

Experiment: We have 200 plots of Seed stands under 63 species covering an area of 454 ha. Seed stands in West Bengal are old and their productivity has vastly diminished; it is to be tested on its productivity and if required to be discarded and new stands have to be created.

Observations: Work is almost getting completed.

5. Evaluation of existing CPTs and Plus Trees and identification of new ones in collaboration with the IFP, Ranchi.

Year: 2018 to be wound up by 2020

Experiment: We have identified 1029 Plus trees and 1551 Candidate Plus trees. Some of them have grown older and need to be discarded and new trees have to be identified based on standard parameters.

Observations: Almost getting completed.

6. Development of Nursery protocol for Tall sapling production, taken up departmentally by the Silviculture Division(S)

Year: 2019 to be wound up by 2021

Experiment: various parameters in the tall sapling production are tested and standardised. Following parameters are studied: Pot size in different years, growing medium, spacing, watering regime, shifting regime. Study is conducted with respect to slow growing and medium growing tree species.

Observations: Hycopt size and medium have almost been standardized.

7. Survey of native tree species and associated birds in forests to ascertain causes of its decline (climate change/over exploitation etc.) to adopt suitable conservation measures

Year: 2020 to be wound up by 2021

Experiment: 38 sample high forests tracts are selected from different parts of the state and different species composition, its frequency, density and area coverage etc. along with parameters like various biodiversity indices are taken up. Along with it associated bird species are also observed. These are GPS marked permanent observation plots and can be revisited every five years to study the changes.

Observations: It has been given to an agency and they are yet to give the results.

II. Projects Funded through the State Plans and CAMPA

1. Experiment on **transplanting of large tree saplings and its growth pattern**
2. Experiment on **Lantanaweed eradication in North Bengal**
3. Experiments on various pot size in nursery
4. Effect of Core manuring
5. Effect on the growth of saplings kept in small hycopts for one, two and three years and later transplanting in the field.
6. Setting up of large **clonal orchards**
7. Setting up of large **Research trial plots**
8. **Mangrove restoration programme along the E. Medinipur coasts**
9. Standardizing the Rooting protocol of various tree species cuttings such as Teak, Behera, Sissoo, Taxus, Katus(*Castanopsissp*), Pipli, Piasal etc.

6. New Thrust Areas

1. **Tree improvement** on some more species: Gamar, Champ *etc.* (RFRI. Jorhat)
2. Productivity studies of **Coppice Sal forests** in SW Bengal
3. Suitable **plantation models** for South and North Bengal
4. Carbon sequestration studies **and soil carbon monitoring.**
5. **Conservation programmes** in *Syzigium* spp. and *Cinnamomum* spp., Orchids
6. **Thinning regime** for plantations



mangrove restoration in E Medinipur coasts



Developing and implementing a thinning regime

7. Research Advisory Committee

To advise on the research related matters, a Research Advisory Committee has been constituted with following members vide G.O No:

1. Addl. Chief Secretary/ Principal Secretary, Dept of Forests : Chairman, RAC
2. Principal Chief Conservator of Forests, HoFF : Member
3. Principal Chief Conservator of Forests, Res, Mon&Dev : Member
4. Principal Chief Conservator of Forests, General : Member
5. Principal Chief Conservator of Forests, Wildlife : Member
6. Managing Director, WBFDC : Member
7. Chief Project Director, JICA : Member
8. Director, Institute of Forest Productivity, Ranchi : Member
9. Director, Botanical survey of India : Member
10. Dr. (Prof.)N.D Paria, ex-V.C, Vidyasagar University : Member
11. Chief Conservator of Forests, Res &Dev : Member
12. Addl Pr. Chief Conservator of Foests, Res & Mon : Member-secretary

