

CHAPTER - I

EXECUTIVE SUMMARY

A. Introduction

The National bamboo mission scheme is a Government of India scheme is being implemented in the state of Karnataka with an objective of improving the growing stock of Bamboo resources in the country and to ensure sustainable access to the traditionally dependent communities to take up value addition activities. The Scheme is having following objectives.

B. Objectives of the Scheme.

- (a) Improve the productivity of Natural Bamboo resources through adoption of good management objectives.
- (b) Increase the Bamboo resources through creation of new bamboo plantation.
- (c) Improve the access of stakeholders to bamboo resources.
- (d) Training and capacity building in value addition and skill development and market linkage.

C. Funding

The funding to the program is made by the bamboo mission agency of GOI on annual basis.

D. Evaluation Objectives

The Evaluation of various activities implemented during the year 2009-10, 2010-11, and 2010-12 were undertaken in 7 circles of the Karnataka Forest department with the following objectives.

- (a) Physical verification of the assets/activities implemented with 10% sampling intensity.
- (b) Assessing the success of the plantations/growth performance/durability of assets.
- (c) The impacts of the activities on the achievements of the objectives/goals.
- (d) To analyze the causes and impediments in achieving the objectives.

E. Evaluation Results

Plantations Evaluations

Range	Very Good	Good	Average	Failed
Londa	1	0	0	0
Golihalli	0	2	1	0
Khanapur	1	0	0	0
% ranking	20	40	20	0

Survival percentage: The plantation evaluation of NBM has shown survival percentage varying between 55 to 95% in different divisions. The table and graph representing the success rate is presented below.

Fig.1 showing the success rate ranking of the plantations.



Plantation Grading: Out of 5 Plantation evaluated two very graded as very good with the survival rate of more than 80%. Similarly two plantations raised in Golihalli were found to be good with the survival rate exceeding 70%. And one plantation was found to have less than 50% survival raised in Golihalli of Belgaum division. The overall success of the plantation at the initial years of the plantation may be rated as good to very good.

In Belgaum circle out of total 29 plantations raised in three years in 8 plantations were surveyed and assessed for the survival % and the growth performance. The results of the survival percentage against each plantation are presented in the table below

2. Table showing the survival % and growth parameters of plantations

Sl. No.	Year	Division	Range	Location	Extent	Species planted	Height (m)	CD (in cm)	%
1	2010-11	Belgum	Londa	Akrulli	20	Bamboo	2.08	2.5	85
2	2011-12	Belgum	Khanapur	Manturguied	25	Bamboo	2.0	0.4	94
3	2010-11	Belgum	Golihalli	Golihalli	20	Bamboo	1.6	0.5	50
4	2008-09	Belgum	Golihalli	Maskenti	30	Bamboo	2.9	0.69	74
5	2010-11	Belgum	Golihalli	Golihalli	50	Bamboo	1.5	0.45	82

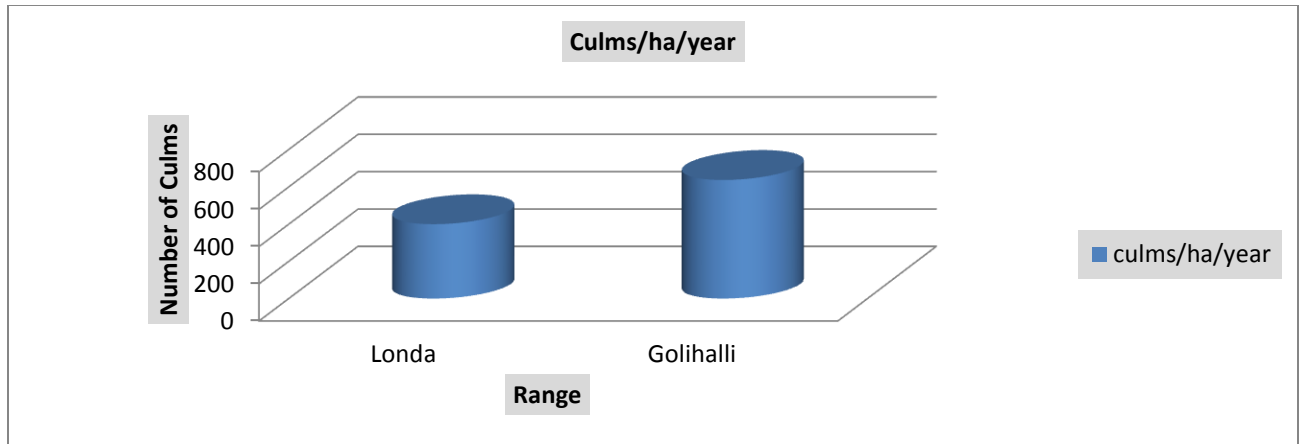
Survival Rate: The survival rate of Bamboo plantation was found varying from 50-94% in different ranges. Khanpur range had highest survival rate of 94% followed by Londa and Golahalli with 82% survival rate.

