Forestry
EXPERIENTIAL LEARNING PROGRAMME FOR B.Sc. Hons. (Forestry)

Module – 1: Development of Quality Planting Materials in Forestry

1. Objectives:
   Training, confidence building and exposure of students to:
   - Assess the requirement of planting stock of various plantation agencies involved in afforestation programme.
   - Produce seedlings and ETPs (entire transplants)
   - Market of planting stock

2. Activity:
   Survey:
   - The students will work out the demand survey for the supply of planting materials for different agencies involved in afforestation programmes. Accordingly, the sources of quality planting materials/propagules will be identified.
   - Procurement of superior planting material for raising healthy nursery stock of different priority species.
   - Planting stock production on the basis of specific technology available (package of practices) for individual species.
   - Grading, packaging and transportation.
   - Risk factors such as diseases, insect attack, market fluctuations and other adverse environmental conditions, impacting production of quality planting material.
   - The benefit : cost ratio will be worked out for the assessment of work done according to requirements.
   - Risk assessment will also be studied and worked out on inputs and outputs for the nursery production.

3. Project Development (Activity-wise)
   Project shall be developed on following points:

   Market survey:
   - For assessment of demand in local and potential institutions through market survey, the agencies working on afforestation programmes will be identified to meet out their plantation targets assigned. They will be contacted for their demands for planting material of various species.

   Nursey development:
   - On the basis of demand, the choice of species for nursery raising will be adopted for nursery plant production. However, this will depend upon the availability of planting materials, logistics and condition of nursery.
     - The superior / quality sources of reproductive material/propagules will be identified and obtained from different agencies, namely ICFRE, State Forest Department, IHB, State Agricultural Universities, WIMCO Pvt. Ltd. etc.

   Production plan:
- The species-wise production plan will be prepared according to the planting material available (elite planting stock, micro and macro propagated plants).

**Grading, packaging and dispatch:**
- Before getting the planting stock removed from nursery, the certification according to laid out standards will be done. And finally the stock will be graded, packed and transported to the agencies involved in afforestation/plantation programmes.

The nursery will produce about 1,20,000 plants of various species namely poplar, willow, bamboos and other forestry species on the basis of demand/requirement from different planting agencies.

**Benefit: Cost analysis:**
- The details of the input cost.
- The details of income generated will be used to find out the net income generated.

4. **Distribution of credits (Activity-wise):**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientation, survey and project development</td>
<td>2</td>
</tr>
<tr>
<td>Quality nursery stock raising</td>
<td>14</td>
</tr>
<tr>
<td>Marketing</td>
<td>03</td>
</tr>
<tr>
<td>Report preparation and presentation</td>
<td>01</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>20</strong></td>
</tr>
</tbody>
</table>

5. **Duration:** 180 days

6. **Faculty responsibility:** Orientation, screening of planting materials and input, supervision of quality planting material production and marketing thereof. Monitoring, assessment and evaluation.

7. **Production plan: Month-wise operational activities (Illustrative example)**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Activity</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun.</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec./Jan</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Orientation, survey and project development</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2.</td>
<td>Procurement of seed and cuttings</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3**</td>
<td>Nursery raising (seed bed, cutting beds, soil amendments, filling of polybags, root trainers media preparation etc.)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4.</td>
<td>Hedging and collection of cutting from VMG</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5.</td>
<td>Nursery management operations (cultural operations, procuring, transplanting, spraying, irrigation etc.)*</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>6.</td>
<td>Grading, lifting, transportation &amp; marketing</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>X</td>
</tr>
</tbody>
</table>

* This will continue for complete one year depending upon climatic conditions and species.
** For the 1st batch, the planting material will be prepared by the faculty and for the subsequent batches. The material will be raised by the previous batches.

8. Production plan (Activity-wise/student)

<table>
<thead>
<tr>
<th>Quality target</th>
<th>Approx. cost of Production/ seedling, Rs.</th>
<th>Approx. Total cost, Rs.</th>
<th>Average sale, Rs.</th>
<th>Approx. Sale price, Rs.</th>
<th>Anticipated income, Rs.</th>
<th>Target*/student for 5 months, Rs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nursery production of poplar, willow, bamboos, kachnar, beul, marinoo, drake, tuni, shisham, harad, behra, aonla etc.</td>
<td>1,25,000</td>
<td>1.50</td>
<td>2,02,500</td>
<td>12 / plant</td>
<td>15,00,000</td>
<td>12,97,500</td>
</tr>
</tbody>
</table>

*Rs. 60,000/- per student. There will be around 20 students, so minimum Rs. 12 lakhs will be earned to make the unit viable.

9. Marketing

The nursery stock of required species will be sold to the agencies viz. SFDs, NGOs, Watershed projects, DRDA, individual farmers and firms for captive plantations.

