

**EVALUATION OF NATIONAL BAMBOO MISSION
2013-14 TO 2016-17**

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Karnataka Evaluation Authority

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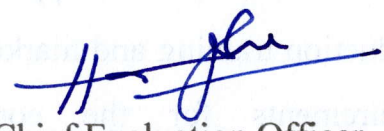
Foreword

Development of forest resources has a major goal of enhancing forest cover and ensuring environmental security and along with to support the livelihoods of the fringe communities. The National Bamboo Mission is a scheme in this direction to promote growth of bamboo sector and the related economic activities to generate employment opportunities with an integrated approach covering production training and marketing through Self Help Groups with state specific requirements for the communities. The evaluation of the scheme **National Bamboo Mission** (2013-14 to 2016-17) was initiated by the Karnataka Forest Department through Karnataka Evaluation Authority to assess the success of the programme in achieving these objectives and support extended to the communities. The study was carried out by The Energy Resource Institute (TERI) under the guidance and monitoring of KEA.

The study is based on secondary and primary data. The primary data is collected from 26 plantation works sampled. It is observed that there is limited information on area based regionally differentiated strategy. The other major findings include – low financial achievement (77%) delay in Annual Plan Approval, only 8% plantations had SMC structures indicating low priority, less involvement of JFMCs and low quality of bamboo supplied by the Department. Marketing promotion and training activities for cooperatives and SHGs were also not observed. The major recommendations are provision of required skill and training, provision of region-specific bamboo species, networking with specialised research and training institutions, promotion of bamboo production in private sector, good quality planting material and promotion of Bamboo Producer Organizations (FPOs).

I expect that the findings and recommendations of the study will be useful to the Government and Karnataka Forest Department.

The study received support and guidance of the Additional Chief Secretary Planning, Programme Monitoring and Statistics Department, Government of Karnataka. The report was approved in 49th Technical Committee meeting. The review of the draft report by KEA, members of the Technical Committee and an Independent Assessor, has provided useful comments and inputs to improve the report. I duly acknowledge the assistance rendered by all in successful completion of the study.



Chief Evaluation Officer
Karnataka Evaluation Authority

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We are thankful to the Karnataka Evaluation Authority (KEA) and Karnataka Forest Department (KFD) for assigning this evaluation to the Energy and Resources Institute (TERI), Bengaluru. Visiting several forestry plantations, and other works like soil moisture conservation, wildlife protection and management, habitat improvement works, infrastructure, working plan, research, training and interaction with field staff and officers of Karnataka Forest Department was an enriching and inspiring experience. We would like to acknowledge the guidance, support and cooperation of Mr. G. Sudarshan, IFS, Chief Evaluation Officer, KEA, Dr.Chaya Degaonkar, Additional Chief Evaluation Officer, KEA and Dr.Manjunath, Director (Evaluation), KEA and Ms.Jyothi Jenni, Associate Director, KEA and the entire staff team of KEA.

This study was possible only due to the cooperation and facilitation of officers of KFD, especially Mr. Punati Sridhar, PCCF and HoFF, Mr. Sanjai Mohan, PCCF and HoFF, Wildlife and Chief Wildlife Warden (erstwhile), Mr. Ajay Mishra, PCCF (Development), Ms.Ritu Kakkar, PCCF, (EWPRT & CC), Mr. Shiv Raj Singh, PCCF (Publicity and Communication), Mr.Puneet Pathak, APCCF (CAMPA), Mr.Brijesh Kumar, APCCF (TFC), Mr. R. K. Srivastava, APCCF (NBM), Mr. Hari Kumar Jha, APCCF (EWPRTI/C), Ms. Seema Garg, APCCF (Evaluation) and Mr. Bishwajit Mishra, CCF (ICT Cell). Our gratitude is due to the excellent assistance of RFOs, software developers and staff of Evaluation Wing and ICT Cell of KFD. The cooperation and coordination of all the Circle, Division and Range offices was crucial in completing the field work.

TERI would like to place on record the timely advice of Mr.Amit Kumar, Senior Director, Social Transformation, Dr. Debajit Palit, Director, Rural Energy and Livelihoods, Mr. D.N. Naramsimha Raju, Director, SRC. The study has been carried out with the excellent and committed efforts of the study team comprising of:

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The assignment has provided interesting insights into the efforts of the KFD in forest and wildlife protection and conservation. Interactions with field staff and officers at various levels and individual beneficiaries gave an understanding of how the processes could be simplified and pointers for improving effective delivery of the schemes, which have been brought into the recommendations of this report. TERI hopes to work with the KEA in future too.

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ABBREVIATIONS

ACF	Assistant Conservator of Forests
ANR	Assisted Natural Regeneration
APCCF	Additional Principal Chief Conservator of Forests
APO	Annual Plan of Operation
AR	Artificial Regeneration
ATMA	Agricultural Technology Management Agency
CAMPA	Compensatory Afforestation Fund Management and Planning
CCEA	Cabinet Committee on Economic Affairs
CCF	Chief Conservator of Forests
CF	Conservator of Forests
CPT	Cattle Proof Trench
DAC	Department of Agriculture & Cooperation
DCF	Deputy Chief Conservator of Forests
DRFO	Deputy Range Forest Officer
EPT	Elephant Proof Trench
ER	Eco Restoration
FDA	Forest Development Agency
FG	Forest Guard
FNB	Field Note Book
FPO	Farmer Producers' Organization
GoI	Government of India
GoK	Government of Karnataka
GPS	Geographic Positioning System
HoFF	Head of Forest Force
HRD	Human Resource Development
ICT	Information and Communications Technology
IDI	In-depth Interview
IPRTI	Indian Plywood Research and Training Institute
JFM	Joint Forest Management
JFMC	Joint Forest Management Committee
KEA	Karnataka Evaluation Authority
KFD	Karnataka Forest Department
LPG	Liquefied Petroleum Gas
MGNREGS	Mahatma Gandhi National Rural Employment Guarantee Scheme
MIDH	Mission for Integrated Development of Horticulture
NAP	National Afforestation Programme
NBM	National Bamboo Mission
NGOs	Non-governmental Organizations
NTFP	Non-timber Forest Produce
PCCF	Principal Chief Conservator of Forests
R	Rural
RFO	Range Forest Officer
SCP	Special Component Plan
SHGs	Self Help Groups
SMC	Soil moisture conservation

T	Territorial
TERI	The Energy and Resources Institute
TFC	13 th Finance Commission
ToR	Terms of Reference
TSP	Tribal Sub Plan
U	Urban
VFC	Village Forest Committee
WF	Wildlife

EXECUTIVE SUMMARY

The Evaluation of National Bamboo Mission for the period 2013-14 to 2016-17 was assigned to The Energy and Resources Institute (TERI) in August 2019 by Karnataka Evaluation Authority (KEA) on behest of Karnataka Forest Department (KFD). The study was a summative evaluation wherein the scheme was evaluated post implementation to understand the overall effectiveness of the program/ scheme in terms of the objectives set out. The purpose was to assess the overall impact of the scheme, while also studying the effectiveness of the process/ delivery mechanism followed and to make suitable recommendations thereof to enhance the effectiveness and impact. Multi-dimensional approach including scientific, interactive/ consultative, objective-oriented, analytical, practical and participatory approach using appropriate methods were followed to gather qualitative and quantitative data. The primary data on plantations was gathered using the web based and android application developed by Karnataka Forest Department.

The overall physical (plantation activities of raising, maintenance and advance works) and financial achievement against the targets of the mission during the evaluation period was 91% and 77% respectively. The overall average achievement of physical activities is 56%, which was affected by less progress in some components. During the evaluation period, among the 248 plantation works carried out, 26 plantations were sampled across seven forest circles covering a gross area of plantation of 449 ha (average of 17.26 ha/ plantation) and net area of plantation of 426 ha (average of 16.38 ha/ plantation). The planning process revealed that there was delay in approving Annual Plan of Operation (APOs) and sanctioning of estimates (71% APOs were sanctioned after planting season, .i.e. after September and 81% estimates were sanctioned after September). The plantation journals were available in 77% plantations at the time of visit, of which only 62% had complete details, indicating that there was scope for improving monitoring process.

Monitoring visits by supervisory officers were made only in 38% of the plantations, denoting inadequate monitoring. Joint Forest Management Committee (JFMC) were involved in raising plantations in 31% of the cases, indicating low participation of the community. Bamboo augmentation was carried out as per the cost norms and number of years of maintenance given in the Govt. of India guidelines.

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Out of 26 plantations, 62% had boundary protection measure, mostly barbed wire with wooden posts, of which 56% were breached. Seventy-seven percent of plantations were provided with watch and ward. NBM guidelines stipulate two years of maintenance, among the plantations sampled, 23% were maintained as per guidelines.

The overall survival of the plantations was found to be 39% and 25% seedlings in sample plots were in good condition, while 41% were satisfactory. Highest survival of 90% was found in one plantation in Chikkamagaluru T range, Chikkamagaluru division and circle. Amongst the circles Hassan circle recorded 93% survival, while Ballari recorded the lowest 17% survival. *Dendrocalamus strictus* indicated 62% followed by *Bambusa arundinasia* with 39% survival rate. Department may examine introduction of species like *D. tulda* or other species depending upon industrial demand. The study found that activities were taken up to partially address the objectives on increasing the coverage of area under bamboo in potential areas and promotion, development and dissemination of technologies, while there were no significant efforts to address the remaining four objectives.

The mission objectives were developed for the entire country while strategy, activities and components should be specific to State and agro climatic zones within the State. A comprehensive understanding of the bamboo sector in Karnataka is required to arrive at a suitable strategy by involving all the stakeholders, so that it is regionally appropriate, need-based and resource efficient. This issue requires attention in future to select appropriate sites as well as species like *Dendrocalamus hamiltonii*, *Dendrocalamus stocksii* that are useful for artisans, besides, enhancing the area under bamboo cultivation in forest and non-forest areas to meet the market demand.

In addition to producing raw material, bamboo artisans are to be provided with additional training, storage facilities and assistance for marketing. There is a need to develop a comprehensive database of the stakeholders, including the artisans in JFMCs and build a network for the development of the sector. Consistent efforts are needed to expose the artisans to different bamboo growing states within the country, new technologies to help in drudgery reduction, improving quality of the finished products and modern technologies developed by various research institutions. Specific skill development training based on market demand could be imparted to interested youth and enable them to take up self-employment. Other government schemes such as ATMA, Skill development, SCP/TSP could be leveraged/ converged to have better extension and outreach under the mission.

1 INTRODUCTION

1.1 Background

Forests have a significant role to play in mitigating climate change, conserving natural biodiversity and preserving the watershed functions of the region besides meeting the consumptive needs of human beings. Sustainable development and management of forests have intergenerational implications, which are enshrined in Sustainable Development Goals defined by United Nations. The goal number 15 states that *'Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss'*¹. The National Forest Policy of 1988 also set an objective of increasing the tree cover to 33% in the country as a whole. Karnataka state has 20.11% of the state's geographical area² and has been making sincere efforts to meet the national forest policy objectives. Existing forests are conserved and green cover is sought to be extended to other government lands and also to private lands through as many as 50 different schemes/programs approximately.. Karnataka Forest Department has afforested 2,65,714 ha during the years 2013-14 to 2016-17³ in forest and non-forest areas under various plan and non-plan programmes, of which bamboo and canes comprise 16,638 ha, accounting to about 6% of the total planted area.

Forest Cover in Karnataka State is 38,575.48 sq km which is 20.11% of the State's geographical area. The forest cover in Karnataka has enhanced by 1025.48 sq. kms as per the India State of Forest Report, Forest Survey of India, 2019, Ministry of Environment, Forest and Climate Change, Government of India as compared to the previous report in 2017. Tree cover in Karnataka is 6,257 sq. km which has increased by 544 sq km as compared to the previous assessment report of 2017, which may be attributed to afforestation in non-forest areas.

The Karnataka Forest Department is implementing various schemes to protect and conserve the forest resources, biodiversity and wildlife across the state. The activities undertaken include site specific activities such as safety zone plantation, compensatory afforestation,

¹<https://www.un.org/development/desa/disabilities/envision2030-goal15.html>

²India State of Forest Report, Forest Survey of India, 2019, Ministry of Environment, Forest and Climate Change, Government of India <http://fsi.nic.in/forest-report-2019>

³Annual Reports, 2013-14, 2014-15, 2015-16 and 2016-17 of Karnataka Forest Department

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consolidation and protection of forests, consolidation and regeneration of forests, wildlife protection and management, infrastructure development and forest produce saving devices and other activities.

National Bamboo Mission (NBM)

Bamboo is considered a versatile species providing ecological and economic benefits to communities. The species bears paramount importance as a source of raw material for industrial and domestic use which has necessitated its cultivation in farm lands as well. Till recently, it has remained confined to the forests (12.8% of forest cover); two third of the growing stock is located in the North-Eastern States. Keeping in view the vast untapped potential of bamboo species, the National Bamboo Mission was launched in October 2006, by Government of India (GoI) based on the National Mission on Bamboo Technology and Trade Development Report, 2003. The Department of Agriculture & Cooperation (DAC), Ministry of Agriculture & Farmers Welfare, New Delhi is implementing the 100% Centrally Sponsored Scheme called Mission for Integrated Development of Horticulture (MIDH) in which National Bamboo Mission (NBM) was being implemented as a sub scheme⁴. In Karnataka, the NBM was being implemented by the Karnataka Forest Department, while in some other states was implemented by the Departments of Agriculture, Horticulture or Industries and Commerce.

This study covered the activities for the years 2013-14 to 2016-17. Restructured National Bamboo Mission approved by the Cabinet Committee on Economic Affairs (CCEA) on 25-04-2018 is operational in Karnataka. Since this scheme has been restructured during 2018 with new guidelines already in operation, the findings and recommendations of this study may seem passé at this stage, nevertheless, some useful and pertinent findings and recommendations may be incorporated in the current operations wherever feasible.

The Bonn Challenge is a global effort to bring 150 million hectares of the world's deforested and degraded land into restoration by 2020, and 350 million hectares by 2030⁵. India has committed to restore 21 million hectares (13 million hectares of degraded land by 2020 and

⁴ National Bamboo Mission, Operational Guidelines, Department of Agriculture & Cooperation, Ministry of Agriculture, Govt. of India, Krishi Bhawan, New Delhi, December 2006

⁵<https://www.bonnchallenge.org/content/challenge>

an additional 8 million hectares by 2030)⁶. India has already brought an area of 9.8 million hectares under restoration since 2011⁷. By integrating forest landscape restoration into ongoing environment and development programmes, countries can maximize the impact of their investment. In India most of these targets were integrated into the umbrella of Twenty Point Programme 2006, which is being monitored by the Ministry of Statistics and Programme Implementation, Government of India⁸. The targets of plantations in NBM are not explicitly aligned to this challenge.

This evaluation covers the period 2013-14, 2014-15, 2015-16 and 2016-17 (4 years).

1.2 Stated Objective of the Mission

The National Bamboo Mission envisages promoting holistic growth of bamboo sector by adopting area-based, regionally differentiated strategy and to increase the area under bamboo cultivation and marketing.

The specific objectives of the mission are:

1. To promote the growth of the bamboo sector through an area based regionally differentiated strategy
2. To increase the coverage of area under bamboo in potential areas, with suitable species to enhance yields
3. To promote marketing of bamboo and bamboo-based handicrafts
4. To establish convergence and synergy among stakeholders for the development of bamboo
5. To promote, develop and disseminate technologies through a seamless blend of traditional wisdom and modern scientific knowledge
6. To generate employment opportunities for skilled and unskilled persons, especially unemployed youths

⁶ The Bonn Challenge in Asia: Driving leadership on forest landscape restoration. IUCN Forest Brief, No. 17. April 2017. Accessed at https://www.bonnchallenge.org/sites/default/files/20170502_iucn-forest-brief-no-17-bonn-challenge-asia_web.pdf

⁷ Bonn Challenge and India, Progress on restoration efforts across states and landscapes, 2018. International Union for Conservation of Nature, New Delhi, India, and the Ministry of Environment, Forest and Climate Change, Government of India

⁸ http://mospi.nic.in/sites/default/files/twenty_point_programme_2006/tpp_2006a_background/A_%20Brief_Description_TPP_2006_14may15.pdf?status=1&menu_id=162

1.3 Project strategies

- 1) Adopt a coordinated approach covering production and marketing to assure appropriate returns to growers/ producers
- 2) Promote research and development of genetic superior clones of suitable species and technologies for enhanced production
- 3) Enhance acreage (in forest and non-forest areas) and productivity of bamboo through species change and improved cultural practices
- 4) Promote partnership, convergence and synergy among R&D and marketing agencies in public as well as private sectors, at all levels
- 5) Promote where appropriate, cooperatives and self-help groups to ensure support and adequate returns to farmers
- 6) Facilitate capacity building and human resources development
- 7) Set up national, state and sub state level structures to ensure adequate returns for the produce of the farmers and eliminate middlemen, to the extent possible

1.4 Mission Structure

The mission has a six-member National Apex Committee (NAC) under the chairmanship of Union Minister of Agriculture. The Mission Director functions as the Member Secretary. There is National Steering Committee comprising of five members chaired by Secretary, Agriculture and Cooperation. In addition, there is a National Bamboo Cell headed by Mission Director under which different Working Groups are constituted to cater to the activities like research, plantation development, handicrafts and marketing.

At the State level, State Bamboo Steering Committee comprising of four members and headed by Secretary, Agriculture/ Horticulture/ Forestry oversees the implementation of the programme. At the District Level, Forest Development Agencies (FDAs) and the Joint Forest Management Committee (JFMCs) undertake the implementation of NBM in forest areas. However, in case of non-forest areas Bamboo Development Agencies (BDAs) is the nodal agency for implementation of NBM.