Mean Height: The mean height of bamboo plantation was found to vary between 1.5-2.08 meters in different ranges. The Golihalli had the highest mean height of 2.9 meters height followed by Londa with 2.08 meters. The mean annual increment height of bamboo was around 0.6 meter/annum.

Culm Numbers: The Culm production was found varying from 2-7 in different ranges.

The tables showing the culms are presented below

Range	Culms/clump	Productivity/ha/year	Remarks
Londa	3-4	400 culms/ha	Average
Khanpura	NR		
Golihalli	4-5	637/ha/annum	Good productivity
Golihalli	4-5	637/ha/annum	Good productivity
Golihalli	4-5	637/ha/annum	Good productivity.



Productivity

The productivity of the bamboo plantations were estimated based on the new culms production in the plantation. It is found that Culm productivity varied from 400-637.ha/year. Though it is not a best production scenario, given the limitations of the rainfall and site factors, the productivity is very promising in that site for *Dendocalamus strictus*. However, the productivity can be enhanced with better management interventions like soil working, weeding and soil Bharav for at least 5-8 years of period. The adoption of scientific management of clump to remove the matured culms can enhance the productivity of Bamboo.

IMPACT ASSESSMENT OF NATIONAL BAMBOO MISSION

Economic

The new plantations raised under the NBM scheme is expected to increase the production and availability of Bamboo resources to the Bamboo dependent community. However there was o evidence of community having management participation with the plantation. It is better to organize a community participatory bamboo resource development by institutionalizing the scheme.

Productivity and Sustainability

For continuous supply of bamboo resources to the community from NBM schemes, it is necessary to organize community participation by providing training on sustainable harvest so as to ensure continuous supply of bamboo resources to the community.

Ecological Impact

The scheme is expected to meet the bamboo demand to the community and would help in reducing the pressure on the natural forests. The plantations also help in sequestering the carbon-dioxide from the atmosphere and thus help to mitigate the global warming.

Environmental Benefit

The bamboo resource development scheme will contribute for the increase in the green cover of the country and helps in many forestry functions.

RECOMMENDATIONS

1. Investment on creating bamboo plantation may not be advisable. Rather the tending and improving the existing stock may be a better thing to do.
2. The investment on raising the plantations in drier district may be avoided as the results are not encouraging.
3. The site clearance for raising plantation was noticed in some areas which need to be avoided.
4. The protection measures were not effective in many places. It is essential to provide maintenance provisions for five years so that the purpose is well achieved.
5. Plantation care. The plantation care and maintenance needs to be done for minimum five years. The investment must be done to ensure success of the plantations.
6. NBM must set a very successful model of plantation through innovations and higher investment as there is no cap on the unit cost.
7. Three year assessment is too early to judge the success. There should be five years interval evaluation twice to make a meaningful evaluation.
8. Internal evaluation. The internal evaluation needs to be strengthened and the database must be established to monitor the changes.
9. NBM must explore involving the local community in raising and maintaining the plantations.
10. South American origin species tried by IWST is very promising and the same may be tried in addition to the Bheem variety.

CHAPTER – II

INTRODUCTION

The National Bamboo Mission is a Government of India scheme is being implemented in the state of Karnataka with an objective of improving the growing stock of Bamboo resources in the country and to ensure sustainable access to the traditionally dependent communities to take up value addition activities. The objectives of the scheme are as follows.

1.1 Objectives of the Mission

- (a) Improve the productivity of Natural Bamboo resources through adoption of good management objectives.
- (b) Increase the Bamboo resources through creation of new bamboo plantation.
- (c) Improve the access of stakeholders to bamboo resources.
- (d) Training and capacity building in value addition and skill development and market linkage.

