Economic Assessment of Green House for Cultivation of Float Based Seedling Production in India

Srinath Ramakkrushnan and Aswathaman Vijayan

Abstract—In conventional seedling production, the seedlings are being grown in the open field under natural conditions. Here they are susceptible to sudden changes in climate where their quality and yield is affected. Quality seedlings are essential for good growth and performance of crops in main field; they serve as a foundation for the economic returns to the farmer. Producing quality seedling demands usage of hybrid seeds as they have the ability to result in better yield, greater uniformity, improved color, disease resistance, and so forth. Hybrid seed production poses major operational challenge and its seed use efficiency plays an important role. Thus in order to overcome the difficulties currently present in conventional seedling production and to efficiently use hybrid seeds, ITC Limited Agri Business Divisions - Sustainability Cell conceptualized a novel method of seedling production unit for farmers in West Godavari District of Andhra Pradesh. The “Green House based Float Seedling” methodology aims at a protected cultivation technique wherein the micro climate surrounding the plant/seedling body is controlled partially or fully as per the requirement of the species. This paper reports on the techno economic evaluation of green house for cultivation of float based seedling production with experimental results that was attained from the pilot implementation in West Godavari District, Rajahmundry region of India.

Keywords—Economic Assessment, Float Seedling, Green House, ITC Limited, Payback period.

I. INTRODUCTION

Every Indian farmer faces a unique challenge in undertaking agriculture while raising seedlings. Indian farming & nursery is highly dependent on open field seedling production because of the low economic status of the farmers; the seedlings are being grown under natural conditions. Here they are susceptible to sudden changes in climate where their quality and yield is affected. The country faces major challenges to increase its food production to the tune of 300 million tons by 2020 in order to feed its ever-growing population, which is likely to reach 1.3 billion by the year 2020. Thus in order to overcome the difficulties currently present in conventional seedling production and meet the demands of the future a “Green House based Float Seedling” methodology was conceptualized in West Godavari district of India which aims at a protected cultivation technique wherein the micro climate surrounding the plant/seedling body is controlled partially or fully as per the requirement of the species thereby producing quality transplants.

The float-system of seedling production is a sub irrigation system, where the bottom of the trays is in contact with the water or nutrient solution. Capillary action in growing media carries the water to the seed, which resides on the surface of media filling the tray cells. The proposed project of float seedling production makes use of a Green House structure designed to offer protection and to control the seedling from environmental conditions. The main advantage of producing the float seedling over the conventional plant bed is depicted in the figure below.

![Fig. 1 Advantages of Green House](image)

Green house technology is an agro system that presents important productive advantages in comparison to open air cultivation. Green house protects crops from extreme climatic factors like temperature, high winds, heavy rains, storms, insects and diseases. Green house can provide answers for around the year cultivation under climatic uncertainties and price fluctuations.

![Fig. 2 Green based float seedling production](image)

Srinath Ramakkrushnan is the Assistant Manager of Sustainability Cell in ITC Limited, Agri Business Division – ILTD, Guntur-522 004, India (phone: 91 8008940666; e-mail: srinath.ramakkrushnan@itc.in).

Aswathaman Vijayan is the Regional Manager – Sustainability Cell in ITC Limited, Agri Business Division – ILTD, Guntur-522 004, India (e-mail: aswath9882@yahoo.in).
II. GREEN HOUSE

Greenhouses are framed or inflated structures covered with transparent or translucent material large enough to grow crops under partial or full controlled environmental conditions to get optimum growth and productivity. Greenhouse seedling production is one of the best methodologies which have replaced outdoor plant beds [1].

The following are the most often cited advantages of greenhouse production which includes [4]:

- **Greater control of environmental conditions**: Weather conditions have less direct impact on greenhouse culture than normally experienced in plant beds. Greenhouse-grown transplants tend to exhibit much less premature flowering than plant bed transplants.
- **Labour savings**: Greenhouse culture greatly reduces the amount of labour necessary for transplant production and eliminates the greatest labour peak before topping.
- **Uniform transplants**: Greenhouse-grown transplants generally exhibit more uniform growth in the field than plant bed transplants. This may have positive benefits in cultivation and topping. Although the economic benefit of such uniformity is difficult to measure, the efficiency of cultivation and topping can be improved.

III. EXPERIMENTAL DESIGN

The seedling production unit consists of 1056sqm total area with 40 pools of size 30*7 meter. These pools are leveled properly and the flooring of pool is covered with 200 GSM poly sheet and water is filled up to height of 5 cm. Water soluble fertilizers & micro nutrients are applied directly to the water. Locally available growing medium such coco peat and vermin compost are filled in the trays and seeds are sown onto the surface and pellets are covered again with 2mm thickness of growing medium, then the trays are floated in the pool. There is clear cut water saving of up to 55% and labour reduction of nearly 80% by cultivating seedlings using float methodology. The other advantages include survival and early-season growth of transplanted float plants are generally improved compared to conventional plants and storage of unused plants is a simple matter of re-floating the trays in the float bed [2].

IV. ECONOMIC FEASIBILITY OF GREEN HOUSE

A seedling production centre was conceptualized were a local entrepreneur was selected and trained to cultivate the seedling requirement for his village. A schematic of the envisaged Seedling Production Centre for the farmers in NLS is presented in the figure below. The success and commercialization of any new technology depends on the economical viability of the project. Thus a cost analysis based on the current market conditions was carried out for the greenhouse based float seedling centre on net present worth, internal rate of return, benefit cost ratio and payback period [5].
VI. ENTREPRENEUR INVESTMENT

The following table reflects on the quantity of materials required and the details of the cost involved for constructing a seedling production unit of 1056 Square meter.