10. Risk assessment

The activities may suffer from:
- climatic factors
- market fluctuations
- availability of planting stock
- non-commitment to lift plant material

11. Infrastructure required

a) Cultivable- Land of about 3 hectares with assured irrigation.*
b) Infrastructure

<table>
<thead>
<tr>
<th>Civil works</th>
<th>Quantity</th>
<th>Amount (Rs. In lakhs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mist-chamber with automatic fogging and heating facilities</td>
<td>1</td>
<td>16.00</td>
</tr>
<tr>
<td>2. Net house with hardening chamber</td>
<td>2</td>
<td>04.00</td>
</tr>
<tr>
<td>3. Water tank</td>
<td>2</td>
<td>03.00</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>23.00</td>
</tr>
</tbody>
</table>

Note: * Pre-condition to implement the ELP Module – 1.

c) Power tiller with trolley and other accessories | 1 | 3.00 |
d) Field equipment | | 1.00 |
e) Land development and water harvesting facilities | | 5.00 |

Total: 9.00

Grand Total: 32.00

12. Revolving Funds: Rs 4.00 lakhs

13. Support for guest faculty required
As per the proposal involves in producing large scale healthy and genetically superior nursery plants and supply of the same to different agencies involved in afforestation programme, the support of guest faculty is required from ICFRE, WIMCO and other related sister concerns involved in quality production of planting stock The financial requirement to the tune of Rs. **0.50 lakh** per year per batch should be made available.

14. **Training needs:**
   The staff (faculty and field staff) should be allowed to visit such organizations dealing with use and development of forest based activities. Adequate contingency is required to meet these training needs to the tune of **2.00 lakhs**.
   
   **Grand total of funds required (11+12+13+14) = Rs. 38.50 lakhs**

15. **Economic – Gross turnover, net profit and profit sharing among students, faculty and institution**

   1. Gross turn over - 15,00,000 ( 15 lakhs )
   2. Net profit over variable expenses - 12,97,500
   3. Profit sharing
      i) Student - 75%
      ii) Faculty - 15%
      iii) Department, undertaken EL Programme - 10%

16. **Relevant public-private organization and possible collaborations**
   - State Forest Departments
   - District Rural Development Agencies of H.P and other states.
   - H.P., Mid Himalayan Projects /NGOs
   - Cooperative societies
   - Farmers and private entrepreneurs

17. **Suggestions for objective evaluation**
   - Weekly performance of the students
   - Regularity of each student
   - Weekly field operations details
   - Regular visit of Manager
   - Fortnightly visit of HOD (G.M)
   - Monthly visit of the Dean,(C.E.O) College of Forestry, UHF, Nauni

18. **Product, production and marketing related legal aspects**
   - Proper identification tags and levels on the nursery plants (species, quality, clone identity, size etc.)
   - Release and registration of varieties/clones at University level if any, developed by the department.
Module-2: Cultivation and Value Addition of Medicinal and Aromatic Plants

1. Objectives
   Cultivation and processing of Medicinal and Aromatic Plants have emerged as income generating farming system which add to bio-diversity conservation, natural health and beauty care, increasing local/national/international demand, alternative agriculture, meeting raw material requirement of pharmaceutical industries etc. These activities involved cultivation, local and industrial value addition and final product development. Students will be provided managerial skills in preparing income generating bankable projects, entrepreneurship, production, and marketing of medicinal and aromatic plants. The main objectives are:

   To train and expose the students in:
   - Nursery raising of commercially important Medicinal and Aromatic Plants
   - Production of essential oils used in cosmetic industries/aromatherapy
   - Preparation of herbal tea and whole drug powders
   - Preparation of natural colourants and blended drugs based on pharmacoepial standards
   - Preparation of value added products like oleo-resins/active ingredient enriched extracts, etc. of medicinal plants
   - Extraction and value addition of other non-timber forest products

2. Skill developments
   - Survey and project formulation
   - Identification and prioritization of commercially important forest species/products including MAPs
   - Quality nursery raising practices of MAPs Agro-practices of selected species
   - Post-harvest care and technologies
   - Distillation of aromatic crops for essential oils
   - Product development
   - Marketing strategy

2. Activity components
   - Production of quality planting material and raw material of medicinal and aromatic plants
   - Post harvest processing and preparation of whole plant drug powders having good market demand
   - Production of essential oils from cosmetically important aromatic crops useful in perfumery industries
   - Preparation of blended whole plant drugs based on pharmacoepial standards having good market demand
   - Preparation of active ingredient enriched products of medicinal plants

3. Project development (Activity-wise)
   Market survey:
   - Survey and identification of commodity/product for income generating bankable project and its formulation detailing the concept, sequence of activities and expected outcome
- Consumer preference, clientele, volumes required and appropriate marketing mode
- To provide skills and insight for selecting entrepreneurship based market oriented project with its commercial scope
- Selection of species for nursery and crop raising

**Nursery development and plantation**
- Nursery raising techniques based on existing knowledge restricting to organic cultivation
- Agro-techniques for raising the crop

**Value addition**
- Value addition – detailing the steps to be undertaken and precautions to be taken
- Active content enriched products
- Blended drugs- Reference to pharmacopeial standards
- Herbal tea and products – detailing of proportionate contents (species wise) and manner of preparation

