Research Report No:557

Establishment of Model Bamboo Plantations and Nursery:Bamboo Plantation

(Sponsored by the National Bamboo Mission, Govt. of India)

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(Report of Project KFRI RP.647.5a / 2012)

Principal Investigator : Raveendran V.P.
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Research Coordinator

To Mr. V.P Raveendran/ Dr C K Soman/ Dr. P K.C. Pillai

cc All Scientists/ Convener. IRG/ PA to Director/ Registrar/ Dy Registrar (Admn
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Introduction

Bamboo is one of the fast growing plants in the world which comes under the grass family. It is well known for its varied uses in the different spheres of human life. There are different reports on the number of genera and species of bamboo found in India. As per Bamboos of India: a compendium, 18 genera and 128 species were reported (Seethalakshmi and Kumar, 1998). Of the total species found in India, about 20 are commercially usefull. Western Ghats is one among the major diversity centres of bamboo in the country and 22 species of bamboos under seven genera have been recorded from this region. The total standing crop of bamboo in homesteads was estimated as 13.61 million culms and its green weight was estimated to be 0.331 million tonnes during 2004-2005 whereas the bamboo resource in the forest areas was estimated as 2.63 million tonnes based on the satellite imagery taken in 1997. (Muraleedharan *et al.*, 2007).

Bamboos have formed an essential part of day- to-day human life from ancient times; each house had at least one bamboo based component, especially in the rural areas. But shift from traditional lifestyles have changed the concept of uses of bamboo. Till the invention that bamboo can be used for paper, the general layman's perception of bamboo is that they are a group of thorny plants with least economic productivity, limited uses and difficult to handle and maintain when compared to other cultivated plantation crops. In reality only five to six species in the world have thorns. Bamboos have varied uses with high economic potential and they are easy to maintain. Bamboo, a viable replacement for wood, is an industrial raw material for traditional and modern sectors, an important source of food, medicine and integrally involved in culture and arts (INBAR, 1997).Recently, the availability and accessibility of bamboos have improved due to the establishment of many nurseries for planting materials of better commercial species and conducting more awareness programmes about potential uses at State and National level.

Government agencies such as National Mission for Bamboo Application (NMBA), Bamboo Technical Support Group (BTSG), a wing of National Bamboo Mission (NBM) and nongovernmental organizations give much support for raising plantations, planting materials, its harvesting, site specific species selection and mechanization of bamboo industry. BTSG South Zone gives training and technical advice for raising bamboo plantation and also its harvesting,

technology dissemination among officials, artisans, bamboo farmers etc. BTSG provides technical support for raising plantation in southern region especially in Kerala. In Kerala above 30 plantations were raised in collaboration with public and private sector. While most of the plantations in public firms are mainly meant for pollution control, campus beautification, bio shields etc., in private sector bamboo plantation mainly for to generate income and also for ornamental purposes like campus beautification, home gardening and landscaping.

The main objective of the proposed project was to establishment model bamboo plantation with species suitable for weaving and handicrafts. This report consists of documentation of five plantations in Kerala which were raised by support of BTSG South Zone. This report also discusses the successful bamboo species and its growth in different areas of Kerala with different climatic and physiographic condition such as rainfall, temperature, soil, topography etc

Materials and Methods

Five plantations were raised in different non utilized Government lands in Kerala during the years 2012- 2013. The 13 species selected for planting and type of planting material are given in table 1. The locations for planting bamboos were identified. After weeding and clearing the site, aligning and staking were done and pitting and filling works done at suitable spacing for the species to be planted. The planting was initiated during June 2012. After primary weeding operations pits of 60 cm^3 were dug and were filled with compost/ cow dung, 5 kg per plant. The seedlings were irrigated twice a week from December 2012 to June 2013. Two weeding operations were conducted in the first and second year. Observations on height, girth and number of culms, number of internodes, intermodal length and survival percentage were recorded one year after planting.