1.5 Mission Components

The activities have been broadly classified into three components under the NBM:

- i. Plantation Development
- ii. Handicrafts, Marketing and Exports
- iii. Implementation Monitoring Mechanism

Table 1: Mission objectives, strategies and activities

Objectives	Strategies	Activities
To promote the growth of the bamboo sector through an area based regionally differentiated strategy	Set up national, state and sub state level structures to ensure adequate returns for the produce of the farmers and eliminate middlemen, to the extent possible	<ul style="list-style-type: none"> • Forest Development Agency • Joint Forest Management Committee
To increase the coverage of area under bamboo in potential areas, with suitable species to enhance yields	<ul style="list-style-type: none"> • Promote research and development of genetic superior clones of suitable species and technologies for enhanced production • Enhance acreage (in forest and non-forest areas) and productivity of bamboo through species change and improved cultural practices 	<ul style="list-style-type: none"> • Plantation Development • Nurseries • Area expansion • Maintenance of plantations • Improving existing stock •
To promote marketing of bamboo and bamboo-based handicrafts	Promote partnership, convergence and synergy among R&D and marketing agencies in public as well as private sectors, at all levels	<ul style="list-style-type: none"> • Bamboo wholesale and retail markets • Participation in domestic trade fairs
To establish convergence and synergy among stakeholders for the development of bamboo	Adopt a coordinated approach covering production and marketing to assure appropriate returns to growers/ producers	--
To promote, develop and disseminate technologies through a seamless blend of traditional wisdom and modern scientific knowledge	Facilitate capacity building and human resources development	<ul style="list-style-type: none"> • Technology transfer & HRD • Demonstration of Plantation technology
To generate employment opportunities for skilled and unskilled persons, especially unemployed youths	Promote where appropriate, cooperatives and self-help groups to ensure support and adequate returns to farmers	--

Source: Secondary data from KFD

1.5.1 Plantation Development

- a) Area expansion and Maintenance of plantations: This component primarily aimed at expansion of area under bamboo plantation in the potential areas, both in Government forests as well as in non-forest lands for commercial utilisation. The main objective of this component was to increase production and productivity of the commercially

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important bamboo species and shoots for regular supply to the processing units for production of more value added products. While the cost for planting in forest areas was set at Rs. 25,000 per hectare, the bamboo growers in non-forest areas were extended direct subsidy upto 50% of the cultivation cost per hectare subject to a ceiling of Rs. 8,000 per hectare.

- b) Nurseries: It was envisaged that the planting materials would be supplied through centralised (departmental nurseries) and decentralised nurseries (Mahila and Kissan nurseries). The decentralised nurseries may be raised by individuals, SHGs, NGOs and groups.
- c) Improvement of existing stock: In order to improve the quality of products prepared by artisans, improvement of existing stock was undertaken to derive maximum benefits and returns, without substantial investment. It was learned from KFD that this activity mostly involved cultural operations.
- d) Technology transfer and HRD: Transfer of technology through training, frontline demonstration, publicity and training of trainers were an integral part of the mission. The trainings intended to impart information to farmers to adopt scientific measures for high-yielding plantations of bamboo and harvesting of shoots and acquaint them to various farming techniques through exhibitions and demonstrations. Further, project officers were to be trained in modern technological advances in bamboo plantations at various ICAR/ ICFRE institutes.
- e) Technology dissemination through front line demonstrations: Latest technologies were to be promoted in bamboo plantation through active involvement of farmers' participatory demonstrations in compact areas of one hectare.
- f) Micro irrigation: With the intention to irrigate bamboo plantations, particularly in summer months to promote better yield, support was provided towards installation of irrigation systems (Rs. 20,000 per hectare with a ceiling of 4 ha) depending on actual and emerging needs of the areas identified.
- g) Pest and disease management: As a disease control measure in bamboo plantations, Rs. 200/ ha was allocated as a one-time grant under the scheme.

- h) Innovative Interventions: It was intended that any new intervention in bamboo sector which may lead to increase in farm income by the introduction of innovative technology which are not covered under the NBM and any other schemes would be supported under this activity.
- i) Post-harvest storage and treatment facilities: This activity comprises of creating suitable warehouse facilities near villages to store and treat the bamboo that is harvested.

1.5.2 Handicrafts, Bamboo Marketing and Exports

- a) Bamboo wholesale and retail markets: This activity aimed at setting up bamboo wholesale/ retail markets to facilitate trading activities and also keep track of market information related to various bamboo products, enabling farmers and primary processors to obtain primary market information and data.
- b) Bamboo bazaars: It was envisaged to set up bamboo bazaars along with information centres with computer facilities for keeping track of various demand supply of bamboo products, costs, user industries etc.
- c) Retail outlets (showrooms): This activity aimed to set up retail showrooms in metro cities to popularise various bamboo handicrafts.
- d) Participation in domestic trade fairs: In order to popularise and market various bamboo products throughout the country, 30 participants from each state would be chosen and supported to participate in national level trade fairs twice a year.
- e) Participation in international trade fairs: In order to popularise Indian bamboo products throughout the world, 10 participants selected entrepreneurs were chosen from the participants of the national level trade fairs to display their products in international trade fairs twice a year.
- f) Market surveys: A market survey was to be conducted to estimate demand supply chain and present players and future demands and highlight how bamboo products were to be positioned and the market entry strategy thereby indicating pricing, supply, position and branding.

1.5.3 Implementation Monitoring Mechanism

- a) Monitoring and Evaluation: Apart from continuous in-house monitoring as per the monitoring format in the guidelines, mostly comprising the targets and achievements of various components, a third-party evaluation study was to be conducted using the impact assessment format with specific indicators prescribed in the guidelines⁹.

1.5.4 Performance of the Mission

The stipulated physical and financial targets and achievements for the period of evaluation were collected from the concerned section of the Karnataka Forest Department. Scrutiny of the data revealed that during the period of evaluation Rs.2953.80 lakhs was the financial target of which Rs. 2288.96 lakhs was expended, i.e. 77% achievement. The overall physical achievement of plantation activities (raising, maintenance and advance works) stands at 91%, where the target was 20,246 ha and achievement was 18,361 ha. The overall average achievement of physical activities is 56% which was impacted by no progress in some components over the period of evaluation.

In terms of physical activities, under Plantation Development component, 13 plantations development activities were taken up in public sector. One Kisan nursery was supported in public sector. Area expansion was done through raising plantation in 5200 ha, of which 5000 ha (96%) was in forest area and 200 ha (4%) was in non-forest area. Maintenance of plantations was done in 9255 ha, of which 8405 ha (91%) was in forest area and 850 ha (9%) was in non-forest area. Improvement of existing stock through works protection against grazing, fire and soil enriching and tending operations were done in 3906 ha. Under technology transfer and HRD, there was no progress during the period of evaluation. In terms of demonstrating plantation technology, 1 state level programme, 4 district level programmes were conducted and 50 artisans have participated in training activities.

Under the Handicrafts, Marketing and Exports component, there was no progress in supporting/ establishing/ facilitating bamboo wholesale and retail markets. Artisans participated in 2 domestic trade fairs, details of which were not available for further understanding.

⁹Anonymous. 2006. National Bamboo Mission. Operational Guidelines. Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India, Krishi Bhawan, New Delhi

Under the Implementation Monitoring Mechanism component, one evaluation study was carried out for the works implemented from 2009-10 to 2012-2013 (4 years) by two external agencies, where 54 plantations covering an extent of 1579 ha was evaluated. As many as 23 other works which mostly included SMC and improvement of natural growing stock were evaluated. There were no works related to utilisation of bamboo resources and value addition.

The overall average survival was found to be 71.37%. Plantations were also graded as very good, good, average, poor and failed. Of the sample plantations, 35.96 % were graded very good (above 80% survival of seedlings), 39.47% as good (survival rate 61-80%), 15.027% as average (survival rate 41-60%), 9.96% as poor (survival rate 21-40%) and 9.09% as failure (survival rate below 10%). All other works evaluated were found to be good. ¹⁰

¹⁰ National Bamboo Mission (NBM) Report, Evaluation of Forestry Works 2009-13, August, 2015, Karnataka Forest Department

Table 2: Physical Targets and Achievements 2013-14 to 2016-17

Note: PT –Physical target, PA – Physical achievement

Sl. No.	Components	Unit	2013-14		2014-15		2015-16		2016-17		TOTAL		Achievement %
			PT	PA	PT	PA	PT	PA	PT	PA	PT	PA	
A	PLANTATION DEVELOPMENT												
1	Plantation Development												
	a) Plantation Development in Public sector	No.	12	12	1		1	1			14	13	93
	b) Kisan Nurseries in Public Sector	No.					8	1			8	1	13
2	Area expansion												
	a) Plantation in Forest Area	Ha	2500	2500	500	500	2000	2000			5000	5000	100
	b) Plantation in Non-forest Area	Ha	500	200	500		500				1500	200	13
3	Maintenance of Plantations												
	a) Plantation in Forest Area	Ha	3405	3405	2500	2500	500	500	2000	2000	8405	8405	100
	b) Plantation in Non-forest Area	Ha	500	150	200	200			500	500	1200	850	71
4	Improvement of existing stock	Ha	1200	1200	400	400	2541	2306			4141	3906	94
5	Technology transfer & HRD												
	a) Training of farmers within state	No.	50		50	0	50	0			150	0	0
	b) Training of farmers outside state	No.	25								25	0	0
	c) Training of Field Functionaries	No.	40				150	0			190	0	0
6	Demonstration of Plantation Technology	No.											

Sl. No.	Components	Unit	2013-14		2014-15		2015-16		2016-17		TOTAL		Achievement %
			PT	PA	PT	PA	PT	PA	PT	PA	PT	PA	
	a) State level	No.	1	1	1	0					2	1	50
	b) District level	No.	4	4							4	4	100
	c) Training for artisans	No.	50	50							50	50	100
B	HANDICRAFTS, MARKETING & EXPORTS												
7	Bamboo wholesale & retail markets	No.			1	0	3	0			4	0	0
8	Participation in Domestic Trade Fairs	No.	2	2	1	0					3	2	67
C	IMPLEMENTATION MONITORING MECHANISM												
9	National Bamboo Cell	Project									0	0	
10	State implementation bodies Project report preparation, consultancy	Project									0	0	
11	Procurement of Balco/ Burma Bamboo (tissue culture plants) from authorized agency	Project	0.83	0.83							0.83	0.83	100
	Average achievement %												56

Source: Secondary data from KFD

Table 3: Financial Targets and Achievements 2013-14 to 2016-17

Note: FT – Financial target, FA – Financial achievement

Sl. No.	Components	Unit	2013-14		2014-15		2015-16		2016-17		TOTAL		Achievement %
			FT	FA	FT	FA	FT	FA	FT	FA	FT	FA	
PLANTATION DEVELOPMENT													
1	Plantation Development												
	a) Plantation Development in Public sector	No.	32.76	32.76	40		40	1.5			112.76	34.26	30
	b) Kisan Nurseries in Public Sector	No.					80	8.5			80	8.5	11
2	Area expansion												
	a) Plantation in Forest Area	Ha	312.5	312.5	105	105	420	133.95			837.5	551.45	66
	b) Plantation in Non-forest Area	Ha	20	8	26.5		26.25				72.75	8	11
3	Maintenance of Plantations												
	a) Plantation in Forest Area	Ha	425.63	425.63	312.5	316.12	52.5	52.5	210	144.38	1000.63	938.63	94
	b) Plantation in Non-forest Area	Ha	20	6	8	8			52.5	52.5	80.5	66.5	83
4	Improvement of existing stock	Ha	96	96	80	80	508.2	451.2			684.2	627.2	92
5	Technology transfer & HRD												
	a) Training of farmers within state	No.	0.76		0.5		0.5				1.76	0	0
	b) Training of farmers outside state	No.	0.63								0.63	0	0
	c) Training of Field Functionaries	No.	3.2				0.45				3.65	0	0%

Sl. No.	Components	Unit	2013-14		2014-15		2015-16		2016-17		TOTAL		Achievement %
			FT	FA	FT	FA	FT	FA	FT	FA	FT	FA	
6	Demonstration of Plantation Technology	No.											
	a) State level	No.	3	3	3						6	3	50
	b) District level	No.	4	4							4	4	100
	c) Training for artisans	No.	3.5	3.5							3.5	3.5	100
B	HANDICRAFTS, MARKETING & EXPORTS												
7	Bamboo wholesale & retail markets												
	a) Bamboo wholesale & retail markets	No.			3.5			10.5			14	0	0
8	Participation in Domestic Trade Fairs	No.	7.5	7.5	8						15.5	7.5	48
C	IMPLEMENTATION MONITORING MECHANISM												
9	National Bamboo Cell												
	a) Evaluation and Monitoring	Project	1	1							1	1	100
10	State implementation bodies Project report preparation, consultancy	Project	14.26	14.26							14.26	14.26	100
11	Procurement of Balco/ Burma Bamboo (tissue culture plants) from authorized agency	Project	21.16	21.16							21.16	21.16	100
	TOTAL		965.9	935.31	587	509.12	1138.4	647.65	262.5	196.88	2953.8	2288.96	
	Achievement %			97%		87%		57%		75%		77%	Average 55%

Source: Secondary data from KFD

1.6 Scope of the Evaluation

The Energy and Resources Institute (TERI) was entrusted by Karnataka Evaluation Authority (KEA) to carry out the task of Evaluation of Compensatory Afforestation Fund Management and Planning (CAMPA) 2013-14 to 2015-16, 13th Finance Commission 2013-14 to 2014-15, National Afforestation Programme (NAP) 2013-14 to 2016-17 and National Bamboo Mission (NBM) 2013-14 to 2016-17. This report focuses on CAMPA, while separate reports were submitted for the other three schemes. This report focuses on National Bamboo Mission, while separate reports are being submitted for the other three schemes.

1.6.1 Purpose of the Evaluation

To assess the achievement of the objectives of the NBM and propose suggestions based on the observations to enhance effectiveness in delivery of the NBM.

1.6.2 Objectives of the Evaluation

To evaluate the works under NBM that were carried out by Territorial, Wildlife, Research, Working Plan and Training wings of the Karnataka Forest Department.

- To assess whether the desired impact on natural and social environment is achieved and or undesirable impact is avoided under the mission.
- To assess the efficiency and effectiveness of the mission and the ability of the works executed to meet the intended objectives of the mission.
- To assess the performance of the works under different categories and across the divisions.
- To examine the requirement of works executed under the mission, whether these works to be continued or closed.
- To assess whether the existing arrangements of accounting and reporting are adequate and transparent.
- To analyse whether the grants under the mission were utilized for the intended objectives/ purposes.
- To examine the quality of works and the final success rates are satisfactory etc.
- To examine the impact of beneficiary schemes on the households

1.6.3 Evaluation Questions

The detailed evaluation questions given as per the ToR maybe referred in the annexure. The main components that were studied were as follows.

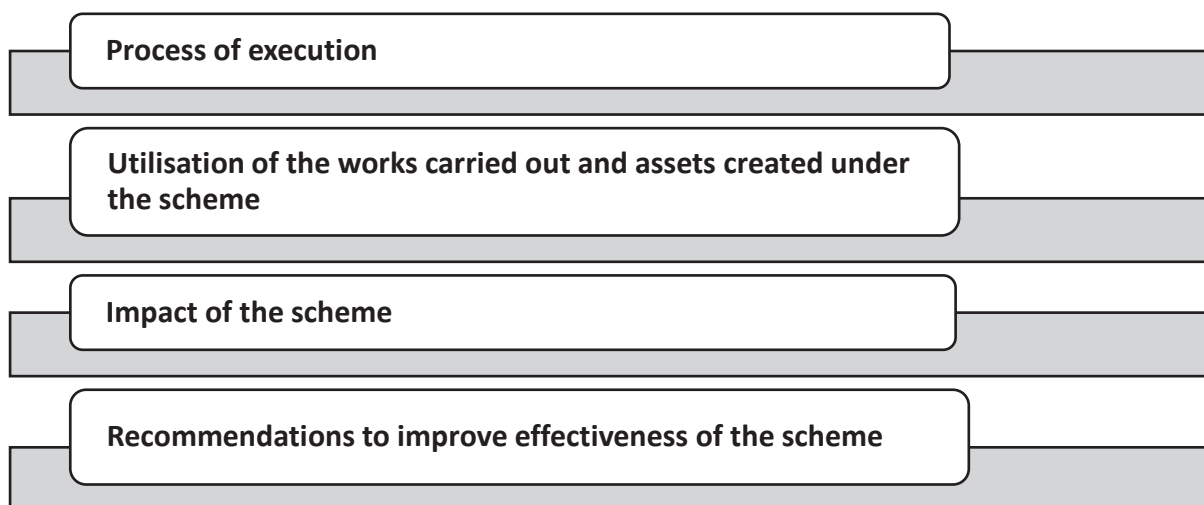


Figure 1:Major Components of Evaluation

1.7 Review of Literature

Secondary data such as scheme guidelines, target and achievements for the reference years of the study and previous evaluation reports were sourced from KFD. In addition, review of existing literature that studied similar aspects was researched online. The major study findings are tabulated to gain an understanding of the work already done in this direction.

Table 4: Brief summary of review of literature

Sl. No.	Study	Highlights
1.	Given. Lisa. M. 2008. The SAGE Encyclopaedia of Qualitative Research Methods. (Vol. 1-0). Thousand Oaks, CA. SAGE Publications.	In-depth interviews were conducted with officers and other stakeholders wherever necessary. The in-depth interviews (IDI) encourages and prompts participants to talk in depth about the topic under investigation without the researcher's use of predetermined, focused, short-answer questions as suggested by Given. L.(2008).
2.	Kruger Richard. 2017. Observation in Evaluation, retrieved from https://www.betterevaluation.org/en/resources/guide/how_to_use_observation	Kruger .R. (2017) opines that observation has a unique niche among evaluation methods and careful observation is distinctive in three important ways: the person doing the observation is trained, prepared, and systematic.