1.2. Funding

The funding of the program is made by the bamboo mission agency of GOI on annual basis.

1.3 Evaluation Objectives of Thirteenth finance commission.

The NBM work has been awarded for the evaluation work in two units of the State. Each unit is composed of group of circles comprising of 11 divisions in each Unit. The following objectives have been listed as the Terms of Reference.

A) Physical verification

- To measure the extent to which the works were carried out for each of the schemes.

B) Impact assessment

- To measure the efficiency and effectiveness of the schemes

C) Gaps in implementations

- To identify the key issues and gaps in implementation and recommendations which could improve the quality of implementations

CHAPTER – III SAMPLE WORK

The data was grouped into activities like plantation, SMC. In each year the data was sorted out into divisions. Using probabilistic sampling method 10% sampling was done. It was further ensured to cover at least one activity in each Range.

1. Table showing the number of samples selected for evaluation under NBM unit I

Sl. No.	Activates	Year wise numbers of activity					Samples selected				
		09-10	10-11	11-12	12-13	Total	09-10	10-11	11-12	12-13	Total
1	SMC and others	2	3	5	3	13	2	1	2	1	6
2	Plantations	17	2	5	5	29	2	1	2	3	8

Fig.1 Showing the numbers of activities done between 2009-10 to 2012-13 in NBM Unit I

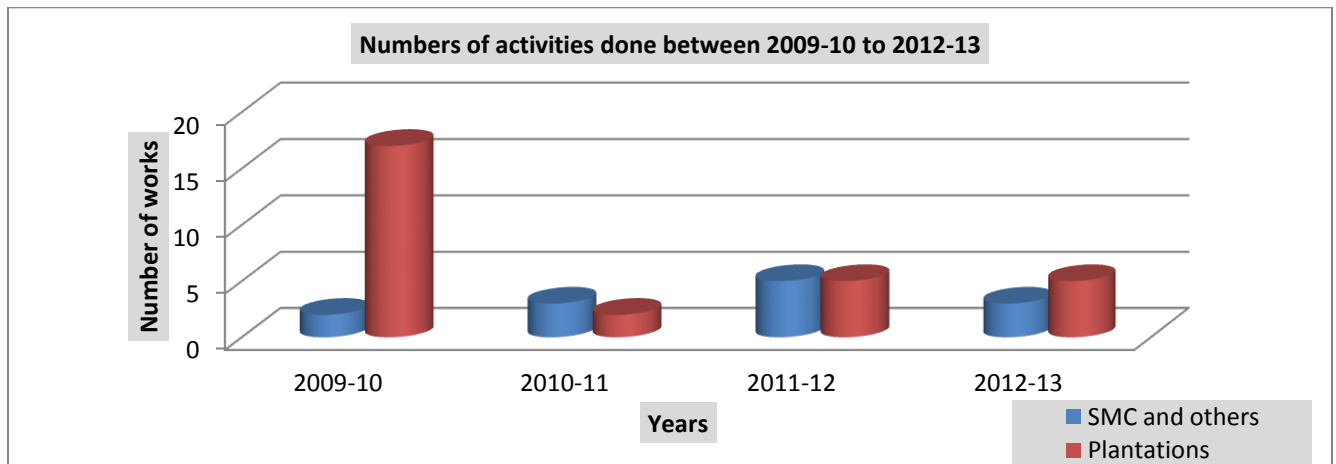
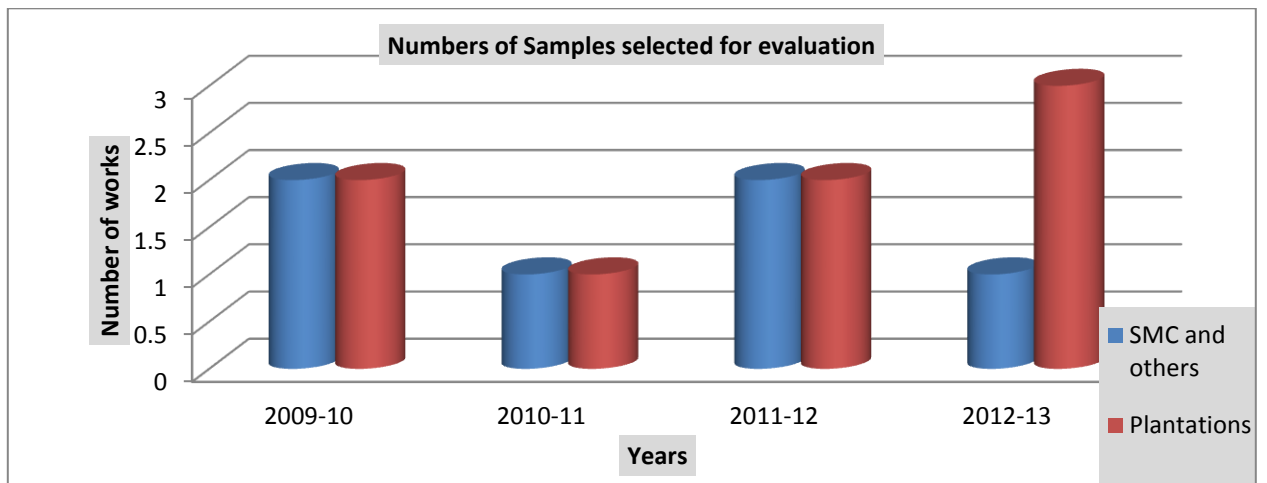