Table 1: Species and type of planting material

Sl No.	Species	Planting material
1	*Bambusa balcooa*	Tissue Culture
2	*Bambusa tulda*	Tissue Culture
3	*Bambus vulgaris Yellow*	Rooted cuttings
4	*Dendrocalamus asper*	Seedlings
5	*Dendrocalamus hamiltonii*	Seedlings
6	*Dendrocalamus sikkimensis*	Seedlings
7	*Dendrocalamus brandisii*	Seedlings
8	*Dendrocalamusgiganteus*	Seedlings
9	*Guadua angustifolia*	Seedlings
10	*Gignatochloa rostrata*	Seedlings
11	*Ochlandra travancorica*	Seedlings
12	*Teinostachyum dulloa*	Seedlings
13	*Thyrsostachys oliveri*	Offsets

Results and Discussion

Five plantations were raised in different unutilized Government lands in Kerala during the year 2013- 2014. The plantation covers 2.69 hectare of land area and consists of 13 bamboo species *viz. Bambusa balcooa, Bambusa tulda, Bambusa vulgaris Yellow, Dendrocalamus asper, Dendrocalamus hamiltonii, Dendrocalamus sikkimensis, Dendrocalamus brandisii, Dendrocalamus giganteus, Guadua angustifolia, Gignatochloa rostrata, Ochlandra travancorica, Teinostachyum dulloa and Thyrostachys oliverii.* The list and summary of details of plantations raised is given in Table 2.

Table 2: List of Plantations

Sl No.	Plantation Name	No. of Species	No. of Seedlings	Area in ha
1	Plantation-1 , Desamangalam Gramapanchayath, Thrissur district	6	236	0.625
2	Plantation-II, Govt. College Kuttanallore,Thrissur district	6	198	0.495
3	Plantation-III, Regional Agriculture Research Station (RARS), Pattambi, Palakkad district	5	336	0.840
4	Plantation-IV, Aralam Farm ,Aralam – Panchayath,Kannur District	10	513	0.737
5	Plantation-V , Kerala State Bamboo Corporation (KSBC), Angamaly, Ernakulam district	2	90	0.221

PLANTATION-1, Desamangalam Gramapanchayath, Thrissur District

Location

Latitude 10° 46' 33.01" N

Longitude 76° 13' 34.40" E

This plantation is under the administration of Desamangalam Grama Panchayath. The plantation is meant for river bank stabilization of Bharathapuzha River. Bamboo seedlings of six species viz.,*Dendrocalamus brandisii, Dendrocalamus sikkimensis,Gigantochlo arostrata,Teinostachyum dulloa, Bambusa balcooa, Ochlandra travancorica* were planted in the river bank of Kudapara

area of Desamangalam Grama Panchayath. This plantation covers 1.54 acres (0.0625) of river bank. A total of 236 bamboo seedlings were planted in this area and covered by protective bamboo guard from grazing. Planting was done till end of the rainy season. The growth attributes and survival percentage of different bamboo species were taken after one year of planting and given below. (Table.3 & Table.4). The highest percentage of survival observed in *Dendrocalamus brandisii* and *Ochlandra travancorica* then comes the species *Bambusa balcooa*. The least percentage of survival was observed in *Gigantchloa rostrata.* Some of the plants were damaged by grazing of domestic animals and raising of water level in the Bharathapuzha River during monsoon season.

Table 3. **Growth parameters of Bamboos-** Desamangalam Plantation

Sl. No.	Species	No. of Seedlings survived	Survival Percentage	Average no. of culms/clump	Average diameter (cm)	Average height (m)
1.	*Dendrocalamus brandisii*	25	50	3	4.5	1.75
2.	*Dendrocalamus sikkimensis*	15	30	4	5.5	2.25
3.	*Gigantochloa rostrata*	10	20	6	3	2
4.	*Teinostachyum dulloa*	13	26	3	2.5	1.25
5.	*Bambusa balcooa*	12	46.15	3	3	1.5
6.	*Ochlandra travancorica*	5	50	3	2.5	2.0
7.	*Dendrocalamus brandisii*	25	50	3	4.5	1.75

PLANTATION-II, C. Achutha Menon Govt. College Kuttanallore,Thrissur District

Location

Latitude 10° 48' 40.58" N

Longitude 76° 11' 13.58" E

The plantation was raised in the C. Achutha Menon Govt College, Kuttanallore campus by Kerala Forest Research Institute with the support of College authorities. The plantation covers about 2.5 acres of land at the boundary of the College ground. The plantation was raised in the year 2012, with different bamboo species. The land surrounding the plantation is highly populated. The terrain is almost flat and laterite rocky soil. Dry climate in summer season