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Sl. No.	Study	Highlights
3.	Anonymous. 2006. National Bamboo Mission. Operational Guidelines. Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India, Krishi Bhawan, New Delhi	The operational guidelines details out the background, mission objectives, strategies, structure, procedure for approval and implementation, mission interventions, monitoring and evaluation and overall targets under the mission.
4.	Anonymous. April 2014. Internal Evaluation Report of 2007-08 Works. Karnataka Forest Department.	The report details the findings of the internal evaluation carried out for the Forestry Works carried out during 2007-08. Describing the salient features of the report, the weighted average survival rates of all the departmental plantations sampled have been used as the indicator for grading the performance. The index of survival rates are, <20% survival is failed, 21 – 40% is poor, 41 – 60% is average, 61 – 80 % is good and > 80 is very good.
5.	Gupta Atul Kumar. March 2008. National Bamboo Mission : a Holistic Scheme for Development of Bamboo Sector in Tripura’ in the Indian Forester, Volume 134, Issue 3. Accessed at http://www.indianforester.co.in/index.php/indianforester/article/view/714	It is expected that the National Bamboo Mission will usher ecological and economic prosperity in the State as also generate trade and commerce in bamboos, leading to national prosperity as well.
6.	Anonymous. 2012. Species and Planting Technique Models. General Guidelines 2012. Karnataka Forest Department. Government of Karnataka.	The state is divided into four silvi (agro) climatic zones for the purpose of this guideline/ report. The taluks/ districts in each zone are as per the agro-climatic zone recognize by the State Agriculture Department. The zones are grouped as follows: <ul style="list-style-type: none"> • Dry zone – North eastern dry zone, northern dry zone, central dry zone, eastern dry zone, southern dry zone. • Transitional zone – southern transition zone, northern transition zone, north eastern transition zone • Malnad and Western Ghat zone – Corresponding to Hilly zone of Karnataka Land Use Board classification • Coastal zone – Coastal zone

Sl. No.	Study	Highlights
7.	<p>Anonymous. 2013-14. Mid Term Third Party Evaluation Study of National Bamboo Mission. Agriculture Finance Corporation submitted to National Bamboo Mission, Ministry of Agriculture, Department of Agriculture and Cooperation, Govt. of India.</p> <p>Accessed at https://studylib.net/doc/8249544/mid-term-third-party-evaluation-study-of-national-bamboo</p>	<p>More number of local people should be involved in raising nurseries by equipping them with technical know- how and improving their entrepreneurial skills, modifying cost norms and developing effective quality control mechanism.</p>
8.	<p>Anonymous. August 2015. National Bamboo Mission (NBM) Report, Evaluation of Forestry Works 2009-2013, Karnataka Forest Department</p>	<p>Evaluation study has been carried out for the works implemented from 2009-10 to 2012-2013 (4 years) by two external agencies in 2013-14, where 54 plantations covering an extent of 1579 ha has been evaluated. As many as 23 other works which mostly included SMC and improvement of natural growing stock were evaluated. There were no works related to utilisation of bamboo resources and value addition. The plantations were graded as follows:</p> <p>Performance of natural regeneration</p> <ol style="list-style-type: none"> i. Very good: > 81% saplings having < 10 cms girth/ 0.1 ha ii. Good: 61-80% saplings having <10 cms girth/ 0.1 ha iii. Average: 41-60% saplings having <10 cms girth/ 0.1 ha iv. Poor: below 40% saplings having <10 cms girth/ 0.1 ha <p>The overall average survival was found to be 71.37%. Plantations were also graded as very good, good, average, poor and failed. Of the plantations sampled, 35.96 % were graded very good (above 80% survival of seedlings), 39.47% as good (survival rate 61-80%), 15.027% as average (survival rate 41-60%), 9.96% as poor (survival rate 21-40%) and 9.09% as failure (survival rate below 10%). All other works evaluated were found to be good.</p>

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Sl. No.	Study	Highlights
9.	Lahiry Samar, 4 th July 2018. The story of National Bamboo Mission, Down to Earth. Accessed at https://www.downtoearth.org.in/blog/agriculture/the-story-of-national-bamboo-mission-61016	It is perceived that the emphasis of NBM has, by and large, been on propagation and cultivation of bamboo, with limited efforts on processing, product development and value addition. This has caused weak linkages between farmers and the industry. There is a need to develop an integrated bamboo industry in the country. It is hoped that the restructured NBM would focus on the development of a complete value chain of the bamboo sector to link growers with consumers.
10.	Anonymous. Bamboo – Success stories in agriculture. Karnataka Forest Department.	A publication by KFD, year not mentioned, lists success stories of farmers Mahesh Talegoudar, Bidarahalli, Mundargi taluk, Baburao Bhimappa Kelageri, Bylur Sonarwadi, Khanapura taluk, Vijay Dhulappa Khetkale, Nagoda, Khanapura taluk, and G. K. Hegde, Mathihalli, Hangal taluk and bamboo artisan Parashurao Shivaji, Khanapur taluk as beneficiaries of NBM.

Source: Secondary data

2 EVALUATION METHODOLOGY

2.1 Approach

The study was a summative evaluation wherein the scheme was evaluated post implementation to understand the overall effectiveness of the program/ scheme in terms of the objectives set out. The purpose was to assess the overall impact of the scheme, while also studying the effectiveness of the process/ delivery mechanism followed and to make suitable recommendations thereof to enhance the effectiveness and impact. Multi-dimensional approach including scientific, interactive/ consultative, objective-oriented, analytical, practical and participatory approach using appropriate methods were followed to gather qualitative and quantitative data. Primary and secondary data were collected and analysed to understand if the works executed are contributing to the objective of the scheme, if so to what extent.

For a project of this nature, the study was carried out using qualitative and quantitative methods.

The approach process and methods that were used are as below:

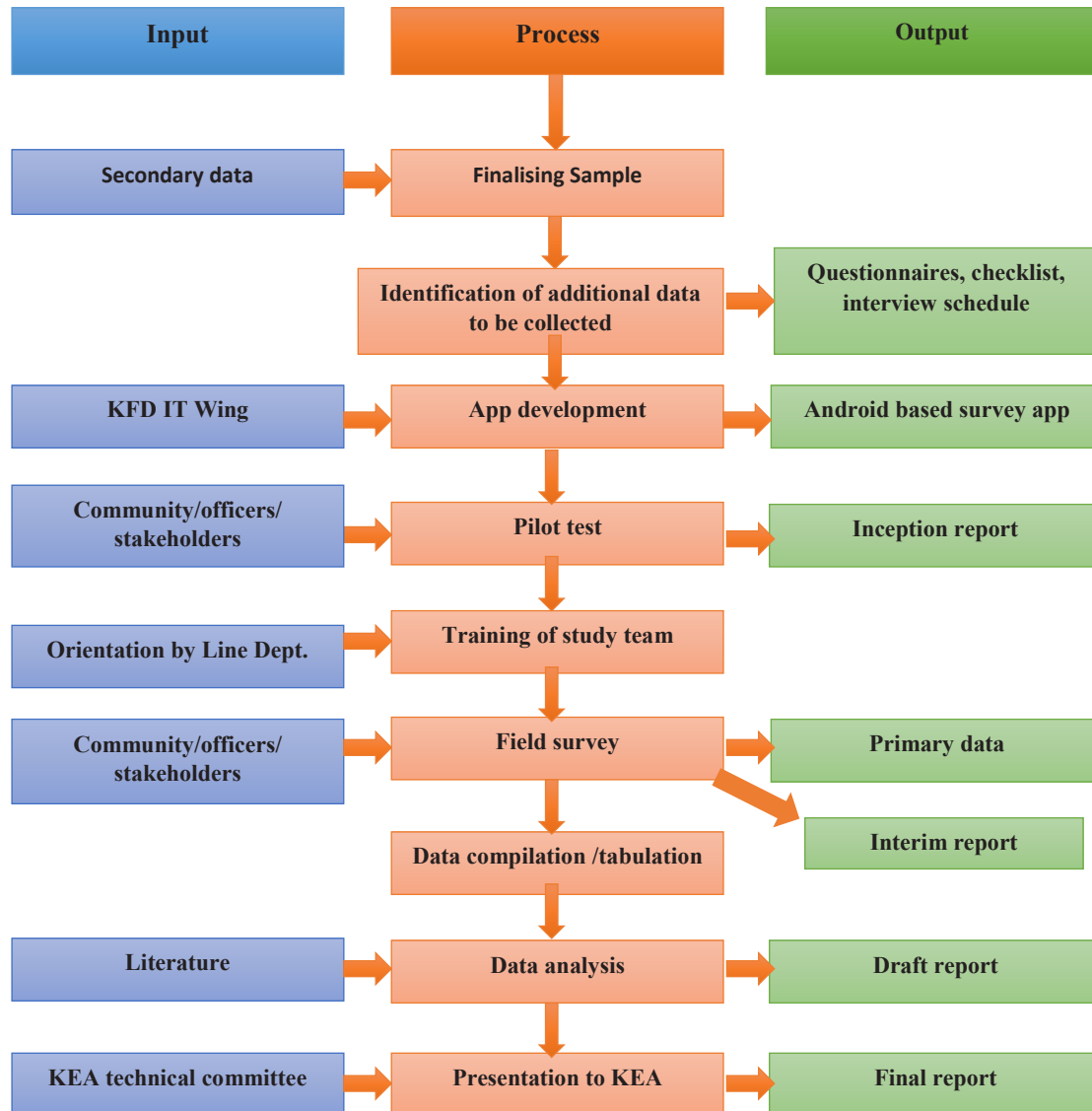


Figure 2: Approach for the evaluation study

2.2 Theory of Change

The following theory of change was developed based on the components of the forestry works assigned for evaluation. The outputs are measurable, while outcomes may be perceivable in the medium - long term after work implementation. The impacts are indicative and can be perceived only in the long term, which is not under the ambit of this study since the works have been executed 3-5 years ago.

Table 5: Theory of Change

Resources/ Inputs	Activities	Outputs	Outcomes	Impact
Policies Schemes Objectives Guidelines Budget Manpower Knowledge Infrastructure Requisite materials	Raising of nursery, plantations and bamboo plantations	<ul style="list-style-type: none"> No. of nurseries and seedlings raised No. of Plantations raised No. of Bamboo plantations raised Area covered by plantation 	<ul style="list-style-type: none"> Species-wise survival rate Improved forest tree cover Increased area under bamboo plantation Reduced dependency on forest for fuel wood and maintenance 	<ul style="list-style-type: none"> Improved environment in the areas planted Increased biodiversity Reduced emission of greenhouse gases Reduced erosion and pollution Enhanced livelihood of bamboo artisans
	Soil moisture conservation works	<ul style="list-style-type: none"> No. of SMC works undertaken 	<ul style="list-style-type: none"> Better moisture and soil retention in plantations Enhanced survival of plantations Enhanced water availability in summer months for wildlife Better wildlife conservation and management 	<ul style="list-style-type: none"> Increased soil and moisture conservation in the watershed & forests Enhanced flora and fauna and biodiversity conservation

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Resources/ Inputs	Activities	Outputs	Outcomes	Impact
	Specialised works of Wildlife	<ul style="list-style-type: none"> No. of Anti-poaching camps established, including manpower No. of measures put in place to reduce man-animal conflict No. of equipment (available for anti-poaching and wild life protection) procured for wildlife protection works No. of fire protection camps 	<ul style="list-style-type: none"> Reduction in the number of poaching cases Reduction in the number of animal attacks cases Reduction in cases of forest fires Better wildlife conservation and management Better cooperation and support of communities in forest fringe areas 	<ul style="list-style-type: none"> Enhanced flora, fauna and biodiversity conservation Enhanced participation of communities in wildlife protection and management
	Specialised works of Working Plan	<ul style="list-style-type: none"> No. of survey and demarcation works undertaken No. of boundary works undertaken 	<ul style="list-style-type: none"> No. of working and management plans prepared and being implemented Area of forest boundary demarcated Reduction in encroachment cases Forest land protected from encroachment 	<ul style="list-style-type: none"> Preservation of diverse flora relevant to different forest locations
	Specialised works of Research and Utilisation	<ul style="list-style-type: none"> No. of activities taken up under the research wing No. of research/ preservation plots maintained 	<ul style="list-style-type: none"> The issues of the operational wings of the department are being addressed and requirement is met adequately Learnings from research plots being adopted to improve quality and survival of plantations Improved quality and survival of plantations 	<ul style="list-style-type: none"> Research activity is contributing to the broad objectives of forest policy

Resources/ Inputs	Activities	Outputs	Outcomes	Impact
	Specialised works of Training wing	<ul style="list-style-type: none"> No. of training programmes conducted for department staff No. of awareness programmes conducted No. of infrastructure created/enhanced for training purpose 	<ul style="list-style-type: none"> The capabilities of the trained staff to discharge duties improved Extent of participation of communities in awareness programmes Department has adequate infrastructure for training Department staff are equipped to handle all tasks and challenges in the protecting and conserving forests 	<ul style="list-style-type: none"> Forests are managed in a scientific manner Enhanced awareness among communities about forest conservation and protection Enhanced participation of communities in forest protection and management
	Construction and maintenance of Buildings, Roads and other infrastructure	<ul style="list-style-type: none"> No. of buildings, roads and infrastructure developed No. of works undertaken/equipment procured to improve digitization and communication network 	<ul style="list-style-type: none"> Percentage of assets/infrastructure is being utilised for the said purpose Latest technology/ software and equipment being used 	<ul style="list-style-type: none"> Department efforts towards forest conservation and protection is strengthened and augmented Department is modernised by using latest It technologies
	Providing individual/community benefits	<ul style="list-style-type: none"> No. of people benefitting from LPG connections and continued usage No. of people benefitting from bamboo plantations 	<ul style="list-style-type: none"> Percentage of household adopted LPG, thus changing the fuel used for cooking Reduced dependency on forest for fuel wood Employment opportunities generated for skilled and unskilled persons 	<ul style="list-style-type: none"> Economic upliftment of households depending on bamboo related enterprises Productive use of time saved by forest fringe community women

Source: Secondary data and TERI Inception report

2.3 Methodology

2.3.1 Study area

Thirteen forest circles and all forest divisions in Karnataka State comprised the study area. A mixed method approach was followed for this study as follows:

- Laying and Measurements of sample plots in plantations
- Field Observations of Other Works
- Interview – with officers/ field officers/ individual beneficiaries
- Focus group discussion with beneficiaries of community assets

There was considerable diversity in the works to be evaluated, which necessitated multiple methods to be used. Most importantly, visiting the work sites, physical verification and taking measurements of the plantations, observing other works such as civil structures, soil and water conservation works, roads, working plan, research, boundary consolidation etc. were carried out.

The boundary of the plantation was perambulated using the KFD android app and random plots generated in the app were considered as the centre of the sample plot to be laid. A minimum of one sample plot was laid for every 5 ha of plantation and a maximum of 10 sample plots were laid for plantations above 50 ha. The size of each sample plot was 1000 square meters (0.1 ha), having a measurement of 31.42 meters x 31.42 meters, laid at random intervals (as indicated in the KFD app) in the block plantation selected for evaluation. In case of plantations like Roadside, Greening of urban areas, Institutional plantations etc., the whole plantation was considered as one sample and 100% evaluation was done in each case.

Observation method was used to study the quality of the works (including community benefit works) executed based on appropriate parameters. Kruger, R. (2017)¹¹ opines that observation has a unique niche among evaluation methods and careful observation is distinctive in three important ways: the person doing the observation is trained, prepared, and systematic.

In-depth interviews were conducted with officers and other stakeholders wherever necessary. The in-depth interviews (IDI) encourage and prompt participants to talk in depth about the

¹¹ Kruger Richard. 2017, Observation in Evaluation, retrieved from https://www.betterevaluation.org/en/resources/guide/how_to_use_observation

topic under investigation without the researcher's use of predetermined, focused, short-answer questions as suggested by Given. L. (2008).¹²

2.3.2 Sampling Design

Forest Department has Territorial, Social Forestry and Wild life Divisions. Apart from this, there are specialized wings like Working Plan & Research which are divided as functional units. The Training wing has a state academy with six institutes spread across the state. At first stage, the Division/unit wise work list as provided by respective APCCF for the scheme was compiled for the whole state in the forest department. Then from this, state level work list the scheme, sorting of various types of works into nine categories was done. This was the second stage of clustering being done at the Department level. From this, the sample work the list for evaluation was generated for the scheme by random sampling of 10% of works from each category (type) of work in the scheme covering all the circles in the State. Thus, the method followed is basically a multi stage sampling in which the first stage of cluster formation is at division/unit level and second stage is at type of work level and 10% works were identified randomly at KEA. The sample to cover all the Circles and all the categories of works implemented in a circle. Selection of samples was based on proportional representation to its area/ no. of works and representing all years of work.

2.3.3 Sample size

Twenty six plantations were selected for sampling out of 248 plantations raised/ maintained during the period of evaluation. Of these, 21 (81%) were in forest areas and 5 were in non-forest area (19%). Distribution of sample plantations by circle and division is presented in the table below:

Table 6: Distribution of sample plantations by Circle and Division

Name of Circle	Name of Division	NBM	
		Total No. of plantations	Sample plantations
Ballari	Ballari		
	Chitradurga	4	
	Davanagere	8	2
	Koppal		
	Sub total	12	2

¹²Given. Lisa. M. , The SAGE Encyclopaedia of Qualitative Research Methods. (Vol. 1-0).Thousand Oaks, CA. SAGE Publications. 2008

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Name of Circle	Name of Division	NBM	
		Total No. of plantations	Sample plantations
Bangalore	Bangalore (U)		
	Bangalore (R)		
	Chikkaballapura		
	Kolar		
	Ramanagar		
	Sub total	0	0
Belagavi	Bagalkot		
	Belagavi	16	2
	Sub total	16	2
Chamarajnagar	Cauvery WL		
	M M Hills		
	Sub total	0	0
Chikkamagalur	Chikkamagalur	18	2
	Koppa	54	5
	Sub total	72	7
Dharwad	Dharwad		
	Gadag		
	Haveri		
	Sub total	0	0
Hassan	Hassan	8	
	Tumkur	4	1
	Sub total	12	1
Kalaburgi	Bidar		
	Kalaburgi		
	Raichur		
	Yadgir		
	Sub total	0	0
Kodagu	Madikeri	9	2
	Vijrajpet	6	
	Sub total	15	2
Mangaluru	Karkala		
	Kundapur		
	Mangaluru		
	Sub total	0	0
Mysuru	Hunsur	7	1
	Mandya		
	Mysuru		
	Sub total	7	1
Shivamogga	Bhadravathi		
	Sagar		
	Shivamogga		
	ShivamoggaWL		

Name of Circle	Name of Division	NBM	
		Total No. of plantations	Sample plantations
	Sub total	0	0
Uttara Kannada	KTR Dandeli	16	
	Dandeli WL		1
	Haliyal	55	5
	Honnavar		
	Karwar	22	3
	Sirsi	5	1
	Yellapur	16	1
	Sub total	114	11
	Grand Total	248	26

Source: Terms of Reference

Table 7: Year-wise Sample Plantations

Year	NBM	
	No. of plantation	No. of sample
2013-14	127	14
2014-15	63	5
2015-16	17	2
2016-17	41	5
Total	248	26

Source: Secondary data and Terms of Reference

* No. of plantations carried out in CAMPA and NAP were per the works list and sampling provided by KEA. These numbers were different from the ToR

Table 8: Details of Officers Interviewed

Designation	Territorial	Wildlife	Aranya Bhavan	Total
PCCF			5	5
APCCF			10	10
CCF	6	1		7
CCF & Director		2		2
CF	1			1
DCF	17	3		20
ACF	19	7		26
RFO	51	25	1	77
DRFO	51	15		66
Forest Guard	1			1
Total	146	53	16	215

Source: Primary data

2.3.4 KEA and KFD consultation

Discussions were held with the officers of various levels to understand the ToR, scope of work, secondary data sources and data collection process on the KFD app. Fine tuning of the app and modifications consumed considerable time initially.

2.3.5 Tools for Evaluation

Primary data was collected on the android based evaluation application developed by the ICT wing of Karnataka Forest Department. The main purpose of the app was to use it for plantation perambulation and plot location selection, which was needed to understand the actual extent of plantation and ensure random selection of sample plot location. The GPS location and photo of each sample was also captured in this application. Series of discussions and field trials were held in association with KFD to fine tune the app to the best possible extent. It was agreed that the data security including data collected/ photo/ plantation map and backup was the responsibility of the KFD. As per the discussion with KFD it was proposed to consider the surviving plants for estimating the survival percentage and ocular perception of field investigator to determine the health of the plants. Similarly, in other works, in addition to observation by field investigators, the utility of the works was assessed in discussion with the forest watchers, guards and other staff as appropriate.

An interview schedule was prepared to gather information from key persons at various levels including policy makers, supervisors and field executives. An android app called 'Collect' app was developed in-house by TERI to elicit information from individual beneficiaries. In addition, a focus group discussion schedule was prepared to interact with community beneficiaries.

