Integral Research Project Proposal:

Bamboo – Melia Dubia

March-2011

Objective:

Study and measure the development of Beema Bamboo and Melia Dubia in Auroville under different growing conditions. This project is divided into what follows:

Project Description: 4 acre trial plot with 1 acre of Melia Dubia and 3 plots of 1 acre with different growing conditions of Beema bamboo.

Stakeholders:

PROJECT PARTICIPANTS	
LOCATION	Auro-Orchard
PROJECT MANAGER	Auroservice, Auroville
SITE MANAGER	Gerard, Auro-Orchard
ADVISORS	Dr. BARATHI – Growmore Biotech, Hosur, Tamil Nadu Dr. GANAPATHY ARUMUGAM – EBTI – Bm2Bp, Coimbatore
FIELD CONSULTANT	Mr. MAHADEVAN Retd. – Director of Agriculture, Pondicherry
PROJECT COORDINATORS	Gerard, Auro-Orchard Pashi Kapur, Auroservice Chandresh Patel, SaraCon

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Introduction on Beema Bamboo and Melia Dubia

Beema Bamboo

Beema Bamboo is high yielding bamboo specie which has been specifically chosen and specifically bred to achieve maximum yield by Dr Barathi. Dr Barathi is director of Growmore biotech, a successful company specialised in tissue culture based in Hosur; Moreover, this bamboo is a native Indian specie which has been proven to grow well under our local conditions and which possesses many assets:

- It has very good yield (about 4-5 times more production per acre than any other naturally available biomass).
- It has a high biomass content, (the hole in the middle is smaller than with other species of bamboo) as well as a good pulp and a high calorific value (4000 Kcal/kg).
- It therefore acts as a carbon sink as it can absorb CO_2 3 to 4 times more than trees
- It has no thorns, making it easy to cultivate and harvest.
- It has the ability to grow in calcine soil and any poor soil by proper use of field management practices or precision farming. Such usage of fallow land as opposed to agricultural land ensures that food chain is not disturbed.
- It does not flower, and thus does not need replanting for about 100 years.
- And as any bamboo, it has always the same size, which is convenient to transport and post-process, whichever end use is considered.

As a result, it has a very good cost to benefit ratio compared to any other known species of bamboo.

The possible end uses are manifold and can range from a straight economic support for the farms by selling to the local market (biomass as an energy source, crafts, pulp production) to a clean way of producing electricity for Auroville through the gasification process; not to forget all the crafts that can be derived from bamboo with high added value. In this project, we will only consider selling this Bamboo to surrounding industries needing pulp and/or biomass inputs.

Melia Dubia

The advantages of this tree are:

- Grows in both tropical and subtropical zones
- Drought tolerant
- Suitable for even marginal lands
- fast growing
- High headed tree, hence allows intercropping
- amenable for high density planting
- easy to propagate both vegetatively as well as through seed
- protocol for tissue culture already developed
- Responsive to biofertilizers
- Technology available for boosting growth and increasing yield
- can be harvested after two years
- amenable to coppicing thereby obviating the need for replanting after every harvest
- free from serious pests and diseases
- Thin bark
- high calorific value of timber (> 5000 kcal/kg)

This tree has slightly different characteristics compared with Beema Bamboo as it can be harvested from the 2nd year only, with a very good yield, which helps achieving a faster return on investment compared with Beema Bamboo. However, the yield from year 3 onwards is lower than the one with Beema Bamboo and Melia Dubia needs replanting every 10 years.

All in all, Melia Dubia represents another good energy crop and allows more biodiversity than Beema bamboo alone.

Experimental Protocol

So as to achieve a scientific study of the growth of Beema Bamboo and Melia Dubia under the integral scheme investigated, the following protocol has been set up:

On the 4 acres available for the project, we are planning to divide it into 4 plots of 1 acre each as follows:

A – 1 Acre Beema Bamboo – 1000 plants High density: Bio- Fertilizers Standard Irrigation	**B – 1 Acre** Beema Bamboo – 400 plants Low density Bio-Fertilizer with controlled irrigation
C – 1 Acre Beema Bamboo – 400 plants Low Density Bio-fertilizer (mainly Rain-fed)	**D – 1 Acre** Melia Dubia – 1800 plants Bio-fertilizer with Standard drip irrigation

For each plot it is planned to make use of drip irrigation so as to achieve maximum water efficiency except plot C. Moreover, so as to monitor exactly the water inputs, three parallel drip irrigation systems will be set up, each one with a dedicated meter. The water inputs will be done according to practical humidity measurements and advised by our appointed consultants, Dr Barathi, Dr Arumugam and Mr Mahadevan. The aim of such way of irrigation is to achieve the minimization of water use under our specific conditions.