Major species

Major species are *Gigantochloa rostrata, Dendrocalmus sikkimensis, Dendrocalamus brandisii, Tenostachyum dulloa, Dendrocalmus giganteus* and *Bambusa balcooa.* The species such as *D. brandisii, D. sikkimensis, G. Rostrata* and *B .balcooa* shows good growth in this area. The growth attributes and survival percentage of different bamboo species were taken after one year of planting and given below. (Table.7& Table.8). The highest percentage of survival observed in *Dendrocalamus sikkimensis* and *Dendrocalamus giganteus* then comes the species *Tienostachyum dulloa.* The least percentage of survival is observed in *Bambusa balcooa.*

Table 4. **Growth parameters of Bamboos-** C. Achutha Menon Govt. College Kuttanallore, Thrissur District

Sl. No.	Species	No. of Seedlings survived	Survival Percentage	Average no. of culms/clump	Average diameter (cm)	Average height (m)
1.	*Gigantochloa rostrata*	46	95.83	3	2.5	1
2.	*Dendrocalamus sikkimensis*	48	100	3	3.5	2.25
3.	*Dendrocalamus brandisii*	46	95.83	3	3	2
4.	*Bambusa balcooa*	3	75	2	2	1.75
5.	*Tienostachyum dulloa*	47	97.51	2	2	1.25
6.	*Dendrocalamus giganteus*	2	100	2	3.5	2.25
7.	*Gigantochloa rostrata*	46	95.83	3	2.5	1

PLANTATION-III, Regional Agriculture Research Station (RARS), Pattambi, Palakkad district

Location
Latitude 10° 30' 10.30" N
Longitude 76° 15' 17.10" E

This plantation comes under the campus of Regional Agriculture Research Station (RARS), Pattambi, Ottapalam Panchayath, Palakkad District. It consists of 2 acres of land. As an experiment mixed cropping was done in this plantation. The bamboos are planted in the year 2012. The land surrounding the plantation is experimenting field of research station. The area is thickly populated. The thorns of bamboo have been used as support for climbing crops and temporary sheds. Most of the bamboo species shows good growth.

Major species

Major species are *Dendrocalamus brandissi, Dendrocalamus sikkimensis,,Bambusa balcooa, Gigantchloa rostrata,* and *Dendrocalamus hamiltonii.* The details of growth measurement and survival percentage of different bamboo species after one year of planting is given in the table below. (Table.5 & Table.6). The highest percentage of survival observed in *Gigantchloa rostrata*and *Dendrocalamus brandisii* then comes the species *Bambusa balcooa* and *Dendrocalamus hamiltonii* . All other species planted are also growing well in the plantation.

Table 5.Growth parameters of Bamboos- RARS - Pattambi Plantation

Sl. No.	Species	No. of Seedlings survived	Survival Percentage	Average no. of culms/clump	Average diameter (cm)	Average height (m)
1.	*Dendrocalamus sikkimensis*	45	93.75	3	3	2.5
2.	*Bambusa balcooa*	95	98.95	3	3.5	2.5
3.	*Gigantchloa rostrata*	48	100	6	2.5	1.5
4.	*Dendrocalamus brandisii*	48	100	3	3	2.5
5.	*Dendrocalamus hamiltonii*	95	98.95	2	2	1.5
6.	*Dendrocalamus sikkimensis*	45	98.51	3	3	2.5
7.	*Bambusa balcooa*	95	93.75	3	3.5	2.5

PLANTATION-IV, Aralam Farm ,Aralam – Panchayath, Kannur District

Location

Latitude 11° 27' 23.38" N
Longitude 75° 46' 27.83" E

The two year old one acre bamboo plantation is situated in small valley of Aralam farm adjacent to Aralam Wild Life Sanctuary. The area is almost hilly terrain and fertile damp soil. The land surrounding this bamboo plantation is Rubber plantation. Bamboo clumps are situated in between areca nut plants and small crops such as cucumber, cowpea etc. were planted between these bamboo clumps. The plantlets were treated with manure such as NPK 100 g per plant. This bamboo plantation is meant for their domestic purposes inside the farm such as construction of sheds and support for climbing crops etc.

