BAMBOO SECTOR IN KERALA: BASELINE DATA GENERATION FOR DEVELOPING AN ACTION PLAN

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KFRI Research Report No.291

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(Final Report of the Project KFRI/462/04, December 2004-November 2005)

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January 2006

Abstract of the Project Proposal

Project No.	:KFRI 462/04
Title	: Bamboo sector in Kerala: Baseline data generation for developing an action plan
Objectives	: 1. To generate baseline data relating to resources, Consumption pattern, socio-economic and livelihood conditions of bamboo dependent, marketing, technology and product development for understanding the working of the bamboo sector. 2. To prepare an action plan for the development of the bamboo sector
Practical utility	: Baseline data on various aspects of bamboo sector will be generated and strategies and action plan for the development of bamboo sector in Kerala will be formulated
Date of Commencement	: December 2004
Scheduled date of completion	: November 2005
Funding agency	: Industries Department, Government of Kerala
Investigators	: P.K. Muraleedharan V. Anitha C.N. Krishnankutty R. Gnanaharan P. Vijayakumaran Nair S. Sankar K.K. Seethalakshmi
Study area	: Kerala state

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ACKNOWLEDGEMENTS

The Project was sponsored by Industries Department, Government of Kerala. We wish to place on record our sincere thanks to Dr. J.K. Sharma, Director KFRI for kind support and encouragement. We are extremely thankful to Shri. C.P. John, Member, State Planning Board, who has shown keen interest in the progress of the project. Our thanks are also due to Shri. V.Rajagopal, General Manager, K.bip and Shri. Ramesh Bhasker, Special Officer, Bamboo Mission for their co-operation. Thanks are also due to Kerala State Bamboo Corporation, Seraphic Handicrafts Co-operative Society, Hindusthan News Print Ltd, and Kerala Forest Department for providing us with data. We are also placing on record our sincere gratitude to Mr. C.Ajithkumar, Ms. M.P.Sreelakshmi, Mr. Shijo Thomas, Mr. C.L.Biju, Mr. P.N. Rajeev, Mr. Arun Kumar, Mr. K.R.Ayyapadas, Mr. P.D. Sebastian and Mr. KV Santheep who collected all relevant data for the project and rendered all necessary help. We are also thankful to Dr. K.C.Chacko, Dr. Jose Kallarackal and Dr.K K N Nair for the editorial scrutiny. Last but not the least we are thankful to Mrs. Ajitha VA for type setting the report.

ABSTRACT

Many national and international agencies have recognized the fact that bamboo is a premier natural resource for human use and a sustainable material of the future. In Kerala, like many other states in India, bamboo is the most versatile among minor forest produces and has multiple uses. However in the recent past, due to heavy biotic pressure, the bamboo availability is getting declined not only from the forests but also from the homesteads. There is a serious concern among various sections in the society that if urgent attention is not paid on this, bamboo will go beyond the reach of common man. It has been therefore, felt that there is pressing need to study the changing scenarios of bamboo sector in Kerala to understand its problems. However, the basic information available on bamboo sector, a pre-requisite for planning, in the state is either inadequate or out dated. Keeping this in view, the present study has generated baseline data relating to resources, consumption pattern, socioeconomic and livelihood conditions of the bamboo dependents, marketing, and technology and product development for understanding the working of bamboo sector and also to prepare an action plan for the development of the bamboo sector.

The study has used both primary and secondary data. Based on multi-stage stratified random sampling method, a sample has been selected from the homesteads of Kerala to study bamboo resources in home gardens, socio-economic conditions of farmers and livelihood conditions of the bamboo dependents. Satellite data have been used to assess bamboo resources in forests. Both primary and secondary data have been used to analyse other aspects of the study

Total standing crop of bamboo in homesteads in Kerala is estimated as 13.61 million culms and its green weight is 0.331 million tonnes. There are six species of bamboo available in homesteads including reed of which *Bambusa bambos* is the dominant species, accounting for 96 per cent. This is followed by *Bambusa vulgaris* and reed, constituting 2.23 per cent and 1.38 per cent respectively.

Due to massive harvesting in the past, 95 per cent of the bamboos in homestead are very small, small, and medium categories. This is an indication that

availability of matured clumps is not high in the state. An attempt was also made to compare growing stock of bamboo and area occupied in homesteads during 1987-88 and 2004-05. The study highlights that there has been a reduction in growing stock by about 0.077 million tonnes from 0.408 million tonnes during 1987-88 to 0.331 million tonnes during 2004-05.

Based on 1997 imagery, bamboo resource in forest areas was estimated as 2.63 million. Further, a comparison of the availability of bamboo and reed in central forest regions in Kerala during 1997 and 2005 shows that the variations in bamboo resources in the study area occurred only 10 per cent during the period

Major consuming sectors of bamboo in the state are pulp and paper industry, traditional sector, export and households of which the consumption of pulp and paper is the major one, constituting 0.085 million tonnes. The total consumption of bamboo and reed in the state is estimated as 0.256 million tonnes.

The socioeconomic attributes of bamboo homesteads are very similar to any area in the State with a heterogeneous community feature and a purely agrarian economy. Bamboo does not contribute much to their gross income. The per capita income of the artisans is estimated as less than Rs.6,000 which is significantly lower than that of the state average (Rs.24,053) and thus they live below the poverty line.

A comparison between the basic characteristics of two bamboo based production sectors involving the trained artisans and the MBDs has demonstrated that labour intensive techniques of production and value added products ensure profitability and employment/ livelihood security. The economic potential highlights that the MBDs do not stand a chance in the face of stiff competition and the incidence of cheap substitutes.