The methodology and tools used are presented below:

Table 9: Methodology and tools

Work	Method of data collection	Tool
Plantation	Laying and measurement of sample plots	KFD Evaluation app (web and android)
Other Works	Observations	KFD Evaluation app (web and android)
Individual beneficiaries	Interview	Collect Android App (Interview schedule)
Community benefits	Focus Group Discussion	FGD checklist
Implementation and Administration	Interview with officers/ field officers	Questionnaire

Source: TERI Inception Report

In addition to the above, a detailed questionnaire was prepared to obtain division level information on the scheme. Tools were submitted to KEA with the inception report and due approval was obtained.

2.3.6 Hypothesis

The hypothesis that there is variation in survival percentage of plantations across the different forest circles was formulated.

2.3.7 Techniques for Evaluation

Gross plantation area was considered as the total land area falling within the boundary of plantations. It included areas like river, marshy patch, rocky outcrops, ponds etc. Net plantation area was considered as the actual area within the plantation boundary excluding the area which was not planted with a given species. It excluded the non-planted area like river, marshy patch, rocky outcrops, ponds etc. The sample plantations were selected irrespective of the area. The gross area and net area and all other secondary data were entered into the web app from the respective plantation journal, sample plots were laid and data collected in the presence of the local officers/ staff.

Survival was considered as the actual number/ count of seedlings surviving in the sample plots, irrespective of the health of the existing seedlings. This number was represented as

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‘total seedlings survived’. The number of empty pits in the sample plots was entered in the android application, based on which ‘calculated failure’ was generated automatically by the android application. The number of total seedlings planted was derived as follows:

Total seedlings planted = Total seedlings survived + Total calculated failures

Survival percentage(%)= Total seedlings survived / Total seedlings planted * 100

The health/ general performance of the seedlings of a given species in the plantation was assessed based on ocular estimation. The best performing seedlings within the plantation was compared with the poorest ones within the same plantation and was graded as good, satisfactory and poor.

2.3.8 Evaluation Team

Five field teams, each consisting of one key professional and one field assistant was formed to collect plantation data and a team of four TERI professionals with diverse expertise carried out evaluation of other works component. The study team consisted of trained TERI professionals and also retired officers of the KFD, all of whom have been involved in evaluation of works of the forest department earlier using the android app. The team members were oriented on the methodology and the process to be followed for data collection to ensure uniformity in data collection.

It was ensured that all the team members followed the same protocol i.e. all team members adopted the same approach in collecting field information, laying sample plots, and interviewing in similar manner. This procedure helped minimise observer bias and avoid inconsistency in reporting.

2.3.9 Pilot study

One of the major tasks in this assignment was finalisation of the web app and android app developed by ICT section of KFD. Several rounds of tests, discussions and deliberations were carried out prior to finalising the app.

The first pilot test was conducted initially in Chikkaballapur range on 13th May 2019 along with the representatives of KEA (ICT Manager) and KFD (Range Forest Officers of ICT and Evaluation sections) to gain an understanding of the application and its feasibility. Raising of plantation in encroachment evicted area in Kyathanahalli block 1 and another work on vehicle parking shed in Chikkaballapur division office were selected for this study. The secondary data was first input into the web app in the Chikkaballapur range office and then the works were evaluated on the field. Several challenges were faced during this test, wherein the android app failed to work without the access to internet and some modifications were required in the web app, android app, questions to be added to the app and some modifications in the app from programming perspective which was communicated to KEA and KFD on 14th May 2019. Based on this field trial, a revised version of the app was tested for second time in Cubbon Park and TERI premises on 18th June 2019. Issues found during this iteration were shared with KEA and KFD.

On 20th June 2019, the revised app was tested for the third time in the Institute of Wood Science and Technology along with the Range Forest Officers (ICT and Evaluation sections). The app with all validations (version 1.2.5.6.1) was given to TERI on 20th July 2019 vide email from KEA. This version was tested for fourth time in Cubbon Park and TERI premises on 22nd July 2019. Issues faced were once again shared with KEA and KFD for modification.

This version was pilot tested for the fifth time on 30th July 2019 at Bangalore Division, Doddaballapur sub division, Devenahalli range. The app was tested in the presence of Deputy Conservator of Forests, Assistant Conservator of Forests, Range Forest Officer, Deputy Range Forest Officer and team. One plantation and two boundary consolidation works were tested from the samples selected.

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Photo 1: Secondary data entry at Chickballapur Range Office



Photo 2: Pilot test at Cubbon park



Photo 3: Data collection with Android app, Devanahalli range, Bangalore Rural division



Photo 4: Project Team at Devanahalli range, Bangalore Rural division

2.3.10 Observations of the Pilot Study

a) Plantation

The Akkupet plantation established under 13th Finance Commission raised in 2013-14 was selected for the study. This plantation followed the ANR model in 3.24 ha of land where 850 seedlings of Honge, Hippe, Mathi and Nerale were planted in pits (0.60x 0.60x0.60) with an espacement of 5m x 5m. Some records were available, while plantation journal was incomplete. Planting density was 262/ha. Maintenance was done for two years thereafter. There was no protection measure around the plantation.

One sample plot was laid to understand the details of plantation. In the sample plot, it was observed that only 7 (14.28%) out of 49 plants planted had survived, which were all Honge species. This low survival was attributed to poor soil quality and drought as explained by the local officers. There were no SMC works in this plantation and there was no VFC.

b) Other Works

Two boundary consolidation works, i.e. cattle proof trenches (CPT) were selected for the study. One work was undertaken in 2013-14 under CAMPA and another one in 2014-15 under 13th Finance. Records were available for one work, while it was not available for the other. Incidentally both works were undertaken in B.S. Gidakaval which is a Reserve Forest (predominantly eucalyptus trees) with adjoining private farm lands. CPT was done in the same forest land in 2001-02, 2006-07, 2010-11 and 2013-14. In both cases selected for study, the CPT was intact with shrub and vegetation growth in some places. It was observed that in few locations the CPT had been intentionally breached and could be easily accessed by cattle. It was understood that there was an ancient temple inside this forest, which villagers often visit. Apart from this usage, the forest boundary was maintained.

The KFD app was a useful tool that saves data entry time, besides reducing human bias. However, over the course of using the app for the field study, it was observed that some issues were still persisting (data loss, uploading issues etc.). In addition, the output tables need to be modified to suit the report requirements and in a way which can be easily tabulated, especially species-wise data. These issues were brought to the notice of KEA and KFD.

2.3.11 Interim Report

An interim report was submitted to the Karnataka Evaluation Authority on 3rd January 2020 vide email and hard copy on 14th January 2020 in addition to the agreed deliverables. The report was presented to KEA on 14th January 2020. The report presented a preview into the way in which data was analysed based on the objective of the scheme (the report was expected to answer the evaluation questions raised in the ToR, and was later modified to assess the achievements of the objectives of the schemes as suggested by KEA).

This modification necessitated gathering additional data adding to additional resources and time. At this stage, data collection was in progress, while data collection on certain aspects such as interview with officers was yet to commence, and much of the secondary data was awaited from Karnataka Forest Department. The app based primary data was yet to be provided to TERI in a usable form (especially species-wise data) and certain issues with the app still persisted. Hence, the content in this report was cursory and more in terms of being an initial template for the draft report.

2.3.12 Limitations

- Time lag between works executed and evaluation due to which some works are not amenable for evaluation
- Availability of required data and information in a timely manner
- Data maintenance and data parameters maintained are not amenable for evaluation
- Option to record non-availability of information/ work in the app
- Ambitious evaluation tasks overlays the time frame
- Resolution of some issues with the app and uploading data remained ongoing
- Delay in receiving secondary data from forest department
- There was limited response to questionnaires from KFD officers
- Shift in the focus of evaluation from answering the questions to meeting the objectives of the scheme necessitated major overhauling of data collection and hence could be carried out to a limited extent due to paucity of time
- The expectation from the study exceeds the time frame and resources allocated for the study.

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3 RESULTS AND DISCUSSION

National Bamboo Mission has focused its thrust on area based regionally differentiated strategy for both forest and non-forest areas at national level. Various activities proposed aimed to increase the production and productivity on one side blending with convergence and synergy amongst stakeholders besides effective and economic utilisation of the bamboo resources. The NBM guidelines provide a framework for implementation. Apart from setting physical and financial targets for some of the activities, the KFD has not prepared a log frame for the period of evaluation.

This chapter discusses the results of the primary data collected with respect to the activities set forth in the mission covering the following broad components/ issues as follows:

- i. Plantation Development
- ii. Handicrafts, Marketing and Exports
- iii. Implementation Monitoring Mechanism

In the evaluation of NBM, as per the ToR, plantations have been sampled, while other works were not part of the design. However, interaction were held with members of Bamboo Artisan Associations to understand the extent of their involvement in the planning, to what extent the raw material requirements were being met through the implementation of the scheme, their felt needs, problems and suggestions to make the delivery of the scheme more meaningful.

3.1 Plantation Development

This activity was undertaken to address the objectives of promoting growth of bamboo sector and increasing coverage of area under bamboo. Apart from planning, development of plantations, monitoring, this component included technology transfer and human resource which aimed to facilitate capacity building and human resource development, promote, develop and disseminate technologies through a seamless blend of traditional wisdom and modern scientific knowledge.

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It was observed that KFD had planted bamboo in 5000 ha during the study period in forest areas fulfilling 100% of the target, whereas, only 200 ha (13%) were planted as against 1500 ha of targeted area in non-forest land indicating acute deficit in achieving the target even though sufficient funds were available. Similarly, only one Kisan nursery was established as against a target of eight nurseries, utilising only 11% of the financial allocation.

Among the 26 sample plantations, the gross area of plantation is 449 ha (average of 17.26 ha/ plantation) and net area of plantation is 426 ha (average of 16.38 ha/ plantation). The NBM guidelines do not mention the criteria or benchmarks of the success of a plantation raised. However, in a previous internal evaluation report of the forestry works by the Karnataka Forest Department, weighted average survival rates of all departmental plantations sampled were used as the indicator for grading the performance¹³ and similar approach was adopted in subsequent evaluation by external agencies to evaluate NBM specifically¹⁴.

3.1.1 Planning process

Bamboo plantations were raised mostly in forest areas, predominantly with *Bambusa arundinasia* and *Dendrocalamus strictus*. Lion's share of planting, i.e. 52% is in Uttara Kannada circle followed by Belagavi, Chikkamagalur and Kodagu circles, each with 12% and least (3%) being Bellari circle.

Among the plantations sampled, Annual Plan of Operations (APOs) with approved dates were available at the time of visit in 7 (27%) samples. Of these, 29% were approved before October, 14% were approved between Oct – Dec and 57% were approved after January. It was also observed that during 2014-15, among the APOs approved with date available, all were sanctioned in March only. It may be inferred that 71% APOs were sanctioned after planting season, .i.e. after October.

Intervention at policy level may be done to sanction APOs well in advance so that due diligence can be taken by field officers for raising quality nurseries and plantations within appropriate season.

¹³ Anonymous. April 2014. Internal Evaluation Report of 2007-08 Works. Karnataka Forest Department.

¹⁴ Anonymous. August 2015. National Bamboo Mission (NBM) Report, Evaluation of Forestry Works 2009-2013, Karnataka Forest Department

Table 10: Year-wise timeline of APO approvals

Year of planting	APO approvals timeline (no. of plantations)							Total
	Before Oct	Oct	Nov	Dec	Jan	Feb	Mar	
2013-14	2		1					3
2014-15							3	3
2015-16						1		1
Total	2	0	1	0	0	1	3	7
Percent	29	0	14	0	0	14	43	100

Source: Primary data

Table 11: Circle-wise timeline of APO approvals

Circle	APO approvals timeline (no. of plantations)							Total
	Before Oct	Oct	Nov	Dec	Jan	Feb	Mar	
Ballari	1							1
Chickmagalur						1	2	3
Hassan							1	1
Uttara Kannada	1		1					2
Belagavi								
Mysore								
Kodagu								
Total	2	0	1	0	0	1	3	7
Percent	29	0	14	0	0	14	43	100

Source: Primary data

Table 12: Work stage-wise timeline of estimate approvals

Year of planting	Sanction Date not available (no. of plantations)	Sanction Date available (no. of plantations)	Estimate approvals timeline (no. of plantations)							Total
			Before Oct	Oct	Nov	Dec	Jan	Feb	Mar	
Earth Work	22	4	1					1	2	4
Raising Seedling	22	4	1					1	2	4
Planting	23	3				1	1	1		3
Total	67	11	2	0	0	1	1	3	4	11
Percent	86	14	18	0	0	9	9	27	36	100

Source: Primary data

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Estimates were available at the time of visit in 25 (96%) samples, partially available in one case. Of these, 8 (35%) plantations had more than one estimate. Out of 78 estimates, 11 (14%) had sanction dates, while 67 (86%) did not have dates. Overall, it was observed that 72% of the estimates were sanctioned between January – March. Among the samples that had estimates with dates, it was noticed that 25% estimates for earth work and raising seedlings were approved before October, while 75% estimates for raising seedlings were approved after January. In case of planting works, all the estimates available with date were approved between December – March.

3.1.2 Cost Norms and Expenditure

The total and average amount spent on raising of plantations including boundary works, SMC, maintenance, earthwork, seedling and planting is as given below:

Table 13: Summary of Expenditure among Sample Plantation

Details	Expenditure as per records provided (Rs.)	Percent of expenditure for each activity out of total planting cost (Rs.)	Average expenditure per plantation (Rs.)	Average expenditure per ha (Rs.)
Earthwork (Rs.)	3731297	35	143511	8759
Raising seedlings (Rs.)	896530	8	34482	2105
Planting Cost (Rs.)	2469488	23	94980	5797
Boundary protection (Rs.)	1989202	18	76508	4669
Soil moisture conservation works (Rs.)	109318	1	4205	257
Maintenance (Rs.)	1561181	15	60045	3665
Total	10757016	100	413731	25251

Source: Secondary data from KFD

The NBM guidelines allocates Rs. 25,000 per ha for plantation development, against which Rs. 25,251 was the average expenditure per ha for the sample plantations as revealed by the records during field study.

Table 14: Circle-wise expenditure for Plantation Works (Rs.)

Circle	No. of plantations sampled	Net area of the sample plantation (ha)	Earth work	Raising Seedling	Planting	SMC Work	Boundary protection	Maintenance	Total	Average per ha
Ballari	2	11	133160 42%	46840 15%	75000 24%	NA 0%	NA 0%	63000 20%	318000 100%	28909
Belagavi	2	50	810343 39%	206827 10%	525000 25%	NA 0%	103710 5%	425000 21%	2070880 100%	41418
Chikkamagaluru	7	49	543600 36%	141576 9%	271077 18%	39318 3%	336012 22%	182090 12%	1513673 100%	30891
Hassan	1	20	251800 66%	NA 0%	NA 0%	NA 0%	128200 34%	NA 0%	380000 100%	19000
Kodagu	2	50	225618 17%	54311 4%	162280 12%	NA 0%	700000 53%	166862 13%	1309071 100%	26181
Mysuru	1	25	221814 38%	121550 21%	44979 8%	NA 0%	NA 0%	200200 34%	588543 100%	23542
Uttara Kannada	11	221	1544962 34%	325426 7%	1391152 30%	70000 2%	721280 16%	524029 11%	4576849 100%	20710
Total	26	426	3731297 35%	896530 8%	2469488 23%	109318 1%	1989202 18%	1561181 15%	10757016 100%	25251

Source: Secondary data from KFD

Note: NA –Not available. In some cases, documents were not available at the time of visit, hence average may not be comprehensive

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The expenditure for raising 5000 ha of bamboo in forests and 200 ha in non-forest area was Rs. 551.45 lakhs and Rs. 8 lakhs respectively. The physical achievement was only 13% and the financial achievement was 11% for plantations in non-forest area, indicating neglect of raising bamboo in non-forest area.

Bamboo augmentation was carried out as per the cost norms and number of years of maintenance given in the Govt. of India guidelines. The Government of India (GOI) scheme has to be implemented as per the cost norms of around Rs. 25,000 per hectare. Overall average expenditure per hectare as per the records provided at the time of study was Rs. 25,251 which is in keeping with the guidelines. However, the average expenditure per hectare across circles varied from Rs. 19,000 per hectare to Rs. 41,481 in Ballari circle.

Analysis of the activities in raising plantations in the study period has indicated that Hassam circle has invested 66% of the total cost on earthwork whereas Kodagu circle has shown the least (17%). Mysore circle has spent 21% of the total cost for raising the seedlings, whereas, Kodagu circle indicated only 4%. Similarly, planting cost varied from 30% in Uttara Kannada to 8% in Mysore circle. Likewise, boundary protection was at the cost of 53% in Kodagu, whereas Mysore and Ballari circles did not incur any expenditure. Cost on maintenance was highest in Mysore circle, i.e. 34% and lowest in Uttara Kannada, i.e. 11%. Soil moisture conservation appeared to be the least priority as indicated by the cost incurred, i.e. 3% of the total cost in Chikkamagalur circle, followed by Uttara Kannada circle (2%).

3.1.3 Soil Moisture Conservation

Among the plantations sampled, 2 (8%) plantations had SMC structure despite the fact that most models have a budgetary allocation for SMC work ranging from 14-25% of the advance work cost allocated per hectare. Among the structures observed, rainwater harvesting trenches and percolation ponds were observed to be serving the purpose. The construction quality of both the structures was observed to be satisfactory.

Table 15: Details of SMC works in Sample Plantations (n=26)

Type of Structure	No. of Structures in sample plantations	Average cost per structure (Rs.)
Rain water harvesting trenches	1	39318
Percolation ponds	1	70000

Source: Primary data

3.1.4 Monitoring

This section discusses the status of plantation journals and monitoring of the plantations by various levels of officers such as Assistant Conservator of Forests (ACF), Deputy Conservator of Forests (DCF), Chief Conservator of Forests (CCF) and Assistant Principal Chief Conservator of Forests (APCCF).

Plantation journals were available in 20 (77%) samples and field note book was available in all samples at the time of visit. Among these, 3 (12%) had partial details, 16 (62 %) samples had complete details, while one had no details.

Among the plantations sampled, 10 (38%) plantations were inspected by a senior officer as recorded in the respective plantation journal. The details are furnished as a table below. This indicates that there is a need to document the visits with recommendations of senior level officers for effective implementation in the plantation journals.