Major species

Major species are *Bambusa vulgaris* (yellow), *Bambusa tulda, Gigantochloa rostrata, Ochlandra travancorica, Dendrocalamus hamiltonii,Dendrocalamus asper , Bambusa balcooa, Guauda angustifolia, Dendrocalamu sgiganteus* and *Thyrostachys oliveri.* The present growth status and survival percentage of different bamboo species after one year of planting is given below.(Table 9 & Table 10). Most of the species planted here show luxurious growth in this area. The least percentage of survival is observed in *Thyrostachys oliverii.*

Table 6.Growth parameters of Bamboos- Aralam Farm , Aralam – Panchayath,Kannur District

Date of observation: **l. No.**	**Species**	**No. of Seedlings survived**	**Survival Percentage**	**Average no. of culms/clump**	**Average diameter (cm)**	**Average height (m)**
1.	*Bambusa vulgaris* (yellow)	9	100	3	3.5	2.25
2.	*Bambusa tulda*	9	100	6	2.5	2.5
3.	*Gigantochloa rostrata*	9	100	4	2.5	1.5
4.	*Ochlandra travancorica*	9	100	2	2	1.5
5.	*Dendrocalamus hamiltonii*	9	100	2	2	1.5
6.	*Dendrocalamus asper*	9	100	3	3	2.5
7.	*B ambusabalcooa*	7	77.77	2	3	2.25
8.	*Guauda angustifolia*	9	100	2	2.5	2.5
9.	*Dendrocalamus giganteus*	9	100	2	3.5	2.5
10.	*Thyrostachys oliverii*	5	55.55	2	3	1.5

PLANTATION-V,Kerala State Bamboo Corporation (KSBC), Angamaly, Ernakulam District.

Location

Latitude 10° 10' 44.38" N

Longitude 75° 22' 23.83" E

This plantation was raised in the campus of Kerala State Bamboo Corporation, Angamali in Ernakulam as a model plantation for demonstration purposes. The plantation covers 1.821 acres (0.737 ha) land area.

Major Species

Only two varieties; *Bambusa balcooa* and *Dendrocalamus brandisii* were planted in this campus. A total of 513 seedlings were planted in this campus. Both species planted here show

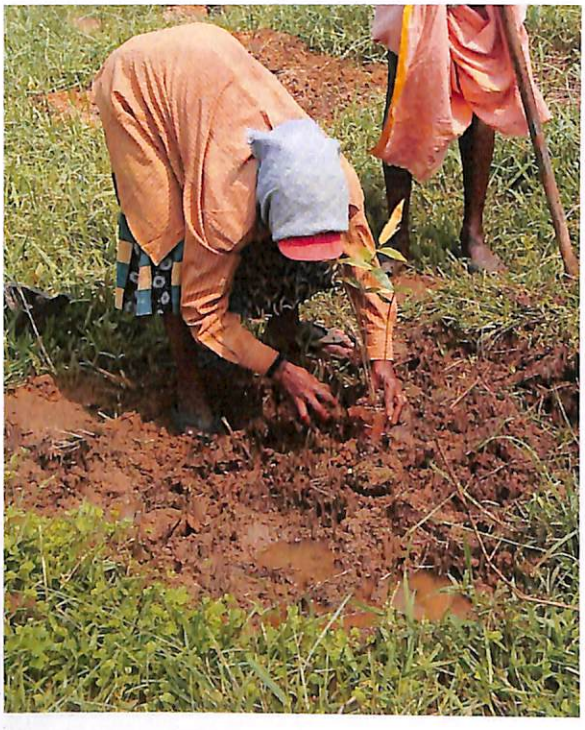
luxurious growth in this area .The highest percentage of survival observed in *Bambusa balcooa.* The present growth status and survival percentage of different bamboo species after one year of planting is given below (Table 11 & Table 12).