Fig.2 Showing the numbers of Samples selected for evaluation in NBM Unit I



CHAPTER – IV

MATERIAL AND METHODS

The present work was carried out to evaluate the forestry work done under NBM, during the year 2009-10 to 2012-13 in unit - 1. Details of material used and methodology followed and observations recorded during the course of investigation are detailed here under.

4.2 Evaluation methods and techniques

4.2.1 Plantations

Evaluation method: as per the terms of reference, 10 % of total numbers of plantations were randomly selected from each division and in each year. The selected samples were later evaluated with 2% intensity. For every 5 ha of plantation one sample plot of 0.1 ha was randomly selected using GPS to measure parameters like height survival rate, collar diameter and vigor of the plantations. The general observations were also selected with respect to biodiversity, soil moisture conservation work ext

Procurer to select plots in plantations

The plantations were divided in to 5 ha gird on the map. Depending on the size of the plantation the number of sample plots was selected as follows.

- (1) <5 Ha - one sample plot
- (2) <10 Ha - two sample plot
- (3) <15 Ha - three sample plot
- (4) < 20 Ha - four sample plot
- (5) >20 Ha – one sample plot for every 5 Ha
- (6) Sample plot size – 1000 m² (31.62 m × 31.62 m)
- (7) GPS point: please record the GPS point.

Selecting 0.1 ha in 5 ha gird: in a 5 ha gird the plots are divided into 7*7 rows and columns .as shown in fig below. Further the procedure to select plots for deferent size plantation is given well in advance as shown in below.

1	2	3	4	5	6	7
2						
3						
4						
5						
6						
7						

- 1) 5 ha -4th row 6th Colum - (1 sample plot)
- 2) 10 ha -3rdrow 7th Colum – (I and 2 sample plot)
- 3) 15ha -2nd row 2ndColum (1, 2 and 3 sample plot)
- 4) 20 ha -5th row 4thColum (1, 2, 3and 4 sample plot)
- 5) 25 ha -1strow 6th Colum (1, 2,3,4 and 5 sample plot)
- 6) 30 ha 6th row 3rdColum (1,2, 3,4,5 and 6 sample plot)

(e) Regarding virtual demarcation of sub plots of 0.1 Ha. One need not physically divide the subplots on the ground. For example 4throw 6th Colum means we take 31 × 4 meters (124 meters) from the corner main plot to the point on 4th row and then from the marked point, measure 6×31 meters to reach the 6th Colum (horizontally) . Follow same procedure for all other rows and columns.

Measurements

a) Survival counts: The total number of plants planted in the sample plot of 0.1 ha was manually counted by counting the pits/trenches. Later the plants surviving were counted to calculate the survival %.

b) Height: In each sample plot height was measured for 2% of the total plants using the calibrated pole or the tape.

c) Collar diameter: The collar diameter was measured for those plants which were measured for the height in cm. (girth was measured and converted to diameter).

d) Counting the natural plants in the area: The plants that were found naturally were counted for the purpose of bio-diversity.