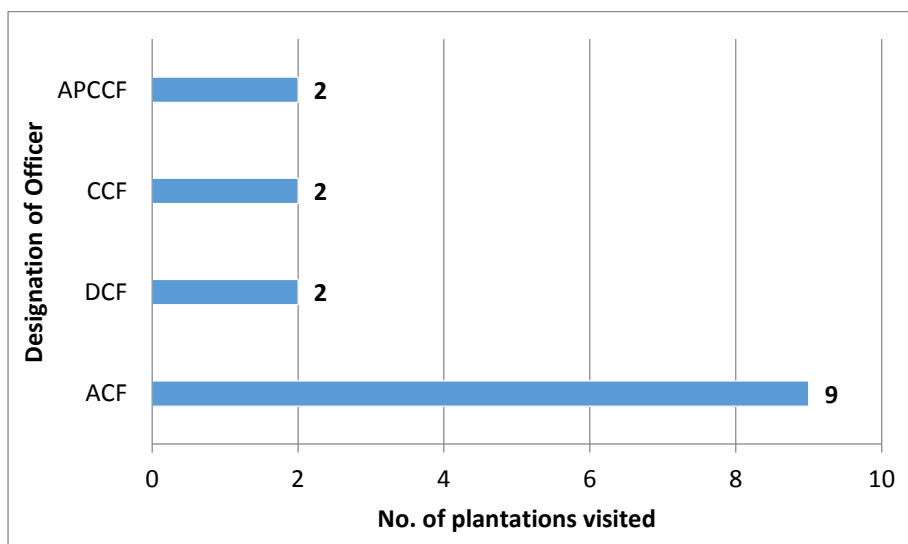


Chart 1: Inspection of Plantation by Senior Officers (n=26)

3.1.5 Involvement of Community

Among the 26 plantations visited, 15 (58%) had Joint Forest Management Committee (JFMCs), of which only 10 (38%) plantations were raised in JFM area. Among these, JFMCs were actually involved in plantation activity in 8 (31%) plantations along with micro plans. The involvement of JFMCs in various stages such as advance work, planting, maintenance, post maintenance etc. are tabulated below. This shows that there is more scope for

involvement of JFMCs in the JFPM plantations visited although the mission envisages the implementation in both forest and non-forest areas, with the active participation of various agencies such as JFMC, farmer associations, self-help groups, cooperative societies and marketing boards etc.

Table 16: Involvement of JFMCs (n=26)

Activity / Stage of involvement	No. of plantations
Advance work stage	8
Planting stage	8
Maintenance stage	8
Post maintenance stage	7
Approval of planting work proposal	8
Provided labour force	8
Supervised planting work	8
Dept. provided fund & VFC raised plantation	7

Source: Primary data

In order to understand various issues involved in production of bamboo products by artisans, interactions were held with the Medara Kedeswara Bamboo Bidiru Kaigarika Association, Ballari, Aadi Mallamma Devi Seva Abhivridhi Trust, Chickballapur and artisans in Koppal, Belgaum, Gadag and Haveri besides obtaining information from other individuals involved in production of bamboo artefacts, during which, issues related to availability of raw material, its quality and suitability, difficulties in procurement, transportation of raw material, storage of finished products and marketing were discussed in detail and suggestions worth considering were recorded.

The artisans were mainly producing baskets, mats, ladders, cradles, screens, winnowing baskets, '*Chandrike*' for silk cocoon weaving, trays, furniture etc. The general opinion of the artisans was that they were able to get raw material from KFD only to the extent of 10% of their requirement. The balance was met by private sources in the nearby local market (about 10%) and the bulk was from Belgaum Bamboo Market. The farmers of Maharashtra, especially in the adjoining areas like Sangli, Sindhudurg, Kudal, Sawantwadi, Vengula, Dodamarg etc. cultivate bamboo as a horticulture crop under irrigation and supply to Belgaum market. It was expressed that the Sawantwadi variety of bamboo is shiny green in colour, has long internodes and thin and soft nodes. These bamboo are soft to work with and

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easily pliable in bamboo mat weaving. The farmer representatives in the associations expressed the desire for cultivating bamboo in their own land with the technological and financial assistance from KFD. It indicates that there is inadequate extension activity in spreading the provisions of the NBM for cultivating bamboo in private lands.

The approximate cost of each bamboo procured from open market, of about 20 feet in length for the artisans varied from Rs. 50 – 100 depending on quality and cost of transportation. On the other hand, the KFD charges Rs. 35 plus tax for solid bamboo and Rs. 55 plus tax for hollow bamboo. Though the KFD supplied at relatively lesser cost, there was a shortfall of supply. The bamboo supplied by KFD was also not of the desired quality. Further, in most of the extractions by KFD, the bamboo culms were cut about 3-4 feet above the ground level which was not preferred by the artisans and also considerable damage was caused to the bamboo stem while giving multiple cuts which hinders obtaining long slivers. Short slivers were not suitable for mat weaving since too many joints result in an inferior quality product.

3.1.6 Planting Models and Species Planted

Bamboo augmentation was carried out as per the mode, cost norms and number of years of maintenance given in the Govt. of India guidelines.

Table 17: Circle-wise and Species-wise sample plantations

Circle	Total Sample Plantations	Species –wise net area in sample plantations (ha)				Total
		<i>Bambosa spp.</i>	<i>Bambusa arundinasia</i>	<i>Dendrocalamus stricutus</i>	<i>Calamus spp.</i>	
Ballari	2			11		11
Belagavi	2		25	25		50
Chikkamagaluru	7	30	9	10		49
Hassana	1			20		20
Kodagu	2	50				50
Mysuru	1			25		25
Uttara Kannada	11	45	106	20	50	221
Total	26	125	140	111	50	426
Percent of total net area (426 ha)		29%	33%	26%	12%	100%

Source: Primary data

Among the plantations sampled, across the circles it may be inferred that *Bambusa arundinasia* covers 33% of the net plantation area, *Bamboo spp* covers 29%, *Dendrocalamus strictus* covers 26% of the area, while cane species cover the remaining 12% area. A choice of most suitable species for each circle may be made after site-species matching and also considering the preferences of bamboo artisans/ market demand. Thus providing direction for regionally differentiated strategy as envisaged in the mission.

3.1.7 Protection and Maintenance

This section discusses the availability, types and status of protection measures, damages to plantation and their causes, number of years plantation has been maintained as against the provision of various models and number of plantation where casualty replacement was done. Among the plantations sampled, protection measures were available in 10 (43%) samples.

Table 18: Details of Boundary Protection Measures

Type of protection	No. of structures in sample plantations	Status of Protection measures (No. of plantations)		
		Breached/ Filled with weeds (CPT)	Rusted	Functional/ Good
Barbed wire fence with stone pillars	1	1		
Barbed wire fence with wooden posts	9	6	3	
CPT	5	2		3
Solar fencing	1			1
Total	16	9	3	4
Per cent		56	19	25

Source: Primary data

The above table helps us understand the types of protection works that were carried out and their present condition. Just 62% of the plantations sampled had boundary protection measures. Among these, 56% boundary works were breached at the time of visit, while 19% were rusted and one solar fence was functional. Overall 25% were functional/ in good condition. This shows that protection measures become ineffective within 3-6 years after establishment/ installation.

Table 19: Circle-wise type of boundary protection measures

Circle	Barbed wire fence with stone pillars	Barbed wire fence with wooden posts	CPT	Solar fencing	Total
Ballari					0
Belagavi			1		1
Chikkamagaluru		2		1	3
Hassana			1		1
Kodagu	1				1
Mysuru					0
Uttara Kannada		7	3		10
Total	1	9	5	1	16
Percent	6	56	31	6	100

Source: Primary data

It may be seen from the above table that the boundary protection measures were visible at the time of visit in all circles except in Ballari and Mysuru. In Uttara Kannada and Chikkamagalur circles, barbed wire fence with wooden posts were adopted, while the measures adopted in other circles were varied.

Table 20: Years of maintenance of plantations

Plantation Model	Model provisions	No. of years plantation maintained			Total
		No details	1	2	
Government of India Guidelines	2	9	11	6	26
Percent of total		35	42	23	100

Source: Primary data

Table 21: Circle-wise maintenance of plantations

Circle	No. of years plantation maintained			Total
	No details	1	2	
Ballari		1	1	2
Belagavi		1	1	2
Chikkamagaluru	5	1	1	7
Hassana	1			1
Kodagu		1	1	2
Mysuru		1		1
Uttara Kannada	3	6	2	11
Total	9	11	6	26
Percent	35	42	23	100

Source: Primary data

NBM guidelines stipulate two years of maintenance. Among the plantations sampled, 42% were maintained for one year and 23% for two years. Interestingly, in 35% samples there were no details/ related documents pertaining to maintenance. Of these, 5 samples were in Chikkamagalur circle, 3 samples were in Uttara Kannada circle and one in Hassan circle.

Table 22: Circle-wise casualty replacement

Circle	No. of plantations sampled	Casualty replacement (No. of plantations)	Percent
Ballari	2	2	100
Belagavi	2	1	50
Chikkamagalur	7	2	29
Kodagu	2	0	0
Hassan	1	1	100
Mysuru	1	0	0
Uttara Kannada	11	6	55
Total	26	12	46

Source: Primary data

Among the plantations sampled, casualty was replaced in 12 plantations (46%), whereas Mysuru and Kodagu circle did not replace the casualty as per the records provided.

3.1.8 Success/ Survival

Most evaluation reports brought out earlier by the KFD have explained success of plantations in terms of survival of the plants¹⁵ and in some cases the health of plants such as girth have been considered to rate the performance of plantations¹⁶.

Table 23: Circle-wise status of plantations and survival percentage

Circle	No. of plantation sampled	SMC Available		Boundary protection Present		Watch and ward		State of Health (% out of seedlings survived)			Overall survival (%)
		No. of plantations	%	No. of plantations	%	No. of plantations	%	Good	Satisfactory	Poor	
Ballari	2		0	0	0	0	0	100	0	0	17
Belagavi	2		0	1	50	2	100	0	75	25	23
Chikkamagaluru	7		0	3	43	2	43	14	43	43	71
Hassana	1		0	1	100	1	100	41	18	41	93
Kodagu	2		0	1	50	2	100	17	67	17	29
Mysuru	1	1	100	0	0	1	100	75	25	0	85
Uttara Kannada	11	1	10	10	91	11	100	24	42	33	34
Total	26	2		16		19					
Percent of total plantations			8		62		73	25	41	33	39

Source: Primary data

¹⁵ Anonymous. April 2014. Internal Evaluation Report of 2007-08 Works. Karnataka Forest Department.

¹⁶ Anonymous. August 2015. National Bamboo Mission (NBM) Report, Evaluation of Forestry Works 2009-2013, Karnataka Forest Department

Bamboo augmentation was carried out as per the cost norms and number of years of maintenance given in the Govt. of India guidelines.

It may be inferred from the above table that among the plantations sampled, only 8% had SMC structures, boundary protection was available in 62% samples, 73% plantations had watch and ward. Among the seedlings surviving in the sample plots, 25% were found to be in good health, 41% were satisfactory and 33% were not satisfactory. The overall survival percentage across the circles was 39%. Interestingly, the plantation sampled in Hassan had 93% survival, it was understood that this plantation was located within forest area with not much interference by public and domestic animals, and since it was in a slightly low lying area, moisture content in the soil seemed good too. Least survival (17%) was observed in Ballari circle, which may be due to the absence of SMC, boundary protection and watch and ward. In addition, the site selection for bamboo plantations appeared to be poor. On the other hand, in Uttara Kannada out of the plantations sampled, SMC was provided for one plantation and boundary protection was given to majority plantations, along with watch and ward. Despite this, the overall survival rate was 34% which may be due to various reasons like untimely planting, inappropriate site conditions, lack of proper maintenance in the subsequent years etc. The hypothesis that there is variation in survival percentage of plantations across the different forest circles was found to be true.

Table 24: Survival percentage based on progressing age

No. of Years maintained	No. of plantations	Average Survival percentage
No details*	9	42
1	11	38
2	6	37
Total	26	39

Source: Primary data

* Data on maintenance not made available during field visit

The above table indicates that plantations with one year maintenance had 38% survival followed by plantations maintained for two years (37%), whereas, nine plantations for which records of maintenance was not available have indicated 42% average survival. The NBM guidelines mention that the assistance for second year maintenance of plantation will be subject to 90% survival of plants. It may be noted that the amount allocated for maintenance

in forest areas was expended completely as per target-achievement data in the years of evaluation. Despite expending all the budgetary allocation, the survival percentage appears to be low, which needs to be studied further in detail.

Table25: Survival percentage based on year of planting

Year of planting	No. of plantations	Survival percentage
2011-12	1	6
2012-13	4	70
2013-14	9	28
2014-15	5	28
2015-16	2	74
2016-17	5	31
Total	26	39

Source: Primary data

The above table indicates highly fluctuating percentages of survival, showing least percentage (6%) in 2011-12 to highest percentage between (74%) and 2015-16. Two plantations of Bamboo (*Dendrocalamus strictus*) sampled from Karwar division of Uttara Kannada circle and Hunsur division of Mysuru circle have recorded the highest survival (74%). Two plantations in Uttara Kannada circle (Haliyal division), one plantation in Hassan circle (Tumluru) and one plantation in Chikkamagaluru (Koppa) raised in 2012-13 with mixed bamboo species have recorded higher percentage (70%) of survival.

The least (6%) survival was seen in Bare plantation raised in 2011-12 in Idagundi range of Yellapur division in Uttara Kannada circle. Bamboo was planted in 25 ha of lateritic soil following NTFP –II model, where the soil was not suitable for bamboo. It may be seen that the increased years of maintenance of the plantations did not result in proportionate increase in survival percentage of the plantation. The reason and causes for the same may be further studied in depth.

Table 26:Species-wise survival percentage

Species	Total seedlings survived in sample plots	Total seedlings planted in sample plots	Survival %
Bamboo (<i>Bambusa spp.</i>)	280	1051	27
Bamboo 1 (<i>Bambusa arundinasia</i>)	286	725	39
Bamboo 2 (<i>Dendrocalamus strictus</i>)	316	507	62
Canes (<i>Calamus spp.</i>)	0	0	0
Total	882	2283	39

Source: Primary data

It may be seen from the above table that average overall survival of *Dendrocalamus strictus* was higher (62%) compared to the other species, while *Bambusa arundinasia* which has been planted in larger area had a lower average survival percentage (39%). Bamboo (*Bambusa spp.*) had 27% survival and Cane (*Calamus spp.*) had negligible survival percentage. Better performance of *Dendrocalamus strictus* among the plantations sampled is attributed to the fact that this species was raised in good site conditions having predominantly red soil in Haliyal, Davangere, Koppa, Karwar, Hunsur and Tumkur divisions by following ANR Model. These plantations were also provided with casualty replacement, along with watch and ward. Lowest survival percentage (3%) was seen in two sample plantations raised in Mastikatte range, Karwar division and Idagundi range, Yellapur division, wherein, both plantations were provided watch and ward, casualty replacement, maintenance works, but they were raised in lateritic soils.

Table 27:Circle-wise and species-wise growth and survival percentage

Circle	Bamboo (<i>Bambusa spp.</i>)			Bamboo 1 (<i>Bambusa arundinasia</i>)			Bamboo 2 (<i>Dendrocalamus strictus</i>)		
	Avg. Collar Girth	Avg. Height (mtrs)	Survival %	Avg. Collar Girth	Avg. Height (mtrs)	Survival %	Avg. Collar Girth	Avg. Height (mtrs)	Survival %
Ballari							7.3	0.5	23
Belagavi				0.3	0.6	5	2.5	2.6	27
Chikkamagaluru	5.0	1.9	65	11.0	6.5	58	4.8	1.6	73
Hassana	12.5	2.4	93				4.5	1.6	97
Kodagu	3.5	1.4	34						
Mysuru							5.2	2.4	74
Uttara Kannada	2.8	1.2	11	5.2	1.7	44	4.3	1.5	71
Total	4.2	1.5	27	5.3	2.2	39	4.6	1.8	62

Source: Primary data

The above table indicates that *Dendrocalamus strictus* has higher survival (62%) with an average height varying from 0.5 mtr in Ballari to 2.6 mtrs in Belagavi with an average girth of 2.5 cms in Belagavi and 7.33 cms in Ballari. *Bambusa arundinasia* with a survival of 39% varied in its height from 0.63 mtr (Belagavi) to 6.5 mtrs (Chikkamagalur) with an average girth of 0.3cms (Belagavi) to 11 cms (Chikkamagalur).

Table 28:Details of Rootstock

Circle	Total no. of plots laid	Rootstock available (no. of plots)	Total No. of stems with collar girth 2-10 cms	Average no. of stems per plot	Average Collar Girth (cms)	Average Height (mtr)
Ballari	3	2	8	4	4	3
Belagavi	10	0	0	0	0	0
Chikkamagaluru	12	5	33	7	5	1
Hassana	4	0	0	0	0	0
Kodagu	10	0	0	0	0	0
Mysuru	5	1	2	1	5	2
Uttara Kannada	45	30	392	13	6	2
Total	89	38	435			

Source: Primary data

The above table reveals that rootstock was nil in Belagavi, Hassan and Kodagu, moderate in Mysore and Chikkamagalur circles and better in Ballari and Uttara Kannada circles. Similarly, the average number of stems follows the same pattern. It may be inferred that the survival rate of bamboo (refer earlier tables on survival percentage) and percentage of rootstock are inversely proportional.

Table 29: Details of Natural trees

Details	Total No. of plots laid	Tree species present (no. of plots)	Total No. of stem with GBH above 10 cms	Average GBH (cms)	Average height (mtr)
Finding	89	76	418	52.16	6.6

Source: Primary data

The above table reveals that among the 89 plots laid, natural trees were found in 76 plots (85%), which is in line with the policy of increasing the natural vegetation in forest area.

3.1.9 Technology Transfer, HRD and Demonstration of Plantation Technology

It appears that KFD had not paid adequate attention in building the capacity of the artisans through technology transfer. Farmers or field functionaries were not trained by the KFD although there was adequate provision during the study period. On the other hand, demonstration of plantation technology had been accomplished wherein 50 artisans have been trained in 2013-14.

The artisans associations expressed the need for training and exposure to bamboo products made in other parts of the country. In addition, they felt the need for assistance in procuring small machineries to reduce drudgery in processing bamboo and also to improve the quality of the finished products. It was also observed that the expertise available from amongst the associations of different districts/ states could be used effectively in imparting training to artisans. In addition, other government schemes such as ATMA, MGNREGS, SCP-TSP could have been leveraged for capacity building.