The traditional bamboo based industry, which was an important source of employment to Marginalised Bamboo Dependent (MBDs) is now in a declining stage. Although a few institutions like Kerala State Bamboo Corporation and co-operative societies were established for solving industry's problems, their interventions are not adequate to improve the conditions. Due to irregular and inadequate supply of raw

materials and lack of adequate marketing facilities, this remains to be a part time/off-season job to many artisans which only supplements their income.

Market study of bamboo from home gardens revealed that bamboo is sold through primary and wholesale depots in Kerala. There are 95 primary depots which are located in most of the districts and cater the local requirements whereas the 35 wholesale depots located in Palakkad District fulfil the demand mostly from the neighbouring State of Tamil Nadu. Of the total quantity of 74,000 metric tonnes green weight of bamboo marketed through the depots in Kerala during 2004-05, primary depots account for 48 per cent and wholesale depots the remaining 52 per cent. It is evident that quantity of bamboo exported to Tamil Nadu has been declining considerably mainly due to the shortage in supply. Profitability analysis of wholesale depots showed that bamboo trade is profitable to traders

Apart from the traditional uses of bamboo, in the context of globalization, this eco friendly material has been assigned new roles and consequently a number of handicraft units have started diversifying their production. The new and elegant looking furniture and other household items are manufactured from bamboo and are now available in the market. The profitability worked out for selected handicraft products indicates that they give marginal profit. The main problems in this sector are: lack of adequate raw materials, low level of adoption of technology, low investment, inadequate marketing facilities, etc. There is scope for using improved technology in handicraft sector without affecting employment. One of the advantages of using modern tools in the handicraft sector is that this would improve quality of the products that ensures better marketing. Solution of some of these problems can certainly boost up the bamboo handicraft sector in future.

The study upholds the view that a holistic approach is required for over all development of the bamboo sector in the state which requires formulation of bamboo policy and implementation of well-knit planning. Keeping this in view, the study attempted to develop strategies and action plan for better development of the bamboo sector in the state.

1. INTRODUCTION

1.1 Background

Bamboo occurs in the tropical, subtropical and temperate regions of the world with uneven distribution based on the annual precipitation, altitude, soil conditions and temperature. Bamboo, a viable replacement for wood, is an industrial raw material for traditional and modern sectors, an important source of food, medicine and integrally involved in culture and arts (INBAR, 1997). In India, about 10.03 million hectares of land area comprising 12.8 per cent of total forests in the country is occupied by bamboo. About 108 species belonging to 15 genera have been reported from India (Kumar, 2004). The employment potential of bamboo is very high and the major work force constitutes the rural poor, especially the women. About 432 million workdays are provided by the bamboo sector annually in India (Adkoli, 1994).

Kerala is one of the major diversity centers of bamboo in the country and 22 species of bamboos under seven genera have been recorded from this area. This comes to about 20 per cent of the total bamboo distributed in India and 95 per cent of the total species reported from peninsular India (Kumar and Remesh, 1999). Bamboo (including reed bamboo) is used as a raw material both by the pulp and paper and the traditional industries in the State. In Kerala, while bamboo is available both from forests and homesteads, reed is available mostly from forests. Due to over-exploitation and other biotic pressures, the area under bamboo in the forests has shrunk considerably and consequently, the raw material requirements of the industrial and the traditional sectors are not adequately met.

Bamboo was one of the important crops in the traditional agricultural setting of the home gardens probably due to its ability to meet the multifarious requirements of the farming community. During the past four or five decades, home gardens have undergone major changes, in terms of structure and species composition. Attracted by regular income, the farmers introduced plantation/cash crops in the home gardens. Later, species substitution / crop mix became more prevalent according to the changes in income from the products. For instance, changes in the land use pattern,

particularly the conversion of mixed farming into systems dominated by crops such as coconut or rubber, have resulted in replacing bamboo in the homesteads. With the decline of bamboo resources in the forests, the industrial manufacturers turned their attention to home gardens for procuring raw materials, which deepened the raw material crisis of the traditional sector. Further, the growing biotic pressure is one of the major reasons for the large scale elimination of bamboos especially from the homesteads. In addition, planting activities have been low both in forest areas and home gardens and consequently, production of bamboo is not in tune with its demand. The supply of bamboo is estimated to be about 50 per cent of the total requirements.

Traditional bamboo-based industry is located in certain pockets of the State where the socially and economically weaker sections of the society are involved in production. Bamboo mats and baskets are the two major products. The manufacturing of handicraft items is a recent addition in the industry and is still in its infancy. Not much attempt has been made to introduce modernization of tools or product diversification or popularization of new products like bamboo shoot. In other words, the industry continues to retain its traditional nature. Further, there are several constraints relating to production, marketing and utilization of bamboos/products in Kerala that hinder the growth of bamboo sector in the State. The development of this sector calls for formulation and implementation of a well-knit development plan, based on reliable data and information.

1.2 Lack of basic information

In Kerala, it is generally said that about 300,000 people, most of whom belong to socially and economically weaker section of the society, depend on bamboo for their livelihood (Nair and Muraleedharan, 1983). The decline of bamboo resources will adversely affect the socioeconomic conditions of the bamboo dependents and bamboo farmers. Bamboo workers are under privileged and their livelihood opportunities are limited and dependent on the development of bamboo sector. Although this is one of the important sectors of the economy, only very few studies are available on the socioeconomic aspects of bamboo sector. For instance, the

studies undertaken by Ajithkumar (1985), Jayasankar (1996 and 2004), Krishnankutty (1998) highlighted the socioeconomic conditions of the weavers. Detailed studies have been carried out on marketing of bamboo in Kerala by Krishnankutty (1991 and 1998), Jayasankar (1996), and Jayasankar and Muraleedharan (2000). Based on sample survey conducted during 1988-89, an attempt was made by Krishnankutty (1991) to estimate the growing stock of bamboo in Kerala home gardens. Nair (2001) has estimated bamboo resources in forest areas of the state with the help of high resolution satellite images.