4. Distribution of credits (activity-wise)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey and project formulation</td>
<td>2</td>
</tr>
<tr>
<td>Nursery raising of MAPs</td>
<td>2</td>
</tr>
<tr>
<td>Raising of crops</td>
<td>5</td>
</tr>
<tr>
<td>Development of products</td>
<td>10</td>
</tr>
<tr>
<td>Report preparation and presentation</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>20</strong></td>
</tr>
</tbody>
</table>

5. Production plan (Activity-wise with time frame, tentative)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Time frame (month)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>st</td>
</tr>
<tr>
<td>Nursery Production (Swertia chirayita, Rosmarinus officinalis, Stevia rebaudiana, etc.)</td>
<td>x</td>
</tr>
<tr>
<td>Raising of crop</td>
<td>x</td>
</tr>
<tr>
<td>Herbal tea preparation</td>
<td></td>
</tr>
</tbody>
</table>
6. Production plan – (Activity-wise/per student, tentative)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Quantified target</th>
<th>Cost of production (Rs)</th>
<th>Approx. Sale Price(Rs)</th>
<th>Anticipated Revenue (Rs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nursery Production (Swertia chirayita, Rosmarinus officinalis, Stevia rebaudiana, etc.)</td>
<td>2000</td>
<td>2500</td>
<td>7/-</td>
<td>14000/-</td>
</tr>
<tr>
<td>Herbal tea</td>
<td>20 kg</td>
<td>3000</td>
<td>500/kg</td>
<td>10000/-</td>
</tr>
<tr>
<td>Blended products/Powdered products (Ashwagandha, Kalmegh, Triphla, Chirayita, Giloe, etc.)</td>
<td>20 kg</td>
<td>5000</td>
<td>1000/kg</td>
<td>20000/-</td>
</tr>
<tr>
<td>Essential oil production (Tagetes minuta, Matricaria chamomilla, Valeriana jatamansi, etc.)</td>
<td>20 lit</td>
<td>20000</td>
<td>5000/kg</td>
<td>100000/-</td>
</tr>
<tr>
<td>Active ingredient enriched extracts of Aloe vera, Stevia rebaudiana, etc.)</td>
<td>10kg</td>
<td>1500</td>
<td>500/ltr</td>
<td>5000/-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>32000</strong></td>
<td><strong>1,49,000</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Approximate income per student per month shall be about Rs 19500/

7. Marketing strategy/plan including product sale

Sale of nursery stock:
The choice of species for raising nursery shall depend on market demand. Major purchasers of such stock shall be state Horticulture and Forest Departments, progressive farmers and NGOs engaged in herbal culture.

Essential oils:
The essential oil shall be sold to Pharmaceutical and cosmetics industries.
Whole and blended drug powders and herbal tea:
These shall be sold in open market especially during state fairs, direct home selling etc.

Active ingredient enriched extracts/decoctions etc.
Pharmaceutical industries with whom such understanding shall be developed.

8. Risk assessment
The activities may suffer due to following:
• Climatic factors
• Market fluctuations

9. Infrastructure required: (Illustrative example)
A) Land requirement - Minimum 5 hectares cultivable land
B) Infrastructure
i) CIVIL WORKS

<table>
<thead>
<tr>
<th>Particulars of work</th>
<th>Qty.</th>
<th>Amount (Rs. In Lakhs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processing laboratory including packaging and grading unit (1500 sq.ft.)</td>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>Sub-total</td>
<td></td>
<td>15</td>
</tr>
</tbody>
</table>

(ii) List of Equipments/Machinery required:

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Quantity</th>
<th>Amount (in Lakhs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Essential oil distillation Unit</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Spray Drier</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Solvent extraction unit</td>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>Small equipment like vacuum pump, oven, grinder/ pulveriser, filtration unit, S S utensils, packaging machine, heaters/stove, chaff cutter, heating mantles, water baths, glassware items etc.</td>
<td>1 each</td>
<td>7</td>
</tr>
<tr>
<td>Sub-total</td>
<td></td>
<td>37</td>
</tr>
</tbody>
</table>

Grand Total (i+ii) = Rs 52.00 lakh

11. Revolving Fund:
Rs. 5.00 lakhs
12. Total funds requirement (9+10+11): Rs 57.00 lakh

13. Economics – Gross turnover, net profit and profit sharing among students, faculty and institution:
   1. Gross turn-over (Batch of 10 students, six months) : Rs. 14.90 lakh
   2. Net profit over variable expenses : Rs. 11.70 lakh
   3. Profit sharing:
      i) Students - 75%
      ii) Faculty - 15%
      iii) Department/concerned college - 10%

14. Relevant public-private organization and possible collaborations
   • State Forest Department
   • State Horticulture Department
   • State Ayurvedic Department
   • Cosmetic Industries
   • Pharmaceutical Industries
   • NGOs/ Co-operative Societies