CHAPTER - V

ANALYSIS AND EVALUATION RESULTS

The data collected on the plantation performance (survival%, Growth parameters height, number of culms and girth), has been tabulated and analyzed by treating the Division as a unit of management (territory) for the assessment of performance. However as the number of sample are too low in each division the circle wise tabulation has been done for the purpose of comparisons which are very distinct with respect to agro-climatic conditions. The financial auditing and the verifications have also been carried out as per the Terms of Performance (TOR) of the evaluation studies.

5.1 Plantation Evaluation

The main activity of the Bamboo mission scheme is raising the Bamboo plantations in the degraded forests or any other suitable land. During the period of evaluation for the three years (2009-13) in four circles 1417 ha of plantations has been raised in various divisions.

5.1.1 Package and practice adopted

The Bamboo forests sites which are degraded have been selected to take up planting and pitting method has been followed as a general practice with spacing varying from 5m x 5m to 10m x 10 m depending upon the degree of degradation in different sites. The pits size varies from 50cm x 50cm x 50cm to 75cm x 75cm x 75cm. In high rainfall areas *Bambusa arundanacea* has been planted as it is naturally found in these areas, where as in the moderate and low rainfall areas *Dendrocalamus strictus* has been planted which is a natural species in the drier climatic zone. However in the natural bamboo flowered but degraded sites, site improvement work like tending and hoeing working has been done to the regenerating seedlings with good protection measures from fire and grazing.

5.1.2 Survival percentage

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4. Table showing the survival % and growth parameters of plantations

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NR: Not recorded

5. Table showing the success ranks of the plantations

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Fig.2 showing the success ranks of the plantations



4.1.3 Key findings

1. **Success Rate:** The survey has shown that 30 % of the plantations raised under the scheme has shown very good success rate under the NBM scheme. Further nearly 45% of the bamboo plantations have shown good success rate indicating high success rate of the plantations. The average success rate was about 15% which is attributable to poor site quality. However, the failure plantations were in two sites out of 14 sites surveyed and these sites fall in the very low rainfall areas.
2. **Growth performance:** The growth performance of *Bambusaarundanacea* was found very good in high rainfall areas like Shimaga and Hassan with an average height growth rate of 5.7 meter in three years is very impressive followed by many plantations with an average growth of 1.1 meter per year.
3. The collar diameter of the best plantation was ranging between 0.7 to 1.3 cm diameters indicating the good growth performance as compared to natural forests performance.
4. The number of culms per clump was found to be varying between 2 to 8 with an average of 5 culms per clump in three year growth indicating a promising growth potential.

5. Failure of nearly 15 % of the plantation is a cause of concern as it would reflect the inherent problems in the site selection and species choice which has been a major problem in the plantation success.

4.1.4. Recommendations

1. **Selection of the site.** It is recommended that the site selection for bamboo plantation should be in the open areas where the shade is less than 10%. The bamboo plantation as a gap plantation has shown very low success and poor performance.
2. **Choice of species.** It is recommended that the areas receiving the low rainfall (<600 mm) may be excluded from bamboo plantations. *Bambusaarundanacea* may be planted in the areas receiving more than 800 mm per annum and the *Dendrocalamusstrictus* may be restricted to moderately good rainfall areas.
3. **Maintenance and cultural operations.** It is recommended that a minimum of five years protection and maintenance may be adopted to ensure good success.

CHAPTER – VI

OBESERVATIONS AND IMPACT ANALYSIS

Economic

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CHAPTER – VII RECOMMENDATIONS

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5. Plantation care. The plantation care and maintenance needs to be done for minimum five years. The investment must be done to ensure success of the plantations.
6. NBM must set a very successful model of plantation through innovations and higher investment as there is no cap on the unit cost.
7. Three year assessment is too early to judge the success. There should be five years interval evaluation twice to make a meaningful evaluation.
8. Internal evaluation. The internal evaluation needs to be strengthened and the database must be established to monitor the changes.
9. The new species Bheem and another South American variety tried and tested by IWST may be a better species given the high productivity of the species.
10. Involvement of local community is a good idea for ensuring good success of the scheme.