Although these studies are very important, the information on socioeconomic and resource aspects of bamboo provided by them are either inadequate or outdated to prepare a well-knit development plan for this sector. Another shortcoming is that they are mostly micro-level studies, confining to one or two weaving communities or localities and consequently, scope of preparation of strategies/policy based on them is limited. In the context of globalization, new found role for eco-friendly materials like bamboo has opened up which calls for preparation of new strategies and action plan, aiming overall development of the sector. This study is a modest attempt to generate baseline data to prepare an action plan for the development of bamboo sector in Kerala.

1.3 Objectives

1. To generate baseline data relating to resources, consumption pattern, socioeconomic and livelihood conditions of the bamboo dependents, marketing, technology and product development for understanding the working of the bamboo sector.
2. To prepare an action plan for the development of the bamboo sector.

1.4 Methodology

1.4.1 Estimation of growing stock of bamboo in homesteads

A sample survey has been conducted in the homesteads of Kerala to estimate the species-wise growing stock of bamboo. The homesteads include house compounds, farm lands and dry land area under agricultural use. The study used a stratified two-stage sampling plan. Panchayats in Kerala have been stratified into two: those with bamboo grown predominantly and those with isolated bamboo clumps. A reconnaissance survey has been carried out to identify the panchayats in which bamboo is found in homesteads. These panchayats belong to the first-stage units of sampling. It was decided to select at least five per cent panchayats from the two strata in proportion to their total number in each stratum. Panchayats in each stratum have been selected at random. Wards of these panchayats form the second-stage units of sampling. Two wards each have been randomly selected in each of the selected panchayats for resource assessment. Growing stock of bamboo in a ward is the basic observation in the sampling plan. At the time of listing, number of clumps in each homestead has been counted and all the culms by culm-diameter classes in each clump have been enumerated. The culm diameter classes are: very small (<5 cm), small (5-7.5 cm), medium (7.5-10 cm), big (10-12.5 cm) and very big (>12.5 cm). Total growing stock in terms of number of culms in different culm-diameter classes has been estimated using the formula of stratified two-stage sampling design (details of estimation procedure and soft ware used are given in Appendix 1.1). By multiplying the number by culm-diameter classes with the corresponding green weight, the bamboo resource in tonnage has been estimated.

1.4.1.1 Reconnaissance survey: According to earlier studies, bamboos are grown predominantly in three districts in the State viz., Palakkad, Thrissur and Malappuram. Based on extensive reconnaissance surveys in these districts, 160 panchayats where bamboos are grown abundantly were treated as stratum I and the remaining panchayats were grouped under stratum II. Considering the fact that a minimum number of sample should be 5 per cent of the total panchayats, 14 panchayats from

stratum I and 51 panchayats in the stratum II have been randomly selected. A list of selected panchayats in both strata is given in Appendix-1.2 (1.2 A and 1.2 B). In each of the selected panchayats two wards have been randomly selected for detailed study. For sample selection, detailed sampling frame such as number of households, availability of bamboo in each wards, etc was prepared for each panchayats. The above information collected for Mundathikode panchayat in Thrissur district, for example, is given in Appendix 1.3 (1.3 A and 1.3 B). The detailed questionnaires for resource and socioeconomic surveys were prepared (copies of the same are attached in Appendix-4).

1.4.2 Status of bamboo in forest areas

Traditional methods involve laying out sample plots and counting number of culms and clumps. With the availability of high resolution satellite images, bamboo stands in forest could be identified in different density classes and availability estimated. An estimation of the bamboo resources was carried out using IRS Ic images taken in 1997. Supervised classification techniques were used for dense bamboo areas and unsupervised techniques for sparse areas. The area in each bamboo density category arrived at was multiplied by quantity of bamboo established through sample plots. It was felt that by 2005, considerable change had occurred in the bamboo availability in the state. With IRS P6 multi-spectral images of 23 m resolution, an attempt was made to examine qualitatively the trends in bamboo status. Availability of even higher resolution images in future would lead to further refinements in estimation.

1.4.3 Consumption of bamboo

The major consuming sectors of bamboo and reed in the state include organized industrial units (pulp and paper), traditional industries, households and export. The consumption by the pulp and paper industry (HNL) has been worked out by taking its average consumption of bamboo and reed during the last five years. Similarly, consumption by Kerala State Bamboo Corporation (hereafter

KSBC/Corporation) has also been worked out. On the basis of Panchayat Register, there are about 40000 bamboo workers in Kerala which include 15,000 workers of the KSBC. Total collection of reed by the Corporation is taken as the consumption of its workers. It was found that on an average about 3 tonnes of bamboo/reed are required per worker per annum and based on which the total consumption of workers (25000) in the unorganized sector was estimated. In the absence of continuous data on export of bamboo during the last five years, the only data relating to 2004-05 was taken for its estimate. The estimation of consumption of bamboo by the household sector is the most difficult one due to lack of data on number of rural households in Kerala. We have used assumptions and approximation for the estimation. It is assumed that the bamboo is used mainly by the rural households and our data show, on an average only 15 per cent of the rural households use bamboo poles. We also assumed that average family size of rural household is 4.5 and based on which 15 per cent of the rural households from Census Data have been taken to work out consumption by households.