Photo 5: Kelaguru plantation, Kalasa range, Koppa division, Chikkamagaluru circle
Appropriate site selected near water body and good growth observed



Photo 6: Bedara Shiraguru plantation, Dandeli T range, Haliyal division
Appropriate site features with luxurious growth of bamboo

When planted in appropriate site location with water sources nearby, bamboo plantations have been successful



Photo 7: Waliwada plantation, Karwar range, Karwar division, Uttara Kannada circle
Plantation Board with all details



Photo 8: Thodikana plantation, Bhagamandala range, Madikeri T division, Kodagu circle
Steep slope, inappropriate site selected



Bamboo plantations on farmers' lands have shown better success due to the personal care and maintenance

Photo 9: Madernalu plantation, Alduru range, Chikkamagaluru division & circle
Good growth and survival of bamboo on Farmer's Land

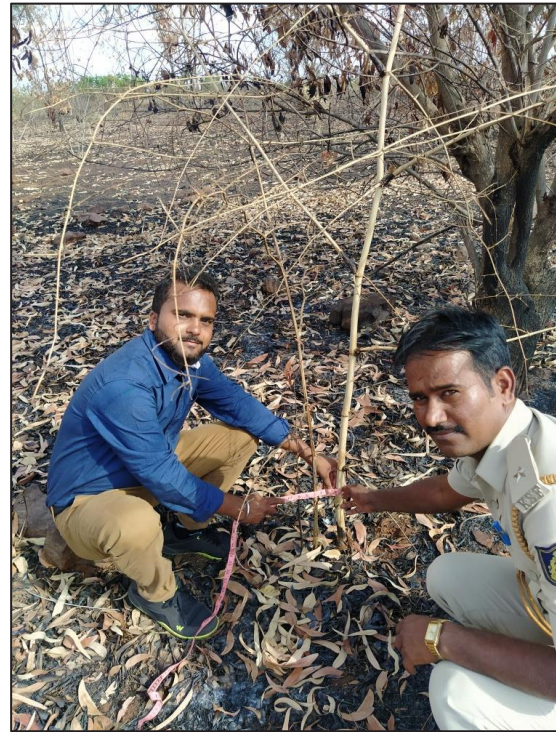


Photo 10: Mavanoor plantation, Gunjnal range, Belagavi division, Belagavi circle
Damaged by fire

3.2 Handicrafts, Marketing and Exports

This activity was undertaken to address the objective of promoting marketing bamboo and bamboo-based handicrafts and to facilitate employment opportunities for skilled and unskilled persons, especially unemployed youth.

There was a provision for participating in three domestic trade fairs and establishing four bamboo wholesale and retail markets during the study period against which artisans participated in two trade fairs, while there is no progress in establishment of markets though there was a provision of Rs. 14.00 lakhs.

The artisans felt that there was adequate demand for bamboo products in local markets. However they have also observed that there was no market demand for certain products such as silk worm rearing trays that have been replaced by wire mesh boxes. They articulated the need for an appropriate community storage facility for their finished goods and wide publicity for their products through Government forums. They requested that KFD could use their products such as tree guards, benches, mats etc. to encourage them.

3.3 Implementation Monitoring Mechanism

This activity was undertaken to address the objective of promoting marketing bamboo and bamboo-based handicrafts and to facilitate employment opportunities for skilled and unskilled persons, especially unemployed youth

The interaction with the concerned section revealed that an evaluation study was conducted for the works carried out from 2009-10 to 2012-13 by two external agencies. An amount of Rs. 21.16 lakhs was spent during 2013-14 under this budget head for procurement of Balco/ Burma bamboo tissue culture plants) from an authorised agency for planting in 0.83 ha however, details of which were not made available.



Photo 11: Focus Group Discussion with members of Bamboo Association, Ballari division



Photo 12: Visit to Narayanapura Bamboo market, Ballari division, Ballari circle



Photo 13: Women artisans engaged in making bamboo products



Photo 14: Meeting with Chief Conservator of Forests, Ballari circle

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4 FINDINGS

Based on the evaluation study, the following inferences may be drawn vis-à-vis the objectives of the National Bamboo Mission:

1. To promote the growth of the bamboo sector through an area based regionally differentiated strategy

There is limited information to understand the regionally differentiated strategy and a coordinated approach covering production and marketing adopted during the years of evaluation.

Among the plantations sampled, across the circles it may be inferred that *Bambusa arundinasia* covered 33% of the net plantation area, *Bamboo spp* covered 29%, *Dendrocalamus strictus* covered 26% of the area, while cane species combined cover the remaining 12% area.

On the other hand, interaction with the bamboo artisans indicated that they prefer species such as *Dendrocalamus hamiltonii*, *Dendrocalamus stocksii* etc. thus indicating a mismatch between the needs of the artisans and the planted species. In addition, *Dendrocalamus strictus* which was planted in smaller area recorded higher percentage of survival (62%), while *Bambusa arundinasia* which has been planted in larger area had a lower survival percentage (39%). Better performance of *Dendrocalamus strictus* among the plantations sampled is attributed to the fact that this species was raised in good site conditions having predominantly red soil in Haliyal, Davangere, Koppa, Karwar, Hunsur and Tumkur divisions by following ANR Model. These plantations were also provided with casualty replacement, along with watch and ward. A comprehensive understanding of the bamboo sector in Karnataka is required to arrive at a suitable strategy by involving all the stakeholders, so that it is regionally appropriate, need-based and resource efficient.

2. To increase the coverage of area under bamboo in potential areas, with suitable species to enhance yields

During the study period, 16,638 ha were planted with bamboo and cane by KFD¹⁷, of which 5200 ha was planted under NBM, constituting 31% of these plantations. The overall physical (plantation activities of raising, maintenance and advance works) and financial achievement

¹⁷Annual Reports of 2013-14, 2014-15, 2015-16 and 2016-17 of Karnataka Forest Department

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against the targets of the mission during the evaluation period was 91% and 77% respectively. The expenditure for raising 5000 ha of bamboo in forests and 200 ha in non-forest area was Rs. 551.45 lakhs and Rs. 8 lakhs respectively. The physical achievement was only 13% and the financial achievement was 11% for plantations in non-forest area, indicating more scope for raising bamboo in non-forest area.

During the evaluation period, among the 248 plantation works carried out, 26 plantations were sampled across seven forest circles covering gross area of plantation of 449 ha (average of 17.26 ha/ plantation) and net area of plantation of 426 ha (average of 16.38 ha/ plantation).

Among the plantations sampled, Annual Plan of Operations (APOs) with approved dates were available at the time of visit in 27% samples. It may be inferred that 71% APOs were sanctioned after planting season, .i.e. after September. Estimates were available at the time of visit in 96% samples, of these 81% were sanctioned after September. In case of planting works, all the estimates available with date were approved between December – March. The planning process indicates lack of preparedness to take up raising of plantations which affects timely preparation of site, raising of desired quality and quantity of seedlings and also effective timely planting in the field.

The NBM guidelines allocates Rs. 25,000 per ha (which is lower than the model specific cost norms of KFD) for plantation development, against which Rs. 25,251 was the average expenditure per ha for the plantations sampled as per the records provided during field study, which is as per the mission guidelines.

Among the plantations sampled, 8% plantations had SMC structures despite the fact that most models have a budgetary allocation for SMC work ranging from 14-25% of the advance work cost allocated per hectare. Soil moisture conservation appears to be the least priority as indicated by the cost incurred, i.e. only 3% of the total plantation cost.

Plantation journals were available in 77% samples, of which complete details were available in 62% and partial details in 12% journals. Field note book was available in all samples at the time of visit. Among the plantations sampled, 38% plantations were inspected by a senior officer as recorded in the respective plantation journal.

Among the 26 plantations visited, 15 (58%) had Joint Forest Management Committee (JFMCs), of which only 10 plantations were raised in JFM area. Among these 10 plantations, JFMCs were actually involved in plantation activity in 8 plantations along with micro plans. This shows that JFMCs were not actively involved in plantations visited, although the mission envisages the implementation in both forest and non-forest with active community participation.

Though the KFD supplies bamboo at relatively low price, there is a shortfall of supply. The bamboo supplied by KFD is also not of the desired quality as articulated by the bamboo artisans. Further, in most of the extractions by KFD, the bamboo culms were cut about 3-4 feet above the ground level which was not preferred by the artisans and also considerable damage was caused to the bamboo stem while giving multiple cuts which hinders obtaining long slivers, besides preventing growth of culms. Research and development of genetically superior clones of suitable species and technologies for enhanced production have not been taken up.

Bamboo augmentation was carried out as per the cost norms and number of years of maintenance given in the Govt. of India guidelines which is suitable for the growth of bamboo and to augment the growing stock of bamboo species in natural forest.

Just 62% of the plantations sampled had boundary protection measures, of which 25% were functional/ in good condition. This shows that protection measures become ineffective within 3-6 years after establishment/ installation. NBM guidelines stipulate two years of maintenance. Among the plantations sampled, 42% were maintained for one year and 23% for two years. Interestingly, in 35% samples there were no details/ related documents pertaining to maintenance.

The overall survival percentage across the circles was 39%. It varied from 93% in Hassan circle to 17% in Ballari circle. Among the seedlings surviving in the sample plots, 25% were found to be in good health, 41% were satisfactory and 33% were not satisfactory.

3. To promote marketing of bamboo and bamboo-based handicrafts

During the years of evaluation, activities were not taken up to promote marketing of bamboo and bamboo based handicrafts, partnership, convergence and synergy among R&D and marketing agencies in public as well as private sectors, at all levels. In addition to producing raw material, bamboo artisans are to be provided with additional training, storage facilities and assistance for marketing.

4. To establish convergence and synergy among stakeholders for the development of bamboo

There have been no efforts to initiate extension, convergence and synergy during the years of study. There is a need to develop a comprehensive database of the stakeholders, including the artisans in JFMCs and build a network for the development of the sector.

5. To promote, develop and disseminate technologies through a seamless blend of traditional wisdom and modern scientific knowledge

This objective has been partially addressed through the demonstration of plantation technologies at state and district levels and training to few artisans. Consistent efforts are needed to expose the artisans to different bamboo growing states within the country, new technologies to help in drudgery reduction, improving quality of the finished products and modern technologies developed by various research institutions. These activities can be dovetailed with other government schemes such as ATMA, MGNREGS etc.

6. To generate employment opportunities for skilled and unskilled persons, especially unemployed youths

During the years of evaluation, activities were not taken up to address this objective nor promote cooperatives and self-help groups to ensure support and adequate returns to farmers. Specific skill training based on market demand could be imparted to interested youth and enable them to take up self-employment. Schemes such as SCP TSP could have been leveraged to address these issues. Similarly promoting Farmer Producer Organisations for bamboo growers could also be explored.

5 RECOMMENDATIONS

This study aimed to evaluate four schemes within a limited time frame and resources. Hence it will be useful to have a separate study for each scheme to arrive at a more comprehensive assessment. Based on this evaluation study, the following recommendations are offered for consideration:

Short term

1. The choice of most suitable species for each circle may be made after site-species matching and also considering the preferences of bamboo artisans/ market demand, thereby providing direction for regionally differentiated strategy as envisaged in the mission. Adequate care may be taken to avoid sites with dwarf trees casting dense shade and lateritic soil.
2. Cost norms of plantation models may be redesigned based on field realities.
3. The department may develop comprehensive definition, benchmarks and rating indices to determine the success and performance of plantations. Survival may be specified and linked to growth of the plants and in case of bamboo, number of culms of the previous and current year, apart from culm height and girth.
4. Species which are of importance to artisans (such as *Dendrocalamus hamiltonii*, *Dendrocalamus stocksii* etc.) may be given focus during area expansion. It is advisable to have a detailed study to select appropriate species of bamboo for propagation by the department during area expansion by considering various aspects such as suitability to agro-climatic zones, utility of the bamboo, preference by the artisans, marketability etc. Support/ inputs of specialised institutions such as Bamboo Society of India, Bamboo Research and Training Centre (Chandrapur, Maharashtra), Cane and Bamboo Technology Centre (Guwahati, Assam), Indian Plywood Industries Research and Training Institute (Bangalore), Bamboo and Cane Development Institute (Agartala, Tripura) etc. may be sought.
5. Focus may be given for the promotion of plantations in non-forest areas and homestead propagation of bamboo can be encouraged as a source of income for farmers and also to meet the market demand. The target may be revised by reducing the planting in forest areas and increasing the private land extent – this will aid in easy and freer availability of the produce (bamboo culms).

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6. Workshops could be conducted at the start of the financial year at division, circle and state levels, with adequate representation from all bamboo and cane associations, so that their needs and expectations are considered. This could also be a forum for sharing the previous years' achievements in a transparent manner and also serve as a networking and idea sharing forum for producers, buyers, service providers, artisans, which will help strengthen, diversify and build the bamboo sector
7. KFD can be the nodal agency and create a database of farmers, artisans, bamboo producers associations, retail outlets and allied service providers in bamboo sector which could be useful to all stakeholders for exchange of information and resources.
8. KFD may help FPOs in setting up community storage facility for finished goods at appropriate locations
9. ICT may develop an application to capture short term monitoring and long term evaluation parameters, along with details of plantation maintenance and monitoring by senior officers
10. Training, skill training and exposure visits may be organised at different levels for farmers, artisans, youth, field functionaries etc. including visits to other states where bamboo products are manufactured and institutions like Indian Plywood Research and Training Institute (IPRTI), Bangalore
11. Wide publicity may be given through various media, including KFD website about adopting eco-friendly substitutes made of bamboo, the provisions/ activities/ circulars/ components/ progress of the NBM
12. Explore the modalities for abolishing permit system for transporting bamboo grown in private areas
13. The APOs and estimates may be approved during the first quarter of the financial year to enable proper planning of works at the field level. Mechanisms may be developed by ICT for APOs, estimates and other relevant documents, which could be sanctioned online/ offline and uploaded to central database.
14. Department may evolve a system wherein the verification of works by DRFO, RFO and ACF and supervisory comments of DCF, CF and other senior officers whether in plantation journals or in their respective tour diaries are made available as a single document helping to properly assess the progress of activities in a plantation.

Medium term

1. A comprehensive understanding of the bamboo sector in Karnataka is required to arrive at a suitable strategy by involving all the stakeholders, so that it is regionally appropriate, need-based and resource efficient.
2. Bamboo production in private sector may be encouraged by KFD through kisan nurseries, incentive could be given to promote the cultivation and providing linkage to market through Farmer Producer Organisations (FPOs) or as societies.
3. JFMCs in NBM areas could be reconstituted to include active members from the Artisans Associations with adequate representation from cane artisans also
4. KFD can interact with all stakeholders (specifically JFMCs and Bamboo and Cane Artisans Associations) and develop macro and micro plans for propagation and utilisation of bamboo resources.
5. KFD may assist the artisans by supplying small machinery/ equipment to reduce drudgery and improve the quality of finished products
6. KFD may explore convergence opportunities with other government schemes/ programmes such as ATMA, MGNREGS, Skill development, SCP/TSP and enable artisans/ growers to access them to have better extension and outreach under the mission.

Long term

1. Good quality planting material from tissue culture or known candidate plus culms. The research wing of KFD could supply these through tissue culture or any other appropriate technology either directly or through private agencies under their supervision. Every nursery raising bamboo should have its own multiplication gardens and a demonstration plot for the farmers to see.
2. Overall guidelines of NBM include ancillary activities for development of bamboo market, skilling, supporting bamboo based industries. However, in Karnataka it was seen that more focus was on raising plantations. The effort should be to have a cluster approach wherein all components of the scheme are implemented in an integrated manner.
3. A policy for sustained supply of bamboo from forest and private land to artisans and industry needs to be evolved

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4. Through the evaluation, linkage of maintenance of plantations to survival of plantations in respective years was not found. It is suggested that a concurrent monitoring of survival rate of every plantation taken under the scheme before sanctioning maintenance in second and third year. KFD may devise an appropriate mechanism for the same.
5. The main objective of NBM is to make bamboo available as a raw material to industry/ artisans. However, it was seen that bamboo raised in forests were many a times not appropriately prescribed in respective working plans for extraction and made available to the industry/ artisans. It is recommended to appropriately modify existing laws/ provisions for making bamboo grown available to industry/ artisans.

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ANNEXURE

TERMS OF REFERENCE FOR THE STUDY

EVALUATION OF FORESTRY WORKS UNDER COMPENSATORY AFFORESTATION FUND MANAGEMENT & PLANNING AUTHORITY (CAMPA), 2013-14 to 2015-16 13TH FINANCE COMMISSION (TFC) 2013-14 to 2014-15, NATIONAL AFFORESTATION PROGRAMME (NAP) 2013-14 to 2016-17 & NATIONAL BAMBOO MISSION (NBM) 2013-14 to 2016-17

1. TITLE OF THE STUDY:

The study is titled as Evaluation of Forestry Works under Compensatory Afforestation Fund Management & Planning Authority (CAMPA), 2013-14 to 2015-16 13th Finance Commission (TFC) 2013-14 to 2014-15, National Afforestation Programme (NAP) 2013-14 to 2016-17 & National Bamboo Mission (NBM) 2013-14 to 2016-17.

2. DEPARTMENT IMPLEMENTING THE SCHEME

Karnataka Forest Department, Government of Karnataka

3. BACKGROUND AND CONTEXT:

Compensatory Afforestation Fund Management & Planning Authority (CAMPA):

The *Forest (Conservation) Act of 1980* governs diversion or use of forest land for non-forest purposes such as industrial or developmental projects. Since forests are an important natural resource and provides us with a variety of ecological services, the Forest (Conservation) Act of 1980 mandates that non-forest land, equal to the size of the forest being diverted be afforested. But, since afforested land cannot become a forest overnight, loss of goods and services like timber, bamboo, fuelwood, carbon sequestration, soil conservation, water recharge, and seed dispersal are still experienced. Moreover, the newly afforested land will take around 50 years to start delivering the comparable goods and services which the diverted land gave just before diversion. To compensate the losses suffered in the interim, the *Net Present Value (NPV)* of the diverted forest are computed for a period of 50 years, and recovered from the "user agency" that is diverting the forests.

As per the act, the CAMPA funds can be used for the following purposes:

- Artificial regeneration (plantation)

- Assisted natural regeneration •
- Forest management
- Forest protection
- Infrastructure development
- Wildlife protection and management
- Supply of wood
- Other forest produces saving devices.

The main works taken up under State CAMPA are:-

Project Specific Activities:-

- A. Compensatory Mforestation (CA), Additional CA (ACA) & Penal CA (PCA):
 - i) In Forest Land
 - ii) In Non-Forest Land
- B. Site Specific Activities:
 - i) Safety Zone plantation
 - ii) Planting in degraded forest area (1 ½ times of safety zone)
 - iii) Fencing
 - iv) Catchment Area Treatment Plan (CATP)
 - v) Planting Dwarf Species
 - vi) Medicinal plantation
 - vii) Soil & Moisture Conservation works
 - viii) Providing LPG connection to local villagers etc.,
- C. Activities for Utilization of NPV:
 - I. Consolidation and protection of Forests:
 - a. Survey and demarcation of Forests
 - b. Forest boundary consolidation through Cattle Proof Trench (CPT)
 - c. Fire protection

- d. Creation of lung spaces by protection and consolidation of valuable forest areas in the city's urban areas and developing them as Tree Parks.