**TABLE I**

<table>
<thead>
<tr>
<th>S.No</th>
<th>Particulars</th>
<th>Cost (Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Poly House - 1056 sqm</td>
<td>368320</td>
</tr>
<tr>
<td>2</td>
<td>Styrofoam Trays</td>
<td>142800</td>
</tr>
<tr>
<td>3</td>
<td>Polythene Sheet</td>
<td>44000</td>
</tr>
<tr>
<td>4</td>
<td>Float Boundary - Wooden Plank</td>
<td>32000</td>
</tr>
<tr>
<td></td>
<td><strong>Grand Total</strong></td>
<td><strong>587120</strong></td>
</tr>
</tbody>
</table>

The fixed expenses include the total green house structure, trays, float pool boundary.

**TABLE II**

<table>
<thead>
<tr>
<th>S.No</th>
<th>Particulars</th>
<th>Cost (Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Growing Medium</td>
<td>20000</td>
</tr>
<tr>
<td>2</td>
<td>Labour</td>
<td>77200</td>
</tr>
<tr>
<td>3</td>
<td>Fertilizer</td>
<td>30000</td>
</tr>
<tr>
<td>4</td>
<td>CPA</td>
<td>8130</td>
</tr>
<tr>
<td>5</td>
<td>Electricity &amp; Other</td>
<td>6400</td>
</tr>
<tr>
<td></td>
<td><strong>Grand Total</strong></td>
<td><strong>141730</strong></td>
</tr>
</tbody>
</table>

The operational cost includes expenditure incurred for field preparation, fertilizers, pesticides, insecticide, irrigation, labor, weeding etc [3].

The table below presents the total revenues realized by the entrepreneur per season by producing 200 Acres of seedlings.

**TABLE III**

<table>
<thead>
<tr>
<th>S.No</th>
<th>Particulars</th>
<th>Cost (Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Total Trays</td>
<td>3800</td>
</tr>
<tr>
<td>2</td>
<td>No of Seedlings</td>
<td>1202206</td>
</tr>
<tr>
<td>3</td>
<td>No of Acres</td>
<td>200</td>
</tr>
<tr>
<td>4</td>
<td>Cost Per Acre (Rs.)</td>
<td>6000</td>
</tr>
<tr>
<td></td>
<td><strong>Total Revenue</strong></td>
<td><strong>1202206</strong></td>
</tr>
</tbody>
</table>

VI. ANALYSIS OF ECONOMIC VIABILITY

The life of the Green house was taken as 20 years but once in 5 years trays, polythene sheet and float boundary should be replaced. The present inflation rate was taken as 7.24%. In the 1056sqm of green house 1414360 seedlings could be raised in two cycles in 4 months. The green house will produce 1202206 seedlings based on survival percentage as given in table below.

The present worth of total cash inflow and outflow for tobacco seeding production under green house condition were calculated and presented in the table [6]. The data reveals that the NPW of investment made on green house when plants of tobacco were grown inside the green house is Rs. 9828997/-.
Based on NPW it can be concluded that the construction of Green House for float based tobacco seedling production is economically viable and there is a substantial increase in the income of farmer by growing these plants inside the green house in West Godavari climate.

**TABLE VI**

<table>
<thead>
<tr>
<th>Year</th>
<th>PW of Total Cash Outflow (Rs.)</th>
<th>Cash Inflow (Rs.)</th>
<th>PW of Cash Inflow (Rs.)</th>
<th>Cumulative Cash inflow (Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Nil</td>
<td>Nil</td>
<td>Nil</td>
<td>Nil</td>
</tr>
<tr>
<td>1</td>
<td>Nil</td>
<td>1202206</td>
<td>1121461</td>
<td>1121461</td>
</tr>
<tr>
<td>2</td>
<td>Nil</td>
<td>1202206</td>
<td>1046139</td>
<td>2167600</td>
</tr>
<tr>
<td>3</td>
<td>Nil</td>
<td>1202206</td>
<td>975876</td>
<td>3143475</td>
</tr>
</tbody>
</table>

*(2.5 Years for 2711609)*

**TABLE VII**

<table>
<thead>
<tr>
<th>S.No</th>
<th>Economic Indicators</th>
<th>Float - Tobacco</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NPW (Rs.)</td>
<td>9828977</td>
</tr>
<tr>
<td>2</td>
<td>B/C Ratio</td>
<td>4.6</td>
</tr>
<tr>
<td>3</td>
<td>Pay Back Period (Years)</td>
<td>2.5</td>
</tr>
</tbody>
</table>

The table above shows the payback period calculation for investment on greenhouse when float nursery was cultivated inside the greenhouse. As the cumulative present worth of cash inflow up to 3 years is more than the present worth of total cash outflow during the total life period of green house (20 Years). The payback period for tobacco seedling production is 2.5 Years respectively. The benefit cost ratio of 4.6 was obtained when the present worth of the benefit stream was divided by the present worth of cost stream. The above results show that the entrepreneur makes a good amount of profit by cultivating tobacco seedling under a green house.

**REFERENCES**


[5] Gerland kingaman -Starting a green house business estimating economic potential – Agriculture and Natural recourses, University of Arkansas, Volume 4, Chapter III.