1.4.4 Socioeconomic assessment of farmers

A stratified three stage sampling design was adopted for the socioeconomic assessment of farmers having bamboo in their home gardens. The first and second stage units of sampling are the same as that for the growing stock estimation. The households with bamboo grown in home garden are the third-stage units of sampling. Information pertaining to the socioeconomic condition of each unit of study, economics of household production system, and dependents on bamboo for livelihood among others were collected with the help of a questionnaire. The reconnaissance survey helped to identify the bamboo abundant areas and all households in the selected wards were visited to list the homesteads with bamboo. The households were then serially numbered based on number of clumps and 12 households were selected by circular systematic sampling method in each selected ward. Of the total 14 Panchayats in stratum I selected for resource survey, only eight panchayats and two wards/panchayat were selected at random partly due to uniformity in the socioeconomic conditions observed and partly due to time and resource constraints. In

stratum II (rest of Kerala) 36 panchayats were selected randomly for socioeconomic survey.

1.4.5 Socioeconomic assessment of bamboo dependents

The reconnaissance highlighted the existence of both organised and unorganised bamboo sector in the State. The three main working sectors identified are: (i) the Marginalised Bamboo Dependents (MBDs) (ii) the weavers with Kerala State Bamboo Corporation and (iii) the trained artisans.

The sampling design followed for the MBDs working sector is the same as that of the socioeconomic assessment where samples are taken from strata I and II. Approximately, 10 households from each panchayat were selected from both strata. In stratum I, clusters from four panchayats viz. *Varavoor*, *Thenkurrissi*, *Mundur* and *Parli,* were taken up for detailed study and the unit of study covered 70 households. In stratum II, in the south, clusters from district and from the north, that from Kannur district were selected and a total of 135 households were surveyed.

1.4.6 Kerala State Bamboo Corporation dependent clusters

From the list of weavers under the Kerala State Bamboo Corporation four Panchayats, viz., *Karukutty, Manjapra*, *Thoravoor* and *Okkal* were randomly selected and surveyed. With regard to the trained artisans (small scale industrial units), one unit was selected at random, namely, the Seraphic Handicrafts Cooperative (Velikulangara, Thrissur). They have been assessed to ascertain the economic potential of bamboo based activities.

1.4.7 Marketing of bamboo culms from home gardens

A market survey of bamboo from home gardens covering bamboo growers, supplying agents, primary and wholesale depots was carried out for describing the trade channels. As most of the bamboo from home gardens is being marketed as poles through the wholesale depots located in Palakkad district in the State, the study was focussed on the wholesale and retail markets and profitability in bamboo trade. For

understanding the structure and pattern of trade, a census survey of wholesale bamboo depots was conducted during 2005. Information on sources of supply, mode of collection, number of supplying agents and quantity of bamboo sold in different sectors was gathered. Interviews were also held with veteran bamboo traders for getting historical information, functioning of the depots, changes in the number of units over time, etc. For identifying the retail markets, data on number of truck-loads of bamboo transported from the depots to different destinations during the period from 2002-03 to 2004-05 were compiled from the registers maintained at the Kerala State border forest check-posts.

Farm price, marketing costs and wholesale price per tonne of bamboo are required for analysing the profitability in the bamboo wholesale trade. Bamboo (poles and residue) is purchased from home gardens, harvested, transported and sold in bulk in the depots. Poles are straight, mature and green coloured pieces 3 m and above. Pieces below 3 m, bent, dried, split or immature culms are termed as residue, used mostly for pulping. Average farm price, marketing costs, net margins and wholesale price per tonne of bamboo were estimated and the percentage share of each component in the wholesale price was computed, in a study on bamboo resource in the home gardens of Kerala (Krishnankutty, 1998). Average wholesale price per tonne of poles (P_P) during 2004-05 was estimated by dividing its average wholesale price per truck-load during 2004-05 with the average net weight of 9.6 tonne per truck-load. Average wholesale price of bamboo (poles and residue) per tonne during the year 2004-05 was computed as the weighted average of their prices, taking the average proportions of poles and residue contained in one tonne green weight of bamboo as the weights. The estimated average proportions of poles and residue are 85.9 and 14.1per cent respectively (Krishnankutty, 1998). Since residue was taken by HNL, price of residue per tonne (P_R) at the depots was calculated as the difference between average price of residue at the company and average cost of transportation from the depots to the company. Average wholesale price per tonne (P_W) of bamboo (poles and residue) during 2004-05 was estimated as $P_W = 0.859\ P_P + 0.141\ P_R$. Average farm price, marketing costs, margins and profitability in bamboo wholesale trade during 2004-05 have been estimated based on the wholesale price of bamboo

during 2004-05 and the percentage share of each component in the wholesale price. Based on the margin per tonne and the total quantity of bamboo (in tonnage) transacted during the year 2004-05, the price received by the farmer and the profitability in the wholesale trade were analysed.

1.5 Plan of study

The report is presented in two parts. While the first part deals with generation of data and important problems faced by the sector, the second part presents strategies and action plan for the development of bamboo sector. The first part is further grouped into seven sections wherein the results and highlights of different sections are discussed and presented. Section 2 deals with bamboo resources in homesteads and forests in Kerala. In section 3, pattern of consumption of bamboo is given. The socioeconomic and livelihood potential of bamboo is discussed in section 4. Details on marketing and value addition and production technology are presented in sections 5 and 6 respectively. In the light of these discussions, the final section 7 draws major conclusions.