The first meeting of RAC held on 27th Sept., 2018 and minutes were circulated

The Monitoring Wing

I. General Procedure and methodology

- It monitors the performance of plantations that are 1st year, 3rd yr. and 5th yr. old respectively and a **State level Report is published**
- **Area, survival % and height** are recorded from random samples from each plantation at a sampling intensity :**7.5%** for 1st year and **5%** for the 3rd& 5th year.
- A weighted average/ weighted performance is later calculated after adding other associated parameters.
- Now this wing has taken up monitoring of 9/10th year plantation in the current year.
- Calendar of works in monitoring: April – Sept: Analysis and cross checking of data

Oct- Feb : Field recording of data



Monitoring in Sunderbans



Monitoring in Hills



Monitoring Grasslands



Monitoring young plantations

- On an average, 15000 ha plantations in SW Bengal and about 5000 ha in North Bengal are monitored under State Plan scheme
- Two meetings are organized after tabulation of data– at Kolkata for South Bengal and at Siliguri (for NB) respectively to discuss the results with DFOs and senior Officers for suggesting corrective actions.
- Monitoring is also done for JICA plantations (~4000ha in S Bengal and 1000 ha in NB) , CAMPA, NamameGange Plantations (~600 ha) etc.
- Generally, for first year, plantations, 90% survival is considered excellent; for 3rdyr, it be above 70% and above 50% in the 5th year.

II. Monitoring Scoring Parameters

Given below the parameters based on which a Plantation is evaluated: Ten parameters have been considered. that are classified into three broad categories

1. Conformity Parameters (with four subdivisions)
2. Execution Parameters (with four subdivisions)
3. Performance Parameters (with two subdivisions)

Scoring Index assigned to first year plantation

Broad category	Detail of parameters	Score
Conformity to the existing rules, provisions and guidelines.	Legal status of the land.	3
	Source of seed and status of nursery.	3
	Maintenance of plantation journal along with regeneration map.	3
	Planting pattern.	3
Execution of Plantation works in the field.	Site quality & choice of species.	5
	Mechanism to protect plantation.	5
	Timely completion of prescribed plantation activities.	5
	Inspection intensity by supervising officers.	5
Performance of the plantation.	Average survival percentage	51
	General health of plantation (Height)	17
Total		100




Scoring Index assigned to 3rd year Plantation

Sl. No.	Detail of parameters.	Score
1	Maintenance of plantation journal along with regeneration map	5
2	Mechanism to protect plantation	5
3	Infilling with big size seedling	10
4	Timely completion of prescribed plantation activity	5
5	Inspection intensity by supervising officers	5
6	Average Survival Percentage	51
7	General health of the seedling (Height)	19
Total		100

Scoring Index Assigned to 5th year plantation

Sl. No.	Detail of parameters.	Score
1	Maintenance of plantation journal along with regeneration map	3
2	Mechanism to protect plantation	5
3	Inspection intensity by supervising officers	5
4	Average Survival Percentage	56
5	General health of the seedling (Height)	21
6	Average GBH of seedling	10
Total		100

Colour Codes are given for visual assessment

Grade	Score (1 st)	Score (3 rd)	Score (5 th)	Colour code
Excellent	>85	>75	>60	
Very Good	>70 – 85	>60 – 75	>44 – 60	
Good	>45 – 70	>45 – 60	>29 – 44	
Average	>30 – 45	>30 – 45	>15 – 29	
Poor	<=30	<=30	<=15	

Since comparing height posed problems between areas of varying Site Quality (Low Site Quality areas would have less height despite best efforts) , the concept of Coefficient of Variation has been introduced which indicates the relative distance from the mean height. It replaced absolute values of height on a State level or between plantations. It has got the advantage of comparing the plantations on a State level or circle level irrespective of the site quality.