II. Consolidation and Regeneration of Forests:

- a. Assisted Natural Regeneration (ANR)
- b. Promotion of Sandal Regeneration on estate management concept.
- c. Production of Quality Planting Materials, collection of quality seeds and other Research activities.
- d. Integrated plan for Conservation and Development of biodiversity, forests and ecology in the forest areas of coastal zone (HasiruKavacha)

III. Wildlife Protection and Management:

- a. D-line clearance
- b. Development & maintenance of road network in protected areas.
- c. Elephant Human conflict mitigation measures (Areas outside & inside protected areas)
 - i. Elephant Proof Trench (EPT)
 - n. Solar Fencing
 - iii. Assistance to Bannerghatta Biological Park
- d. Wildlife Habitat Improvement & Management for individual Protected Area's (PA's)
 - i. Creation of new water holes
 - ii. De-silting of tanks
 - iii. Soil & Moisture Conservation (SMC) works
 - iv. Providing Salt licks
 - v. Elephant depredation camps/ Anti-poaching camps (APC's)

IV. Infrastructure Development:

- a. Strengthening and augmenting digitization and Communication network;
 - i. Cell Phones
 - ii. Computers
 - iii. Laptop
 - iv. Xerox Machines
 - v. GPS
 - vi. Digital Cameras
 - vii. Personal Digital Assistance (PDA)
- b. New Buildings (Staff Quarters)
- c. Building maintenance
- d. Strengthening of Forest Institutes for capacity building.
- e. Purchase of vehicles (Two Wheelers for Forests and Four Wheelers for Officers)

V. Forest Produce Saving devices & other activities:

- a. Supply of energy saving devices at subsidized cost to forest fringe villages.
- b. Maintenance of WP Samples Plots
- c. Repair, Maintenance, & Office Expenditure (RMOE), Travelling Expenses (TE) etc.

Other Schemes

There are other schemes implemented by the forest Department under which the works undertaken are also of similar nature as that of CAMPA. Hence, Karnataka Forest Department (KFD) intends to appraise itself of the outcome of implementation of works under the other schemes as mentioned in the title of this Terms of Reference (ToR) for the period beside each scheme as follows;

- i. 13th Finance Commission (TFC)[Q013-14 and 2014-15]
- ii. National Mforestation Program(NAP)[2013-14 to 2014-17]
- iii. National Bamboo Mission (NBM)[2013-14 to 2014-17]

Many of the work taken up under all the above schemes are in the nature of plantations, other works like buildings, infrastructure development, soil and moisture conservation works and beneficiary-oriented works. In order to avoid the Consultants crisscrossing the whole state separately for each scheme, works under all the above schemes shall be evaluated simultaneously once the evaluation team visits a particular division. This will not only reduce the financial cost of the evaluation in respect of travel expenses, but will also cover all sampled works in a division in one visit. It also helps to make a comparative analysis across the Schemes.

Sampling of works shall be done scheme-wise. Thus, 4 State level evaluation reports i.e one for each scheme as mentioned above have to be submitted separately.

4. EVALUATION SCOPE, PURPOSE AND OBJECTIVES:

4.1 Forestry works carried out in Karnataka Forest Department under above mentioned schemes broadly fall under following categories:

1. Raising & Maintenance of plantations.
2. Seedling Distribution to Public
3. Soil moisture conservation works
4. Specialized works of Wildlife
5. Specialized works of Working Plan
4. Specialized works of Research & Utilization
7. Specialized works of Training wing
8. Construction and maintenance of buildings, Roads & other infrastructure
9. Providing individual/ community benefits

Generally, in any Scheme of KFD, the works may include either or all the works as listed above. Hence, the activities to be evaluated will invariably fall in one of the

above categories. The list of works and other project documents are provided by the APCCF (CAMPA) for the scheme (i), APCCF (Projects) for scheme (ii), APCCF (NAEP-BM) for schemes (iii) & (iv) through their implementing Forest Circles, Divisions and Units. The purpose of evaluation is to assess the implementation process and analyse the impact of them on environment and society.

The field data has to be analysed with respect to the scheme objectives and evaluation issues. The findings have to be reported along with recommendations for improvement as a separate chapter in the final evaluation report of each scheme. A separate evaluation report has to be submitted for each scheme.

4.2 EVALUATION OBJECTIVES:

- To evaluate the works under the above 4 schemes that were carried out by Territorial, Wildlife, Research, Working Plan and Training wings of the Karnataka Forests Department.
- To assess whether the desired impact on natural and social environment is achieved and or undesirable impact is avoided UNDER CAMPA and other schemes.
- To assess the efficiency and effectiveness of the schemes and the ability of the works executed to meet the intended objectives of the Schemes.
- To assess the performance of the works under different categories and across the divisions.

To Examine the requirement of Works executed under all above schemes, whether these works to be continued or closed.

- To assess whether the existing arrangements of accounting and reporting are adequate and transparent.
- To analyze whether the grants under the scheme were utilized for the intended objectives/purposes.
- To examine the quality of works and the final success rates are satisfactory etc.
- To examine the impact of beneficiary schemes on the households.

5. EVALUATION QUESTIONS:

The Proposed evaluation has multiple objectives. Inter alia, this evaluation is expected to examine the following questions and file their succinct findings and conclusions. The Questions of Part (A) & (I) are common and should be answered for all 4 schemes as mentioned in the title of this ToR. The questions from the remaining sections (B) to (H) should be answered based of implementation of that particular component of work in a scheme.

- (A) For Raising & Maintenance of Plantations: -Under all the Schemes to be analysed from scheme perspectives and separate analysis for each scheme.
- i. What is the success rate of departmental plantations under respective scheme in terms of the following?
 - a. Overall and Species-wise survival rates with progressing age across the regions.
 - b. Species-wise performance in terms of girth, height and vigor.
 - c. Compatibility of planted species with the local biodiversity.
 - d. Consistency in performance across Forest Divisions and Circles in the state.
 - e. Potential to contribute to the tree cover in the state in the long run?
 - f. How does the overall survival percentage compare with those observed in the evaluation of previous years?
 - ii. What factors contribute to mortality of seedlings in plantations? How can they be addressed across the regions to reduce mortality?
 - iii. What measures/interventions have been made to improve the survival percentage of plantations over the years since evaluation of plantations has commenced? What has been their actual impact in improving survival percentage?
 1. How can the quality and performance of departmental plantations be enhanced?

- n. Whether plantation models differ across different schemes. Examine the sustainability of these models.
- iii. What is the existing status of forest/ plantation protection and conservation works carried out under these schemes?
- iv. What is their effectiveness in conserving the forests/ plantations and enhancing the productivity?
- v. Whether the Plantation programme under CAMPA and other schemes has been able to cover the forest cover lost? If not, what is the gap?
- vi. Assess whether the desired impact on natural and social environment is achieved and or undesirable impact is avoided.
- vii. Assess the adequacy, regularity and utilisation of funds for plantation activity.

(B) For Soil & Moisture Conservation (SMC) Works:

- i. What is the present condition of SMC works carried out in the plantations and other forest areas? Do they exist? Make observations for each scheme separately.
- ii. In case of water harvesting structures, are they capable of holding water to the designed potential now? If not, why so?
- iii. Is there any visible impact of SMC activity on the vegetation? Assess the impact across the regions.

(C) For Specialized works of Wildlife

- 1. What is the impact of Anti-Poaching Camps (APC) on the forests and Wildlife of the area? Assess across the circles and divisions under each scheme.
- ii. Are the APC's sufficiently equipped with staff and modern equipment's for protection activities?
- iii. What are the other infrastructures required for strengthening APC's?
- iv. What are the instances in numbers and intensity of occurrence of Forest Fires in the area? Have Fire Protection Camps (FPC) helped to prevent, contain and douse forest fires?

- v. What is the status of effectiveness of the activities taken up for mitigating man-animal conflict?

(D) For Specialized works of Working Plan

- i. What is the status of survey and demarcation of forest areas (RF's) in the state?
- ii. What is remaining area which needs to be demarcated? What is the amount required for a 100% survey & demarcation of RF's in the state?
- iii. What is the condition of Cairns, RCC boundary pillars and RF stones? What is the percentage of missing, not visible and damaged boundary demarcation cairns/pillars/stones?

(E) For Specialized works of Research:

- i. Are the research activities like collection of seeds from plus trees, raising & maintenance of Romets; Rare, Endangered & Threatened (RET) seedlings & Quality Planting material (QPM) etc being done annually in the Research Units throughout the state? Which species are commonly done under each of the above component i.e. Seed collection, Romets, RET & QPM.
- ii. To what extent the research activity has contributed to promote the broad objectives of forest policy. What are the suggestions to strengthen and improve the research activities in Karnataka Forest department?

(F) For Specialized works of Training?

- i. What is the kind of infrastructure developed in the training wing of KFD under these schemes? How they have been maintained? To what extent the gaps are addressed?
- ii. What kind of training is supported under these schemes in various training centers in the state?

(G) Other Infrastructure works of KFD

- i. What is the present condition of forest infrastructure created during the evaluation period? What are the different types of works undertaken? Whether

they are as per requirements of local conditions and are completed within the scheduled plan period?

- n. Are they being properly utilized? If yes, to what extent and if no, why?
- iii. What is the status of maintenance of buildings, roads and other infrastructure?
- iv. Is the ICT wing of department sufficiently modernized? What are the gaps which need to be filled in order to make KFD as one of the best digital department in the state?

(H) Providing individual/ community benefits

- 1. What kind of individual and Community benefits has been provided by KFD under the 4 schemes being evaluated?
- n. What is the impact of the schemes on livelihood and living conditions of the beneficiaries?
- ii. What is the nature of benefits and assets provided to the beneficiaries? Examine their suitability and functional status.

(I) General Issues:

- i. Evaluate the quality of the Works/Assets with reference to the sanctioned estimate, utility, functionality, usage, usefulness and appropriateness etc.
- ii. Whether Third Party Monitoring is introduced under CAMPA? What are the monitoring arrangements for the scheme works?
- iii. To what extent the works undertaken under each of these schemes serve the objectives of respective schemes? Which objectives have been fully addressed, which partly and which not at all?
- iv. Evaluate specific achievements failures and gaps of each scheme.
- v. Does the works carried out in the evaluation period under each scheme collectively contribute to the objectives of forest policy?

6. EVALUATION METHODOLOGY:

Sampling Design:

Forest Department in general has Territorial, Social Forestry and Wild life Divisions. Apart from this there are specialized wings like Working Plan & Research which are not divided as divisions but as units. The Training wing has a state Academy with several institutes spread across the state. A multi stage sampling method is adopted to draw the final sample.

- At first stage, the Division/unit wise work list as provided by respective APCCF for a particular scheme will be compiled for the whole state in the forest department.
- Then from this state level work list of a particular scheme, sorting of various types of works into 9 categories shall be done. This will be the second stage of clustering being done at the Department level.
- From this, the sample work the list for evaluation will be generated for each scheme by random sampling of 10% of works from each category (type) of work in that particular scheme covering all the circles in the State. This will be done by Karnataka Evaluation Authority.

Thus, the method followed is basically a multi stage sampling in which the first stage of cluster formation is at division/unit level and second stage is at type of work level and 10 % Works are identified randomly at KEA.

Sample across the categories of works- CAMPA

CAMPA	Total	Sample (10%)
Plantations	578	58
Other works		
Boundary	730	73
Other works	92	9
Other civil works	28	3
Camp	101	11
Building	37	4
Training	93	9
Desilting	155	15
General	34	4
Road	161	16
SMC	98	10
RF Board	314	30
Total	2412	242

Source: Forest Department GoK

Sample across the categories of works under 13th Finance, NAP & NBM Schemes

Sl.no.	Particulars	13 th Finance Total	Sample (10%)	NAP FDA Total	Sample (10%)	NBM Total	Sample (10%)
1.	Plantations	1088	110	579	58	248	25
	Other works						
2.	Boundary	651	65				
3.	Inventory	151	15				
4.	Other works (including General)	44	4				
5.	Other Civil Works	109	10				
6.	Camp	281	28				
7.	Building	170	17				
8.	Training	13	2				
9.	Desilting of tanks	25	3				
10.	Other research work	13	2				
11.	Road	24	2				
12.	SMC	56	5				
13.	RF Board	07	1				
	Total	2646	264	579	58	248	25

Source: Forest Department GoK

- The sample to cover all the Circles and all the categories of works implemented in a circle.
- The RF Board works may be observed on the way while visiting the sample works.
- The sample of works will be randomised by KEA.

Collection of primary data:

- The Consultant is expected to visit all the work spots sampled and provided to them by Karnataka Evaluation Authority for CAMPA, TFC, NAP and NBM schemes. Works once selected for sampling shall not be changed. Location of each sample work should be geo-referenced using GPS (Global Positioning System).
- The Consultant is required to collect the field data on the Android Application developed by ICT wing of Karnataka Forest Department for 'Third Party Evaluation'. Training shall be provided to the successful consultant about the use of the app. The consultant is expected to use the mobile app and capture the evaluation

data through his own device (tablet/ smart phone) on the spot along with geo-referenced and annotated photos of the works and upload them to the forest Dept. and KEA website as soon as the internet connectivity is available. The Client may suggest common configuration to all the Consultants for compatibility purpose which the Consultants must reckon. The backend application software, evaluation formats, basic information about the selected samples etc., will be hosted on the website. The Consultant will be given privileged access to the sampled data relevant to him on the website. Client will not supply the android equipment. Consultants must arrange for the same.

- **Form-1** of the app should be used if the work evaluated is a **Plantation**. The Consultant should collect all the details as required in the above format which may include the diverse species used in planting, survival percentage of the planted seedlings, their vigor, level of protection available, prospects of becoming a fully stocked plantation etc. All the fields in the above format should be filled and no field should be kept blank. The sampling intensity for plantations shall be 2% irrespective of the extent of plantation. This works out to have a sample plot for every 5 hectares of plantation, but in case where the extent of block plantation is less than 5 hectares, one sample plot shall be laid compulsorily. The size of each sample plot shall be 1000 square meters-(0.1 hectares), having a measurement of 31.42 meters X 31.42 meters, laid at random intervals with a random start, in the block plantation selected for evaluation. In case of plantations like Roadside, Greening of urban areas, Institutional plantations etc. and the whole plantation has to be considered as one sample and 100% evaluation has to be done for such plantations.
- The boundaries of plantation selected for evaluation shall be geo referenced and a plantation sketch prepared. Grids of 5 hectares or 0.1 hectares (1,000 square meters) shall be plotted on this sketch and the required number of sample plots shall be selected randomly. The sampling intensity shall not be less than 2%. The sampling intensity can be a little more than 2% to round off the decimals that are likely to

arise as the plantations are of various sizes. The evaluation shall include, among other, information on suitability of species planted, survival percentage, growth conditions, health of surviving plants, species wise girth at collar region, average height of the plants, quality of the work, with reference to the sanctioned estimate, carried out, etc. The sample plots laid for assessing the performance of the plantations shall be geo referenced with the help the GPS.

- Form-3 pertains to evaluation of 'Other works' like building & road construction, Soil and Moisture Conservation works, Boundary consolidation works, specialized works of Wildlife, Working Plan, Research & Training wings apart from purchase of equipment/ vehicles etc.
- Fonb-4 relates to works of extending individual or community benefits to the beneficiaries under various schemes. The Consultant should examine relevant expenditure related documents, visit the work spots, examine the overall usage and its impact on the beneficiary, interact with the beneficiaries and record their satisfaction level apart from uploading details in the app.
- Sample data shall be collected in quantitative form generally. Where appropriate, it may be qualitative or mixed. No field in the digital forms of the android app should be left vacant while uploading the data.
- As per requirement Focus Group Discussions and in depth Interviews of implementing and monitoring officers at various levels are to be conducted.
- Secondary data related to different schemes may be collected from the Forest department.

7. DELIVERABLES AND TIMELINES:

The whole study is to be completed within 6 months from date of getting confirmed evaluation assignment. The evaluating agency is expected to adhere to the following time lines and deliverables

Deliverables and time schedule

1. Work plan submission/Inception report	: One month after signing the agreement
2. Field Data Collection	: Two – three months
3. Draft report submission	: One month after Field Data Collection
4. Final report submission	: One month after Draft report submission
5. Total Duration	: 6 Months

8. QUALITIES EXPECTED FROM THE REPORT:

The evaluation report should generally conform to the United Nations Evaluation Guidelines (UNEG) "Standards for Evaluation in the UN System" and "Ethical Standards of Evaluations".

- a) The results should correspond to the ToR. In the results chapter, each question of the ToR should be answered. The overall results to be analysed in an integrated way to draw the conclusions.
- b) The report should be complete and logically organized in a clear but simple language. Evaluation report should conform to the standard report writing style and structure.
- c) The report should present a comprehensive review of the Scheme/ programme in terms of the content, implementation process, adequacy, information and access to beneficiaries.
- d) The Report should provide a scientific assessment of the impact of the works under the CAMPA and other schemes in Forest Department in Karnataka. It should assess the impact in terms of the increase in forest cover, Soil moisture, Infrastructure development research and training and find out as to what extent the scheme objectives are attained. The qualitative data should be used in an unbiased manner to support or for further analysis of and reflections from the quantitative data. The analysis should provide adequate space for assessing the variations across the regions and categories. Case studies to be presented to bring out the realities at the local level.
- e) With regard to recommendations, the number of recommendations is not a measure of the quality of evaluation. The report should come out with specific recommendations

based on adequate field evidence for any modifications in the programme design, content, implementing procedures, and any other modifications to improve the access and impact of the Scheme/Programme. The recommendations should be short term to bring in mid course corrections and the long term to bring about modifications/change in the policy.

Structure of the report:

The following are the points, only inclusive and not exhaustive, which need to be mandatorily followed in the preparation of evaluation report:

By the very look of the evaluation report it should be evident that the study is that of Forest Department, Government of Karnataka and Karnataka Evaluation Authority (KEA) which has been done by the Evaluation Consultant Organization. The report should be complete and logically organized in a clear but simple language. Besides conforming to the qualities covered in the Terms of Reference, report should be arranged in the following order:

1. Title and Opening Page
2. Index
3. List of acronyms and abbreviations
4. Executive Summary- A stand alone section that describes the program, purpose and scope of evaluation, research design and methodology, key findings, constraints and recommendations. It should be brief and precise not exceeding 4-7 pages.
5. Background- A section that briefly covers the history or genesis of the sector under which the programme/scheme being evaluated covered. It should give recent fact sheets taken from reliable and published sources.
6. Objectives and performance of the program being evaluated- This section will include the stated objectives of the programs and the physical and financial achievements of the selected program in the period of evaluation. It should cover the description of the target group, aim of the program and method of selection of

beneficiaries.

7. Review of literature/past evaluation reports.
8. Evaluation Methodology - This should include research design, sample design and size, questionnaire design and pilot test, data collection and quality assurance plan.
9. Findings of the evaluation study.
10. Case Studies, Best Practices
11. Limitations/constraints in the evaluation study.
12. Recommendations that flow from the evaluation.

Annexures-

1. Sanctioned Terms of Reference of the study.
2. Survey tools and questionnaires
3. List of persons interviewed.
4. Place, date and number of persons covered by Focus Group Discussion.
5. Additional documents

9. ADMINISTRATIVE ARRANGEMENTS:

The Forest Department and KEA will provide the necessary information pertaining to the study and also co-operate with the consultant organization in completing the assignment task within the stipulated time period. The forest department will provide all the details of the works undertaken in four schemes at various levels till the village level and the list of beneficiaries. The concerned district and taluk officials will be instructed by the Forest Department for providing the required information/data at the taluk and GP levels.