2. ASSESSMENT OF BAMBOO RESOURCES

2.1 Bamboo in homesteads

Growing stock of different species available in the homesteads and total growing stock for the state have beenestimated separately here. The estimated number of clums in two strata with the respective standard errors are given in Table 2.1. The major species of bamboo available in homesteads are : *Bambusa bambos*, *Bambusa vulgaris, Dendrocalamus strictus*, Ochlandra (reed), *Thyrsostachys oliveri, Pseudoxytenanthera stocksii.* Total standing crop is estimated as 13.61 million culms and its green weight is 0.331 million tonnes (Table 2.2). Of the above six species, *Bambusa bambos* is the dominant species, accounting for 95.50 per cent, followed by *Bambusa valgaris, and* reed constituting 2.23 per cent and 1.38 per cent respectively. The remaining three species account for only 0.89 per cent.

Table 2.1. Total culms in two strata

Output of Programme Sample				
	Mean	**SE (Mean)**	**Total**	**SE (Total)**
Strata I Y1	5464	871	12241291	1952789
Strata II Y2	127	18	1377621	197141
Total			**13618912**	

(SE- Standard error)

Table 2.2. Species-wise total number of culms and green weight

	Bb	**Bv**	**Ds**	**To**	**Reed**	**Ps**	**Total**
Green	13003843 (95.50)	303835 (2.23)	16000 (0.11)	98440 (0.72)	188434 (1.38)	8360 (0.06)	13618912 (100)
Weight (tonnes)	326736	3767	405	486	262	46	331702

(Bb) Bambusa bambos, (Bv) Bambusa vulgaris, (Ds) Dendrocalamus strictus, (To) Thyrsostachys oliveri, (Ps) Pseudoxytenanthera stocksii

The *Bambusa bambos* is more predominantly seen in Stratum I, i.e., 12.06 million accounting for 92 per cent of the total. Very small, small and medium categories of this species consists of 96 per cent of the total, indicating that availability of matured plants is not high in the state (Table 2.3). In other words, there

has been massive harvesting of bamboos, particularly this prominent species, in the recent past which probably caused draining of the big and very big size culms.

Table 2.3. Number of culms and growing stock of *Bambusa bambos*

Green	Very Small	Small	Medium	Big	Very big	Total
Stratum I	3616223	5122069	2739767	466692	118189	12062939
Stratum II	287891	342507	254081	56424	0	940904
Total	**3904114 (30)**	**5464576 (42)**	**2993848 (23)**	**523116 (4)**	**118189 (1)**	**13003843**
Weight in tonnes	**39041 (11.94)**	**121435 (37.17)**	**124744 (38.18)**	**30772 (9.42)**	**10744 (3.29)**	**326736 (100)**

In the case of *Bambusa vulgaris* total standing crop is 0.303 million culms and its weight is estimated as 0.037 million tonnes (Table 2.4). Percentage of distribution of culms under different size classes is almost same as that of *Bambusa bambos*, that is, very small and small categories dominated, accounting for 78 per cent.

Table 2.4. Number of culms and growing stock of *Bambusa vulgaris*

Green	Very Small	Small	Medium	Big	Very big	Total
Stratum I	20897	19014	0	18801	58712	12062939
Stratum II	85445	111635	43060	4983	245123	940904
Total	**106342 (35)**	**130649 (43)**	**43060 (14.17)**	**23784 (7.83)**	**303835 (100)**	**13003843**
Weight in tonnes	**532 (14.12)**	**1485 (39.43)**	**957 (25.40)**	**793 (21.05)**	**3767 (100)**	**326736 (100)**

Dendrocalamus strictus is distributed only in stratum I. The number of culms are estimated as 16000 with a weight of 0.0004 million tonnes (Table 2.5). Reed is seen in both the strata, but its availability is more in stratum II. The estimated number of culms of reed is 188434 and weight is 0.0002 million tonnes (Table 2.6). The standing crops of the remaining two species,viz. *Thyrsostachys oliveri* and

Pseudoxytenanthera stocksii are 0.984million and 0.0008 million numbers respectively (Tables 2.7 and 2.8).

Table 2.5. Number of culms and growing stock of *Dendrocalamus strictus*

Green	Very Small	Small	Medium	Total
Stratum I	7360	6560	2080	**16000**
Stratum II	0	0	0	0
Total	**7360** (46)	**6560** (41)	**2080** (13)	**16000** (100)
Weight in tonnes	**82** (20.25)	**219** (54.07)	**104** (25.68)	**405** (100)

Table 2.6. Number of culms and growing stock of Reed

Green	Very Small	Total
Stratum I	5200	5200
Stratum II	183234	183234
Total	**188434** (100**)**	**188434** (100)
Weight in tonne	**262** (100)	**262 (**100)

Table 2.7. Number of culms and growing stock of *Thyrsostachys oliveri*

Green	Very Small	Small	Medium	Big	Total
Stratum I	88080	6480	3440	440	**98440**
Stratum II	0	0	0	0	0
Total	**88080** (89.48)	**6480** (6.58)	**3440** (3.49)	**440** (0.45)	**98440** (100)
Weight in tonne	**400** (82.30)	**46** (9.47)	**34** (7)	**6** (1.23)	**486 (100)**

Table 2.8. Number of culms and growing stock of *Pseudoxytenanthera stocksii*

Green	Very Small	Total
Stratum I	0	0
Stratum II	8360	8360
Total	**8360** (100)	**8360** (100)
Weight in tonne	**46** (100)	**46** (100)

Details regarding growing stock of bamboo and area occupied in homesteads during 1987-88 and 2004-05 are given in Table 2.9. A comparison indicates that there has been a reduction in the growing stock by about 0.077 million tonnes from 0.408 million tonnes during 1987-88 (Krishnankutty, 1991) to 0.331 million tonnes during 2004-05 which accounts for 37 per cent. Total area occupied by bamboo, that is actual ground space taken by the standing crop, in homestead is estimated as 192.23 ha during 2004-05 as against an estimated area of 309.49 ha during 1987-88. The estimated number of clumps is 1.59 million while it was 2.56 million during 1987-88. Generally, in forest plantation the spacing of bamboo clumps is 6 and based on which the ground space required for 1.59 million clumps is estimated as 5724 ha as against 9216 ha during 1987-88.

