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:**
  ii. Arboretums: Sukna, Kunia (Jalp.), Atiamochar (Coochbehari) 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.**

<table>
<thead>
<tr>
<th>Region</th>
<th>Plus trees</th>
<th>Candidate Plus trees</th>
</tr>
</thead>
<tbody>
<tr>
<td>N Bengal Hills</td>
<td>504</td>
<td>76</td>
</tr>
<tr>
<td></td>
<td>479</td>
<td>31</td>
</tr>
<tr>
<td>SW Bengal</td>
<td>110</td>
<td>20</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>1093</td>
<td>76</td>
</tr>
</tbody>
</table>


Seed stand of Teak

Plus tree: Lali

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 42,116 trees over 70 species

<table>
<thead>
<tr>
<th>Region</th>
<th>Net area</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>NB Hills</td>
<td>34 ha</td>
<td><em>Taxussp</em>, <em>Quercussp</em>, <em>Michelia</em> spp., Lampate (<em>Duabangasp</em>), Katus (<em>Castanopsissp</em>), Sissoo, Toon</td>
</tr>
<tr>
<td>NB Plains</td>
<td>20 ha</td>
<td><em>Michelia</em> <em>champaka</em>, Benteak (<em>Lagerstromia</em> <em>hypoleuca</em>), Mahogoni, <em>Sidha</em> (<em>L. lanceolata</em>), Gokul (<em>Ailanthussp</em>), Lali(<em>Amoorarohutuga</em>), Hartoki (<em>Term. chebula</em>)</td>
</tr>
<tr>
<td>SW Bengal</td>
<td>8.5 ha</td>
<td><em>Haldi</em>, <em>Piasal</em>, Mahogoni, <em>Amla</em>, Red Sanders, Behara, Strychnos</td>
</tr>
</tbody>
</table>

- **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), Gharpanchot (Purulia) and Bonny Camp (Sunderbans)
  - **Designated in 2014**:
    - Phalut, Panchnoi (Darj), Rachela (Kalimpong), Bichabhanga (Jalp.), Susunia (Bankura) and Kankajore (Jhargram)
  - **Designated in 2020**: Jhalda (Purulia),

- **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:

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

*under preparation

- **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

  a. **Critically Endangered spp:** Ampellocissusbarbata (Lianna), Lumnitzeraracemosa (Mangrove), Panaxpseudoginseng (Ginseng - Herb), Picrorhizakurroa (Perennial herb), Podophyllumhexandrum (Gymosperm - Per. herb), Swertiachirayita (Herb), Taxuswalliachiana (Tree), Perseaglaucens (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:** 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:

i. **Preservation Plots**: These, mostly in high forests, are preserved in perpetuity to study the biodiversity changes and measurements are taken at 5 yrs. Intervals (by FRI/ICFRE).

ii. **Sample Plots**: Laid out to study vol. increment in plantations thinned after five yrs interval to prepare yield table & vol. table (for Working Plans)

iii. **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).

iv. **Ex situ/ in situ Conservation areas**: Lloyds Botanic Garden, Herbal gardens, arboretums etc.

v. **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.

<table>
<thead>
<tr>
<th>Region</th>
<th>Preservation Plots</th>
<th>Sample Plots</th>
<th>Linear sample Plots</th>
<th>Gridded Virtual Monitoring Plots</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Area (ha)</td>
<td>Number</td>
<td>Area (ha)</td>
</tr>
<tr>
<td>NB Hills</td>
<td>20</td>
<td>250.4</td>
<td>76</td>
<td>41.4</td>
</tr>
<tr>
<td>NB Plains</td>
<td>2</td>
<td>16</td>
<td>3</td>
<td>0.6</td>
</tr>
<tr>
<td>SW Bengal</td>
<td>10</td>
<td>38.7</td>
<td>6</td>
<td>4.25</td>
</tr>
</tbody>
</table>

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 Salugaral (N. Bengal).

   **Observations**: i. growth in Arabari and Hura are generally better vis 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
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, Kuilapal and Beliatore  
   **Observations:** Overall growth is good except Arabari. Clones planted in Kuilapal, 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 Baikuntapur, Jalpaiguri, Buxa Tiger Reserve, and Cooch behar barring the areas of Wild life where forest plantations are not done generally.  
   **Observations:** Final analysis of Baikuntapur completed. Soil testing of Jalpaiguri and Buxa completed and mapping is being done. In Baikuntapur, it was observed that soils are generally deficient in available Nitrogen in the top soil despite high organic matter content.

4. **Evaluation of present seed stands in the State in collaboration with Institute of Forest Productivity, Ranchi.**  
   **Year:** 2018 to be wound by 2020
**Experiment**: We have 200 plots of Seed stands under 63 species covering area of 454 ha. Seed stands in West Bengal are old and its productivity has vastly diminished; it is to be tested on its productivity and if required to be discarded and new stands has 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 has grown older and need to be discarded and new trees has 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 **Lantana weed 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](image1)
 ![Developing and implementing a thinning regime](image2)

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