Table 4. **Growth parameters of Bamboos-** KSBC Angamaly Plantation

Sl. No.	Species	No. of Seedlings survived	Survival Percentage	Average no. of culms/clump	Average diameter (cm)	Average height (m)
1.	*Dendrocalamusbrandisii*	63	90	4	4.5	3
2.	*Bambusa balcooa*	440	99.32	3	1.5	1.25

Plantation-I

Desamangalam Grama Panchayath, Thrissur



Plantation-II

Govt. College, Kuttanallore, Thrissur District








Plantation-III

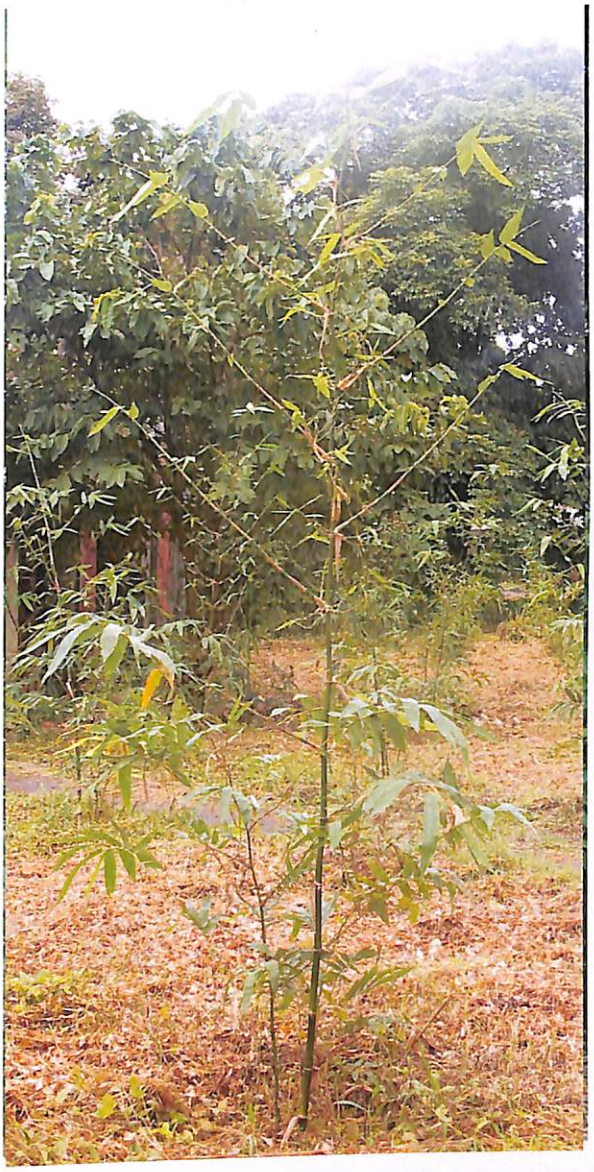
Regional Agriculture Research Station (RARS), Pattambi

Plantation-IV

Aralam Farm, Aralam Panchayath, Kannur District

Plantation-V

Kerala State Bamboo Corporation (KSBC), Angamaly, Thrissur



Conclusion

Five plantations were raised in three districts of Kerala during 2012- 2013 with the support of BTSG South Zone. They are,

i) Plantation-1 ,DesamangalamGramapanchayath, Thrissur district

ii) Plantation-II, Govt. College Kuttanallore,Thrissur district

iii)Plantation-III, Regional Agriculture Research Station (RARS), Pattambi, Palakkad district

iv)Plantation-IV, Aralam Farm ,Aralam – Panchayath,Kannur District

v) Plantation-V, Kerala State Bamboo Corporation (KSBC), Angamaly,Ernakulam

All the Five bamboo Plantations are well established and species planted are found growing well. Considering the survival and growth of bamboo species, it varies slightly in different areas according to the soil, water availability, topography and other climatic factors of that area.

REFERENCES

INBAR. 1997. Working through bamboo and rattan. INBAR News Magazine (special Edition). 5 (3): 8-14.

Muraleedharan, P.K., Anitha, V., Krishnankutty, C.N., Nair, P.V., Sankar, S. and Seethalakshmi, K.K. 2007. *Bamboo sector in Kerala: Baseline data generation for developing action plan.* KFRI Research Report 291, 109(p).

Seethalakshmi, K.K. and Kumar, M.S. 1998. *Bamboos of India: A Compendium.* Kerala Forest Research Institute & International Network for Bamboo and Rattan: Peechi, Thrissur, Kerala342(p).

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