Table 2.9. Growing stock of bamboo clumps and area occupied in homesteads during 1987-88 and 2004-05

Year	Total culms (in million)	Weight (in million tonne)	Total no. of Clumps (in million)	Total basal area of clumps (in Ha)	Area under bamboo with spacing of 6 x 6 m (Ha)
1988-89	21.72	0.408	2.56	309.49	9216
2004-05	13.62	0.331	1.59	192.23	5724

2.2 Bamboo in forest areas

The attempts to estimate bamboo resources in the forest area were carried out separately by Chandrasekharan (1973) and Nair (2001). During these two periods, significant changes have occurred both in forestry sector as well as bamboo growing areas in the state such as addition of vested forests to reserve forests, reorganization of Divisions and flowering of bamboo. Because of these, the comparison of both the estimates is a difficult task. However, they would indicate the variations in the bamboo resources in the state.

Chandrsekharan (1973) estimated a total quantity of 1.4 million tonnes of bamboo for whole of Kerala (9,400 km^2, excluding the vested forests). Based on 1997 imagery, Nair (2001) estimated bamboo for whole Kerala including vested forests

(11,126 km^2) at 2.63 million tonnes (Map 2.1) which is much higher than that was reported to be available in 1973. Of the five regions in the state, where bamboo is available, the Olavakode region has the maximum quantity of bamboo (34.0 %). In this region, most of the bamboo is located in Nilambur North and Nilambur South Forest Divisions and Parambikulam Wildlife Sanctuary. The Northern region that includes Northern Circle and Wayanad Wildlife Sanctuary, takes the next position (30.7 %). The Southern region is ranked third (21.7%) in terms of bamboo availability. The Thiruvanavnthapuram Wildlife Division, Thiruvanavnthapuram and Achenkovil Forest Divisions in the southern region, contribute the maximum. The Central and the High Range regions which also cover the Wildlife Sanctuaries/National Parks of the area contain 8.9 per cent and 4.76 per cent respectively.

Division-wise, maximum quantity of bamboo is in the Wayanad Wildlife Division (16.2% of total) and Nilambur North Division (15.0%). This is followed by Achenkovil (7.9%), Parambikulam (6.0%), Nilambur South (5.7%), Wayanad North (5.3%), Trivandrum (2.8%) and Trivandrum Wildlife (2.78%) Divisions. Other Divisions have relatively less bamboo.

As per the resource survey conducted in 1973, the availability of bamboos and reeds varied in different Divisions. With a view to provide raw material to HNL, a detailed estimation of reeds was carried out in 1978 (Asari,1978). It was found that the central region was one of the important areas where reeds were available in plenty. In the central region, reeds are prevalent more in Kothamangalam, Malayattur and Vazhachal Forest Divisions (Map 2.2).

Flowering is a factor that can cause sudden changes in the estimates of quantity of bamboo. Currently the major bamboo bearing belts in Nilambur, Wayanad and Kozhikode are in the process of flowering. Another major bamboo area, Parambikulam flowered about 10 years ago and the bamboo clumps there at present are in establishment stage. Based on present age distribution, it is evident that Parambikulam area will have fully grown bamboo clumps by about 2010. In other

words, the availability of bamboo can fluctuate because of reasons like gregarious flowering and hence, utilization plans should take this into account.

With high resolution satellite imagery of 2005, an attempt has been made here to assess bamboo availability in Central forest region which comprises central circle and Protected Areas.

2.2.1 Trends in the Central region

An analysis of availability of bamboo and reed in central forest region shows that, in general, the same has not changed appreciably in the central circle as there was no gregarious flowering during this period. The bamboos which were planted in teak plantations at the time of felling showed vigorous growth at its early period but later it was weak due to poor soil conditions. The central region has only less bamboo whereas extensive reed brakes can be seen in Vazhachal and Malayattur areas. The details on bamboo stock in central regions during 1997 and 2005 are given in Table 2.10.

Trichur Division: Trichur Division consists of Vadakkancherry, Pattikkad and Machad Ranges. Because of geographic continuity, Peechi Wildlife Sanctuary is also included in this section. Vegetation is mostly deciduous. Bamboo is distributed in small patches all over the division, especially in the drier regions.

In Vadakkanchery Range, bamboo in low density is found only in patches, mostly along the forest edges. In the 2005 image, crops such as eucalypt are seen to have increased reducing area under bamboo (25% decrease). In Machad Range also, bamboo is mainly along the periphery. Bamboo is more pronounced in isolated forest patches, with a decrease of about 10 per cent due to the same reasond. Small patches of bamboo are seen in the periphery in Pattikkad Range. Blank areas have increased near bamboo leading to reduction of about 10 per cent. In Peechi Range bamboo is in isolated hills. Bamboo patches and blank areas are more prominent and an increase of bamboo is estimated as 10%. There is hardly any reed present in the Trichur Division.

Chalakudy Division: Chalakudy Division consists of Pariyaram, Palappilly and Vellikulangara Ranges. Because of geographic continuity, Chimmony Wildlife Sanctuary is also included under this. Bamboo is distributed in small patches all over the Division. Bamboo flowered in 1979-80. Between 1972 and 1980, an average of 1,000 tonnes have been extracted every year (Akkara, 1984) from ranges of Pariyaram and Palappilly.