1st Year		3rd Year		5th Year (except CMM*)				5th Year CMM	
CV for height	Score	CV* for height	Score	CV for height	Score	CV for CG	Score	CV for height	Score
0-10	17	0 -15	19	0-15	21	0-10	10	3-15	31
10-20	14	15-30	16	15-30	17	10-20	9	15-25	25
20-30	11	30-45	13	30-50	12	20-30	7	25-35	17
30-40	8	45-60	10	50-70	9	30-40	5	35-50	10
40-50	5	60-80	6	70-90	5	40-50	3	50-70	5
Above50	2	>80	2	>90	2	>50	1	>70	2

***CV is Coefficient of Variationie. Standard deviation x 100/ Mean; CMM is Mangrove plantations**

Soil Conservation Wing

- It undertakes soil and water conservation works in **North Bengal**.
- Three Divisions were there under one Conservator, Soil Conservation (N) of which the Kalimpong was abolished in 2019 leaving only two Divisions viz. Kurseong Soil Conservation and Jalpaiguri Soil Conservation Division
- Since the Soil Conservation Divisions in **South Bengal** were converted to Territorial Divisions and hence none there in South Bengal although old names remain such as Kansavati N & S Divisions (Purulia), Panchet Division (Bishnupur) etc.

Major Activities:

- a. **Soil Conservation works:**
 - i. **NBHills:** Gully plugging, boulder sausage works, hand packed wall and plantation activities on land-slide/slip-prone areas in hills
 - ii. **NB Plains:** River training to check change in the course of rivers that carry large amount of silt and boulders from the hills.
 - b. **Plantation works:** are **specialized** since undertaken on the newly formed boulder-strewn/gritty soils and pioneer species are generally planted
 - c. **Much of the activities** centred around the soil conservation works related to the Teesta Low Dam project funded by the CAMPA.
 - d. **There is much scope in South West Bengal** also where gully erosion and reel erosion in the Laterite tracts are common.
-
- **Various Structural works being undertaken:**
Major components are:
 - a. Structural works/ engineering works
 - b. Plantation works following structural works to stabilize soils. Specific species of vegetation are planted on these relatively barren refractory soils. Various grasses,

Bamboos, *Pandanussp.* are early pioneering species from which more exacting species are taken up depend on the successional stage.

C.

Given below are the various types of works undertaken:



Hand packed wall



Cement Rubble Masonry wall



Sausage works



Terrace plantation with pallisades



Slip planbtation in the land slide area



Catch water drain

- **Successful Stabilization works at the Peshoke khola**

Highly landslide prone Peshoke khola stand out as a successtory and given below various steps:



- **The Integrated Watershed Development Project**

The Project is being implemented by the Agriculture Dept and the forest component has been allotted to the Forest Directorate with CCF, Soil consvation as the Nodal Officer. Altogether seven Project implementing Units were formed representing seven Forest Divisions , viz.

Kurseong SoilConser ation Division,Division covering Darjeeling Dist

Kalimpong Soil conservatipon covering the Kalimpong Dist

Jalpaiguri Soil conservation Division covering the Jalpaiguri, Coochbehar and the Alipur Duar dist

Bankura (S) Division covering the district of Bankura

Medinipur Division covering the dist of West Medinipur

Kansavati (N) Divison covering the dist of Purulia

The Project is at the fag end of its term , waiting for the Phase II to commence.

Development Circle

- It imparts **Induction Training** to frontline staff from Foresters and guards at:
 - The Forest Training Centre, Hijli (Kharagpur)
 - The Forester's school at Dowhill (Kurseong)
 - Forest Training Centre, Rajabhatkhawa (AlipurDuar)
- It undertakes **shortin-service training also** to frontline staff
- It takes up **Induction training of other state frontline staff** when requested for.
- Forester's training and Forest Guards Training is for duration of six months



Forester's School, Dowhill, Kurseong Session in progress

Museum



FTC, Hizli, Khargpur

In service training

Executive hostel

- The Forester's school has started functioning since 1907 and is one of the oldest in India
- The FTC at Hizli have started functioning since 2016 under JICA assistance and has state of art facilities to suite the present day training regime.

- There is an executive hostel also at Hizli to accommodate officers for in service training.
- Course curricula and study materials were already prepared with the JICA project funds.
- A **Van Vigyan Kendra** would start functioning under the aegis of ICFRE with active co-operation from IFP, Ranchi.

OUR PUBLICATIONS

