World Academy of Science, Engineering and Technology
International Journal of Agricultural and Biosystems Engineering
Vol:7, No:5, 2013

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

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***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 were 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 as 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 were 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 1.30 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

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.

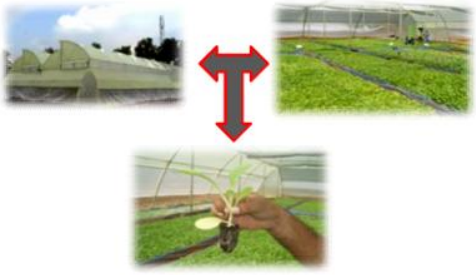

Fig. 2 Green based float seedling production

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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].

Fig. 3 Green House

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].

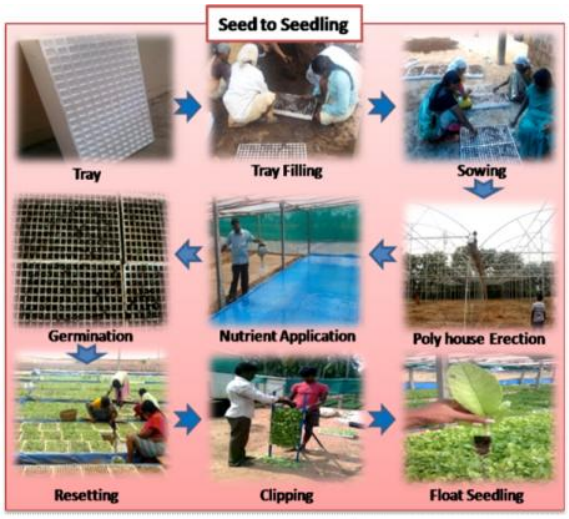

Fig. 4 Process Map Seed to Seedling

Fig. 5 Pilot Project at Dippakayalapady Village

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 green house based float seedling centre on net present worth, internal rate of return, benefit cost ratio and payback period [5].

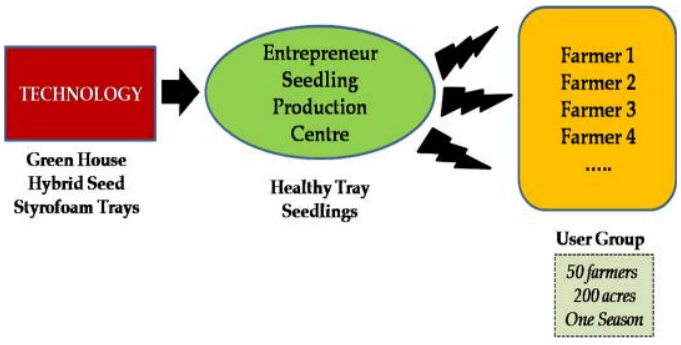

Fig. 6 Seedling Production Centre Model

V. 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
FIXED EXPENSES INITIAL INVESTMENT

S.No	Particulars	Cost (Rs.)
1	Poly House - 1056 sqm	368320
2	Styrofoam Trays	142800
3	Polythene Sheet	44000
4	Float Boundary - Wooden Plank	32000
	Grand Total	587120

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

TABLE II
OPERATIONAL EXPENSES

S.No	Particulars	Cost (Rs.)
1	Growing Medium	20000
2	Labour	77200
3	Fertilizer	30000
4	CPA	8130
5	Electricity & Other Cost	6400
	Grand Total	**141730**

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
ENTREPRENEUR REVENUE

S.No	Particulars	Cost (Rs.)
1	Total Trays	3800
2	No of Seedlings	1202206
3	No of Acres	200
4	Cost Per Acre (Rs.)	6000
	Total Revenue	**1202206**

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 was 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.

TABLE IV
INVESTMENT DETAILS

S.No	Particular	Tobacco
1	Initial Investment –First Year (Rs.)	587120
2	Operational Expenses – Every Year (Rs.)	141730
3	Repair & Maintenance – Every 5th Year (Rs.)	437392
4	Total Revenue (Rs.)	1202206
5	Seedling Survival Rate	85%
6	Inflation Rate	7.24%
7	Nursery Period	4 Months
8	Investment Every Year (Rs.)	141730
9	Investment Every 5th Year (Rs.)	437391

TABLE V
CASH FLOW FOR GROWING SEEDLING IN GREEN HOUSE

Year	Cash Outflow (Rs.)	PW of Cash Out flow (Rs.)	Cash Inflow (Rs.)	PW of Cash Inflow (Rs.)	NPW (Rs.)
1	**2**	**3**	**4**	**5**	**(5)-(3)**
0	587120	587120	0		-587120
1	141730	132211	1202206	1121461	989250
2	141730	123331	1202206	1046139	922807
3	141730	115048	1202206	975876	860828
4	141730	107320	1202206	910332	803011
5	579122	409069	1202206	849190	440122
6	141730	93388	1202206	792155	698767
7	141730	87116	1202206	738951	651834
8	141730	81265	1202206	689320	608054
9	141730	75807	1202206	643022	567215
10	579122	288950	1202206	599834	310884
11	141730	65966	1202206	559547	493580
12	141730	61535	1202206	521965	460429
13	141730	57402	1202206	486908	429505
14	141730	53547	1202206	454205	400658
15	579122	204102	1202206	423699	219596
16	141730	46596	1202206	395241	348645
17	141730	43466	1202206	368695	325229
18	141730	40547	1202206	343932	303385
19	141730	37823	1202206	320832	283008
20	0	0	1202206	299284	299283
Total	4592166	2711609	24044120	12540586	9828971

The present worth of total cash inflow and outflow for tobacco seedling 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/-.

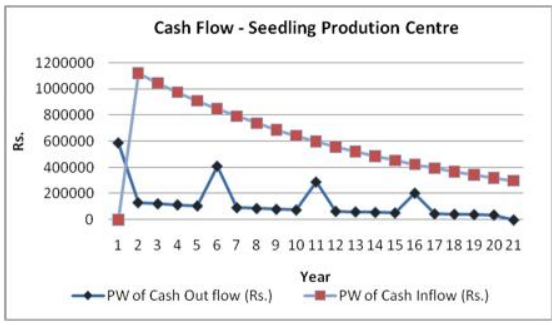

Fig. 7 Seedling Production Centre Cash flow

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
COMPUTATION OF PAYBACK PERIOD

Year	PW of Total Cash Outflow (Rs.)	Cash Inflow (Rs.)	PW of Cash Inflow (Rs.)	Cumulative Cash inflow (Rs.)
0	2711609	Nil	Nil	Nil
1	Nil	1202206	1121461	1121461
2	Nil	1202206	1046139	2167600
3	Nil	1202206	975876	3143475
(2.5 Years for 2711609)				

TABLE VII
ECONOMIC INDICATORS

S.No	Economic Indicators	Float - Tobacco
1	NPW (Rs.)	9828977
2	B/C Ratio	4.6
3	Pay Back Period (Years)	2.5

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.

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