Chimmony WLS: Bamboo is found in the moist deciduous forests adjoining semi-evergreen forest. There appears to be no notable change in the status of bamboo. In Palappilly Range, only a slight increase of 10 per cent could be seen. In Vellikulangara and Pariyarm Ranges, bamboo is mainly seen in the isolated hills. In both the areas, there appears to be slight reduction in density by 10 per cent.

Table 2.10 Bamboo stock in the central region of Kerala during 1997 and 2005

Sl.No	Division	Range	Total forest area (Km^2)	Bamboo stock (Dry, tonnes, 1997)	Bamboo stock (Dry, tonnes, 2005)
1.	Trichur	Vadakkanchery	58.86	5,194.00	3,895.5
2.	Trichur	Pattikkad	59.44	2,098.80	1,888.92
3.	Trichur	Machad	92.34	5,300.00	4770.0
4.	Trichur	Peechi WLS	126.73	3,816.00	4,197.6
5.	Chalakudy	Pariyaram	115.31	16,726.80	15,054.12
6.	Chalakudy	Palappilly	56.00	15,518.40	13,966.56
7.	Chalakudy	Vellikulangara	108.40	1,759.60	1,583.64
8.	Chalakudy	Chimmony WLS	75.00	7,038.40	7038.4
9.	Vazhachal	Charpa	59.98	26,609.80	23,948.82
10.	Vazhachal	Vazhachal	90.64	34,220.90	34,220.9
11.	Vazhachal	Sholayar	138.88	19,405.40	21,345.94
12.	Vazhachal	Kollathirumedu	29.35	18,243.40	16,419.06
13.	Vazhachal	Athirappally	95.10	14,292.60	15,721.86
14.	Malayattur	Kalady	72.51	8882.80	9,771.08
15.	Malayattur	Kodanad	56.74	3667.60	3,667.6
16.	Malayattur	Thundathil	131.40	13462.00	13,462.0
17.	Malayattur	Kuttampuzha	357.11	37969.20	41766.12
		Total	1723.79	234205.7	232718.1

Vazhachal Division: Vazhachal Division consists of Charpa, Vazhachal, Sholayar and Athirappilly Ranges. Bamboo is distributed in small patches more on the western side, along water courses.

Athirapally range: Bamboo is more in isolated hills. There is an increase of 10 per cent during 1997 and 2005.

Kollathirumedu Range: Bamboo looks paler leading to decrease by 10 per cent.

Sholayar Range: Increase of 10 per cent compared to 1997 image.

Charpa Range: Bamboo is mainly along streams, decrease by about 10 per cent.

Vazhachal Range: Bamboo less clear in 2005 image. Current forest working plan for the Division proposes working circles for bamboo and reed.

Bamboo Working Circle (1951-53 to 1966-67): The aim was to provide adequate bamboo and reed for the local people. The bamboo-working circle was not divided into annual coupes.

Reed working circle (Current working plan) This forest Division supports one of the best and largest extent of reed bearing areas of the State, which highlights the importance of this working circle. Reed occurs in abundance in all Ranges of this Division. There are reed areas along the banks of streamlets, water courses and reservoirs and in the gaps between plantations. Asari (1978) in his management plan for the reeds (Table 2.11) in the forests of Kerala described the major reed catchments and Vazhachal was identified as one among them. Vazhachal felling series comprises of areas in Vazhachal and Sholayar Ranges. Reeds are supplied to Hindustan Newsprint Ltd. and Kerala State Bamboo Corporation.

Table 2.11 Schedule of felling in Vazhachal Division as per Reed Management Plan

Year	Range	Yield (MT)
2001-02	Charpa, Vazhachal	8,500
2002-03	Charpa, Vazhachal, Kollathirumedu, Athirapally, Sholayar	14,064
2003-04	Kollathirumedu, Athirapally, Sholayar	5,564
2004-05	Charpa, Vazhachal	8,500
2005-06	Charpa, Vazhachal, Kollathirumedu, Athirapally, Sholayar	14,064

Malayattur Division: Malayattur Division consists of Kalady, Kodanad, Kuttampuzha and Thundathil Ranges. Bamboo is distributed in small patches all over the Division. Most areas of the Division have bamboo in medium to low densities. Present study shows more or less same quantity of bamboo in Malayattur Division. Thundathil and Kodanad Ranges do not show any change in the status of bamboo. Kalady Range shows an increase by 10 per cent. Bamboo shows slight increase in Kutttampuzha Range.

Almost all forest working plans for the Division have prominent sections on bamboo and reeds. There are plantations of bamboo and reeds in the Division. Due to over exploitation in the past, the availability of bamboo in the natural forests reduced to a considerable extent. In Kalady Range bamboo is confined to Kunthirumudi, Muttenmudi and Poonippara areas. In Kodanad Range bamboo is available in Illithodu, Pothuppara and Erumugham areas. In Thundathil Range, bamboo is available in places such as Koovapuzha, Thumpumedu, Idamalayar, Karimpani and Edamalakkudy. In Kuttampuzha Range bamboo is present in Idamalayar, Anakulam, Pooyamkutty and Kappayam areas.

Reeds have been extracted in large quantities over the years for industrial as well as domestic purposes like fabrication of huts, small household items, handicrafts, etc. Reed is confined in distribution in the banks of the watercourses forming thickets. Earlier, industrial units like Punalur Paper Mills, GRASIM Industries and Hindustan Newsprint Ltd. were the main consumers of reeds from this area. Reeds are also collected by the Government owned Kerala State Bamboo Corporation. Present consumers are only HNL and KSBC. Construction of big dams, conversion of reed

areas to plantations and agricultural lands have reduced reed availability in the Division. Hence the intensity of harvest has increased over the years.