The Advisors, both for Bamboo & Melia Dubia, have offered following free of charge services:

1. Soil sampling and soil analysis
2. Selection and screening of suitable micro organisms soil and crop based for the mass production of Biofertilizers and Biocontrol agents
3. Field design and other activities
4. Execution of plantation
5. Planning for training and pruning
6. Monitoring pest and diseases
7. Collection of Biometric observation on experimental farm

8. Analysis of growth parameters
9. Selection of a suitable variety from the mass plantation selected from different provenance for future mass production
10. Analysis of calorific value at different stages
11. Wood analysis and analysis of Oil from the samples
12. Coppicing ability and no of coppices
13. Coppicing rotation
14. Yield and Biomass analysis

Finally, all the inputs of fertilizers and the growth rate of the bamboo will be regularly recorded inside a logbook.

After this pilot phase, and in the case of the expansion of the project, any needful empirical figures will therefore be available.

Practical implementation and investments

Beema Bamboo plantation and cultivation

Beema Bamboo can grow on any type of land by making good use of precision farming. Even the most calcine land can be turned into a good support to grow this bamboo. The methodology is the following (All the pictures come from a farm called VAMSI GARDENS which is located about 50km south of Pondicherry and which has been successfully growing Beema Bamboo since 2008):

For each plant, a pit of 2*2*2 feet is dug and subsequently filled with appropriate manure/compost/fertilizers. This will then serve as a cradle to ensure the growth of the bamboo seedling. Later the natural mulching provided by the bamboo leaves will greatly help to enhance the soil and prevent evaporation.

Then the actual plantation step happens in parallel with the installation of the drip irrigation system with one dripper at each plant root.

Once the planting has been done and through the use of fertigation, the amount of work is minimal and mainly consists in monitoring the water and fertilizer inputs. Some plant replacement due to seedling mortality in the first year has to be done during the second year only (about 10% of the total number of plants). Then some weeding has also to be done yearly. To sum up, the maintenance after the second year does not represent much work or attention.

Epilogue for VAMSI GARDENS:

Project A - 4 acres plot

Key Assumptions

The assumptions for our study are largely sourced from Dr Barathi. We have then verified them for their relevance in Auroville. It appears that all the figures were appropriate with the exception of labour cost which has been raised from Rs.70/man-day to Rs.230/man-day. A more detailed set of estimates is available in spreadsheets. Some of the key estimates and conclusions are as follows:

Production Estimates	Plot A	Plot B	Plot C
Cultivation Area (acre)	1	1	1
No. of Plants (per acre)	1000	400	400
Ploughing Cost per acre (Only Year 1)	3,000	3,000	3,000
Weed Removal per acre (Year 2 onwards	1,500	1,500	1,500
Manure required (cft/plant/year)	2	2	2
Cost of Manure (Rs/cft)	5	5	5
Fertilizer required (kg/plant/year)	1.5	2.5	2
Cost of Fertilizer (Rs / Kg)	5	5	5
Plant Protection (Rs/ac)	1000	1000	1000
TC Plantlet price (Rs/seedling)	25	25	25
Transportation cost (Rs/seedling)	2	2	2
Irrigation System	18,000	15,000	-
Irrigation maintenance cost per year	300	300	-
Farm Management cost per Year	2500	2500	2500
Labour wages (Rs/manday)	230	230	230
Consultancy Cost per year	5000	5000	5000
Contingency Expenses	5%	5%	5%

For plot D, we are using the figures given by our advisor, Dr. Ganapathy Arumugam (Ebti – Bm2Bp) who have been successfully grown Melia Dubia near Coimbatore during the last two years. For a relatively high-density plantation and bio-fertilizers, we can expect the following expenses

	Plantation Phase	Year 3	Year 4	Year 5 - 10
Cost Estimates for Plot D	Rs.169,575	Rs.38,186	Rs.40,022	Rs.43,365
Irrigation Equipment	Rs.25,000			
Selling Price /Ton	Rs.1,800	Rs.1,800	Rs.1,800	Rs.1,800