It is expected to complete the present study in 6 months time line, excluding the time taken for approvals at KEA.

QUALIFICATION OF THE CONSULTANTS:

Consultant Organizations are expected to have at least minimum 5 years of experience in undertaking evaluation studies in Forest/Natural Resource management area. They should have the following key professional staff in their team:

S. No	Subject Experts Requirement	Experience
1.	Principal Investigator: Retired Forest official (not below the rank of Chief Conservator of Forests)/ First class MSc Life Sciences/ Forestry/. Ph. Dis preferable.	With at least 05 years of field experience in evaluation of Forestry works
2.	1st Core Team Member: B E (Civil) Engineer	With at least 3 years of field experience in related field
3	2nd Core team member First Class Post graduate in Sociology/ Social Work/ Rural Development.	With at least 3 years of field experience in related field
4.	3rd Core Team Member: Resource Analyst /Chartered Accountant/ Data Analyst with Post Graduate degree in Statistics/ Computer Science.	With at least 3 years of field experience

10. COST SCHEDULE OF BUDGET RELEASE :

Output based budget release will be as follows;

1. The first instalment of consultation fee amounting to 30% of the total fee shall be payable as advance to the consultant after the approval of the inception report, but only on execution of a bank guarantee of a scheduled nationalised bank, valid for a period of at least 12 months from the date of issuance of advance.
2. The second instalment of consultation fee amounting to 50% of the total fee shall be payable to the consultant after approval of the draft report.
3. The third and final instalment of consultation fee amounting to 20% of the total fee shall be payable to the consultant after the receipt of the hard and soft copies of the

final report in such format as prescribed in the agreement along with all original documents containing primary and secondary data, processed data outputs study report and soft copies of all literature used in the final report.

4. Taxes will be deducted from each payment as per rates in force. In addition the evaluating agency/ consultant is expected to pay service tax as their end.

11. SELECTION OF CONSULTANT AGENCY FOR EVALUATION:

The selection of evaluation agency shall be finalized as per provisions of KTPP Act and rules without compromising on the quality.

12. Contact person for further details:

- Nodal Officer, Forest Department, Government of Karnataka.
- Consultant (Evaluation) KEA

(Acl\o. " '-"" .
ToR Prepared by
(Dr. Chaya Degaonkar)

-Sd-
Chief Evaluation Officer
Karnataka Evaluation Authority

Annexure-1

DETAILS OF SCHEMES TO BE EVALUATED

SCHEME-1: COMPENSATORY AFFORESTATION FUND MANAGEMENT & PLANNING AUTHORITY (CAMPA)

1. Introduction:

CAMPA has been constituted in pursuance of the Hon'ble Supreme Court's order dated 30-10-2002 in IA No.544, in Writ Petition(Civil) No. 202 of 1995 for the purpose of management of money collected towards Compensatory Afforestation (CA), Net Present Value (NPV) and any other money recoverable in pursuance of the Hon'ble Supreme Court's Order to this regard.

Ministry of Environment, Forest and Climate Change, (MOEFCC) Government of India has issued guidelines for operating the funds under State Compensatory Afforestation Fund Management and Planning Authority (CAMPA) for preservation of natural forests, management of wildlife, infrastructure development and other allied works.

The State CAMPA would administer the amount received from the Ad-hoc CAMPA and utilize the amount collected for undertaking Compensatory Afforestation, assisted natural regeneration, conservation and protection of forests, infrastructure development, wildlife conservation and protection and other related activities and for matters connected therewith or incidental thereto.

2. The Major objectives of the State CAMPA Projects:

As per guidelines issued by the Ministry of Environment and Forests, Government of India, the State CAMPA shall seek to promote:

- (a) Conservation, Protection, Regeneration and Management of existing natural forests;
- (b) Conservation, Protection, and Management of wildlife and its habitat within and outside Protected Areas including the consolidation of the protected areas.
- (c) Compensatory Afforestation
- (d) Environmental services, which include:-

- (i) Provision of goods such as wood, non-timber forest products, fuel, fodder and water and provision of services such as grazing, tourism, wildlife protection and life support;
- (ii) Regulating Services such as climate regulation, disease control, flood moderation, detoxification, carbon sequestration and health of soils, air and water regimes;
- (iii) Non-material benefits obtained from ecosystems, spiritual, recreational, aesthetic, inspirational, educational, symbolic and
- (iv) Supporting such other services necessary for the production of ecosystem services, biodiversity, nutrient cycling and primary production.
- (v) Research, training and capacity building. The project is implemented in all districts of the State. With the release of funds from Ad-hoc CAMPA, Government of India, the State CAMPA has embarked on a mission mode to take up Project Specific Activities i.e., Compensatory Afforestation & other Site-Specific Activities and Activities for utilization of NPV amount like Consolidation, Protection, Regeneration in natural Forests Wildlife Protection and Management activities, Infrastructure Development etc.

As envisaged by the Hon'ble Supreme Court of India and as per guidelines issued by the Ministry of Environment and Forests, Government of India, the main works taken up under State CAMPA are: -

3. Project Specific Activities:-

A. Compensatory Afforestation (CA), Additional CA (ACA) & Penal CA (PCA)

- i) In Forest Land
- ii) In Non-Forest Land

B. Site Specific Activities:

- i) Safety Zone plantation
- ii) Planting in degraded forest area (1 1/2 times of safety zone)
- iii) Fencing
- iv) Catchment Area Treatment Plan (CATP)

- v) Planting Dwarf Species
- vi) Medicinal plantation
- vii) Soil & Moisture Conservation works
- viii) Providing LPG connection to local villagers etc.,

C. Activities for Utilization of NPV:-

I. Consolidation and protection of Forests:

- a. Survey and demarcation of Forests
- b. Forest boundary consolidation through Cattle Proof Trench (CPT)
- c. Fire protection
- d. Creation of lung spaces by protection and consolidation of valuable forest areas in the city's urban areas and developing them as Tree Parks.

II. Consolidation and Regeneration of Forests:

- a. Assisted Natural Regeneration (ANR)
- b. Promotion of Sandal Regeneration on estate management concept.
- c. Production of Quality Planting Materials, collection of quality seeds and other Research activities.
- d. Integrated plan for Conservation and Development of biodiversity, forests and ecology in the forest areas of coastal zone (HasiruKavacha)

III. Wildlife Protection and Management:

- a. D-line clearance
- b. Development & maintenance of road network in protected areas.
- c. Elephant Human conflict mitigation measures (Areas outside & inside protected areas)
- d. Elephant Proof Trench (EPT)
- e. Solar Fencing
- f. Assistance to Bannerghatta Biological Park
- g. Wildlife Habitat Improvement & Management for individual Protected Area's (PA's)

- i. Creation of new water holes
- ii. De-silting of tanks
- iii. Soil & Moisture Conservation (SMC) works
- iv. Providing Salt licks
- v. Elephant depredation camps/ Anti-poaching camps (APC's)

IV. Infrastructure Development:

- a. Strengthening and augmenting digitization and Communication network;
 - i. Cell Phones
 - ii. Computers
 - iii. Laptop
 - h. Xerox Machines
 - i. GPS
 - j. Digital Cameras
 - k. Personal Digital Assistance (PDA)
- b. New Buildings (Staff Quarters)
- c. Building maintenance
- d. Strengthening of Forest Institutes for capacity building.
- e. Purchase of vehicles (Two Wheelers for Forests and Four Wheelers for Officers)

V. Forest Produce Saving devices & other activities:

- a. Supply of energy saving devices at subsidized cost to forest fringe villages.
- b. Maintenance of WP Samples Plots
- c. Repair, Maintenance, & Office Expenditure (RMOE), Travelling Expenses (TE) etc.

SCHEME- 2:13TH FINANCE COMMISSION (TFC)

1. Introduction:

Karnataka is pioneer in implementation of various Forestry Programs. The successful implementation of various programs with the assistance of State Government, Central Government and Externally Aided projects has added fillip to its efforts done so far in this field. Appreciating the implementation of these programs and preparation of working plan the Government of India under '13th Finance ' has come forward to support the Forest Department of Karnataka. The project is implemented in all districts of the State. With this assistance from the Government of India, the Forest Department has embarked on a mission mode to expand the Forest cover and strengthen the infrastructure of the department in all districts of the state.

2. The Major objectives of the 13th Finance projects:

The broad objectives of the grant-in-aid for forests are to provide the wherewithal for preservation, so as to halt and reverse past declines in the quantum and quality of area under forest: and to provide fiscal resources by which the state can enable alternative economic activities as a substitute for economic disability imposed by forest cover.

- i. To increase the Forest Cover of the state
- ii. To improve the infrastructure of the department especially for front line staff
- iii. To improve the mobility of the Field Staff through induction of vehicles
- iv. Use of modern technology like GIS through ICT (Information, Communication & Technology) etc)
- v. Enhance protection mechanism for forest & wildlife

3. Project Specific Activities:

1. Advance works for Plantation

2. Raising of Plantation
3. Maintenance of Plantation
4. Development of Central Nursery
5. Development & maintenance of Sandal & Medicinal Plant Estate
4. Habitat Improvement
7. Support to ANR to Special such as Dindiga/Caned regeneration
8. Raising/Maintenance of Seedlings of Polythene Bags (PBs)
9. Eco-Tourism Development
10. KaravaliHasiruKavachaYojane
11. Renewable Energy
12. Research & Utilization Activities
113. Training activities for forest staff
14. ICT, Mobility, Publicity & Other Infrastructure Developments in HQs
15. Building infrastructure development works (Civil Works)
14. Publicity, Awareness, Training, etc.,
17. Working Plan Activities
18. Fixing/Creating/Formations Cairns
19. Establishment & Maintenance of Protection Camps like Forest PC, Anti-Poaching Camps, Anti-Smuggling Camps, Anti-depredation camps etc
20. Boundary Consolidation including D-line clearance, CPT and Boundary Walls.
21. Vehicle Maintenance.
22. Purchase of Laptop, Desktops, related accessories and other ICT Requirements

**SCHEME-3 :NATIONAL AFFORESTATION PROGRAM-
FOREST DEVELOPMENT AGENCY (NAP- FDA)**

Objectives of the Scheme

- i. **Goal:**
Increase and/ or improve Forest and Tree cover (FTC)
- ii. **Purpose:**
Rehabilitation of degraded forests and other areas by institutionalizing decentralized/ participatory forest management and supplementing livelihoods improvement processes.
- iii. The activities involved and the outputs of NAP-FDA scheme are as follows;

Outputs	Activities
(a) Improved natural forest stock	Assisted natural regeneration of degraded areas
Increased and improved FTC	(a)Artificial regeneration and Enrichment planting. (b) Promotion of Non-Timber forest Products (NTFPs)
(c)Participatory forest management initiated by supporting the immediate needs of fringe-community	Entry Point Activities
(d)Long -term participation of fringe-community in forest management	(a)Participatory-micro-planning, implementation and monitoring of projects (b) Flexible project design and cost Norms
(e)Increased Soil and Moisture Conservation (SMC)	Biological SMC supplemented by physical SMC treatment as per local site condition.
(f) Improved forest/ tree productivity	Promotion and use of improved technologies and high-quality planting material.
(g)Increased capacity of fringe community and frontline staff to develop and manage natural resources	Awareness generation, training and linkage with other institutions
(h)Enhanced opportunity for local forest-based micro enterprises	Value-addition and marketing of forest produce from project area
(i) Review and independent monitoring processes internalized	Bottom-up internal monitoring of projects and independents third party concurrent and final evaluations of each project
G)Tree cover in non-forest areas promoted	(a) Agro-forestry on bunds and farmlands (b)Coastal shelterbelt and tank foreshore plantations on public and private lands.

SCHEME-4: NATIONAL B MBOO MISSION (NBM)

Mission Objectives:

- To promote the growth of the bamboo sector through an area based regionally differentiated strategy
- To increase the coverage of area under bamboo in potential areas, with suitable species to enhance yields.
- To promote marketing of bamboo and bamboo- based handicrafts.
- To establish convergence and synergy among stakeholders for the development of bamboo.
- To promote, develop and disseminate technologies through a seamless blend of traditional wisdom and modern scientific knowledge.
- To generate employment opportunities for skilled and unskilled persons, especially unemployed youths.

Strategy:

To achieve the above objectives, the mission would adopt the following strategies:

- Adopt a coordinated approach covering production and marketing to assure appropriate returns to growers/ producers.
- Promote Research and Development (R&D) of genetic superior clones of suitable species and technologies for enhanced production.
- Enhance acreage (in forest and non-forest areas) and productivity of bamboo through species change and improved cultural practices.
- Promote partnership, convergence and synergy among R&D and marketing agencies in public as well as private sectors, at all levels.
- Promote where appropriate, cooperatives and self-help groups ensure support and adequate returns to farmers.
- Facilitate capacity-building and Human Resources Development.
- Set up National, State and sub State Level Structures, to ensure adequate returns for the produce of the farmers and eliminate middlemen, to the extent possible.

List of Plantations sampled

SL-NO	CIRCLE	DIVISION	SUBDIVISION	RANGE	PLANTATION	YEAR OF PLANTING	NET PLANTATION AREA HA
1	CHIKKAMAGALURU	KOPPA T	KOPPA T	N.R PURA T	Madbur	2014-15	2
2	CHIKKAMAGALURU	KOPPA T	KOPPA T	N.R PURA T	H M jagadish S/o Manjappa gowda,K Kanabur	2014-15	1
3	BALLARI	DAVANAGERE T	DAVANAGERE T	HONNALI T	Bamboo	2013-14	6
4	CHIKKAMAGALURU	KOPPA T	BALEHONNUR T	BALEHONNUR T	Halasur sy no.45	2016-17	10
5	CHIKKAMAGALURU	KOPPA T	BALEHONNUR T	BALEHONNUR T	halasur sy.no 55	2012-13	20
6	BALLARI	DAVANAGERE T	DAVANAGERE T	DAVANAGERE T	Anagodu Sy no 129 130 131	2014-15	5
7	UTTARA KANNADA	KARWAR T	KARWAR T	KARWAR T	Naitisavar bamboo 157A1A	2015-16	10
8	UTTARA KANNADA	KARWAR T	KARWAR T	KARWAR T	Wailwada Bamboo	2016-17	10
9	UTTARA KANNADA	SIRSI T	SIRSI T	SIRSI T	Unchalli 2013	2013-14	20
10	MYSURU	HUNSUR T	HUNSUR T	PERIY APATTANA T	Balekatte plantation	2015-16	25
11	UTTARA KANNADA	HALIYALA T	DANDELI T	DANDELI T	Raising of Plantation Copt No. V-21 Dandeli	2016-17	25
12	UTTARA KANNADA	HALIYALA T	DANDELI T	DANDELI T	Maintenance of One year plantation during 2014-15	2013-14	10
13	CHIKKAMAGALURU	CHIKKAMAGALURU T	CHIKKAMAGALURU T	CHIKKAMAGALURU T	Gonakal Sy.no.194	2013-14	10
14	UTTARA KANNADA	KARWAR T	ANKOLA T	MASTIKATTA T	Adlur Fs No-77	2013-14	20
15	CHIKKAMAGALURU	KOPPA T	BALEHONNUR T	KALASA T	Kelaguru NBM	2013-14	3
16	UTTARA KANNADA	DANDELI WL	ANSHI WL	KUMBARAWADA WL	Shevalli Maintenance Of One Year Old Plantation	2013-14	50
17	UTTARA KANNADA	YELLAPUR T	MANCHIKERI T	IDUGUNDI T	Bare 2011 Rains Plantation	2011-12	25

SL-NO	CIRCLE	DIVISION	SUBDIVISION	RANGE	PLANTATION	YEAR OF PLANTING	NET PLANTATION AREA HA
18	UTTARA KANNADA	HALIYALA T	HALIYALA T	HALIYALA T	Kurigadda	2012-13	25
19	HASSANA	TUMKUR T	TUMKUR T	KUNIGAL T	Odehalla plantation	2012-13	20
20	KODAGU	MADIKERI T	MADIKERI T	BHAGAMANDALA T	Thodikana	2014-15	20
21	KODAGU	MADIKERI T	SOMAWARAPETE T	SOMAWARAPETE T	Hudgoor plantation	2013-14	30
22	CHIKKAMAGALURU	CHIKKAMAGALURU T	MOODIGERE T	ALDUR T	Mansoon pitting and planting at private Lands in Madeneralu	2013-14	2.5
23	BELAGAVI	BELAGAVI T	BELAGAVI T	GUNAL T	Mavanoor 223	2016-17	25
24	BELAGAVI	BELAGAVI T	KHANAPUR T	KHANAPUR T	Shindhohi fs no 31 & dokegali 2,4,6	2016-17	25
25	UTTARA KANNADA	HALIYALA T	HALIYALA T	SAMBRANI T	Bamboo Plantation	2012-13	25
26	UTTARA KANNADA	HALIYALA T	HALIYALA T	HALIYALA T	Haliyal Block 141	2014-15	1

Annexure 3

List of SMC Works sampled

CIRCLE	DIVISION	SUBDIVISION	RANGE	PLANTATION
MYSURU	HUNSUR T	HUNSUR T	PERIYAPATTANA T	Balekatte plantation
UTTARA KANNADA	KARWAR T	ANKOLA T	MASTIKATTA T	Adlur Fs No-77

List of Species planted

Sl. No.	Species
1	<i>Bambosa spp.</i>
2	<i>Bambusa arundinasia</i>
3	<i>Dendrocalamus stricutus</i>
4	<i>Calamus spp.</i>

EVALUATION TEAM

Core Team

- Dr. B. Shivaraju, IFS, APCCF (Rtd.), Principal Investigator
- Dr. Lasya Gopal, Co- Principal Investigator
- Dr. Nagraj Patil, Civil Engineering Expert
- Dr. Krishnamurthy, Statistician
- Mr. Ashwathaiah, DCF (Rtd.), Team Member
- Mr. Nagesh I. V DCF (Rtd.), Team Member
- Mr. H.H. Ninga Setty, Team Member
- Mr. Yabbati Nagaraju, Team Member
- Dr. Sridar Babu M. N, Team Member
- Mr. Hara Kumar Verma, Team Member
- Mr. Arjun Shetty, Team Member
- Dr. Veerabaswant Reddy, Team Member
- Mr. Kiriti Sahoo, Team Member
- Mr. ManjunathJadhav, Team Member
- Mr. Mahendra Math, Team Member

IT and Secretarial Support

- Mr. T. Saravana, IT Manager
- Ms. Shobha M.P., Executive Secretary
- Ms. Jyothi. S., Secretary
- Ms. Manjula, Secretary
- Ms. Christina Preethi, Secretary