Reed areas are mainly confined to Thundathil and Kuttampuzha Ranges. In Kalady Range reeds are not available. In Kodanad Range, Erumugham area (north-west portion of the range) reeds are available. In Thundathil and Kuttampuzha Ranges reeds are in plenty along the river and stream banks. The entire reed area in the Division is divided into six felling series and sub coupes as given below (Table 2.12). An area of 12 ha of reed plantation raised artificially is also included in the above total area.

Table 2.12 Felling series of Reeds in Malayattur Division

Sl. No.	Felling series	Number of coupes	Area (ha.)
1	Adimali	1	2,368
2	Edamalakudy	1	2,531
3	Pooyamkutty	3	6,767
4	Kuttampuzha	3	12,500
5	Idamalayar	3	17,093
6	Vazhachal	1	6,350
Total		**12**	**47,609**

Map.2.1 Bamboo resources in Forests 1973 and 1997

Map.2.2 Bamboo and Reed resources in forests during 1973

3. CONSUMPTION OF BAMBOO AND REED

3.1. The sector-wise utilisation of bamboo

The major sectors which utilize bamboo/reed include industrial (pulp and paper), traditional, household and export sectors (Table 3.1). Pulp and paper industry which uses both bamboo and reed, collects bamboo from both homesteads and forests and reed from forests only. In fact the government has a commitment to supply bamboo and reed to pulp and paper industry and Kerala State Bamboo Corporation from the forest areas. The traditional sector uses reed predominantly. Household sector uses both bamboo and reed for a variety of purposes. Bamboo, mostly collected from homesteads, is exported to other states by private traders in the state.

Table 3.1. Sector-wise use of bamboo

Sl.no	Sector	Type of bamboo	Uses
1.	Pulp	Reed and bamboo	Paper, rayon
2.	Traditional	Reed	Baskets, mats, handicrafts, winnows, broom sticks.
3.	Household	Bamboo and Reed	Poles, tents, houses, scaffolding, agricultural implements, etc. Walls of houses, thatching (leaves), household items.
4.	Export to other states	Bamboo and Reed	Farm uses, supports, scaffolding. Baskets, mats.

3.2 Bamboo and reed from forests

Bamboo and reed from forests are supplied to forest-based industries. The details of bamboo and reed supplied during the period 1989-90 to 1999-2000 to the industrial sector are depicted in Table 3.2. Since there is no up to date data available, only broad trend on this aspect can be mentioned. While the quantity of bamboo supplied ranges between 0.039 and 0.310 million tonnes, the quantity of reed varies

between 0.055 and 0.106 million tonnes. The variations in the quantity supplied both bamboo and reed related to availability of the resources in the forests in a particular year and also due to change in demand.

Table 3.2 Quantity of bamboo and reed extracted from forests (in million tonnes)

Year	89-90	90-91	91-92	92-93	93-94	94-95	95-96	96-97	97-98	98-99	99-2000
Bamboo	0.080	0.235	0.063	0.067	0.117	0.100	0.084	0.301	0.146	0.130	0.039
Reed	0.106	0.106	0.058	0.058	0.090	0.080	0.058	0.079	0.088	0.087	0.055

3.3 Consumption of bamboo by pulp and paper industry

At present, there is only one pulp and paper unit- Hindustan Newsprint Limited (HNL)- in the state. This unit is one of the bulk consumers of reed and bamboo in the state. During the last 11 years, that is from 1994-95 to 2004-05, HNL consumed 966397 tonnes of reed and bamboo of which the former accounts for 75 per cent (Table 3.3). HNL collects reed only from forests, but bamboo from both forests and homesteads.

Table 3.3 Consumption of reed and bamboo by HNL (1994-95 to 2004-05) (in Tonnes)

Period	Reed	Bamboo	Total
1994-95	84215	4603	88818
1995-96	56770	32949	89719
1996-97	52496	9609	62105
1997-98	82278	7294	89572
1998-99	74310	43780	118090
1999-2000	72580	18382	90962
2000-01	62507	34888	97395
2001-02	65496	30337	95833
2002-03	72037	27092	99129
2003-04	61867	11350	73217
2004-05	48645	12912	61557
	733201	233196	966397

Source: HNL

Details of quantities of bamboo collected from forests and homesteads by the HNL are presented in Table 3.4. As evident, HNL collects more bamboo from homesteads than from forests, probably due to price differences existing in these

sectors. For example, the price of one tonne of bamboo collected from forests amounts to Rs. 850, in addition to an extraction cost of Rs. 1500 per tonne. Further, the unit has to pay Rs. 25 as regeneration tax, 5 per cent as forest development tax and 4 per cent value added tax. In contrast, price of bamboo amounts to Rs. 1800 per tonne from the private sources which includes extraction cost also.

Table 3.4 Quantity of bamboo collected from forests and homesteads

Period	Govt. (in tones)	Private (in tonnes)
01.09.2001-31.08.2002	1173.26	9505
01.09.2002-31.08.2003	1521.87	12254
01.09.2003-31.08.2004	16.00	9352
01.09.2004-01.06.2005	2582	4729

Source: HNL

3.4 The traditional sector

Kerala State Bamboo Corporation is the main agency in the state to supply reed to traditional sector (organized), including small scale units. Details on number of reed collected and supplied through depots by KSBC are furnished in Table 3.5. The number of reed poles collected by the Corporation during 1990-91 to 2004-05 ranges between 16.28 million and 8.04 million, indicating a significant variation. Of the total number of reed poles collected, about 60 per cent are supplied to traditional sector and rest to small scale industrial (SSI) units. Another important trend regarding collection is that there was a decline in collection of number of poles since 2001-02 which, according to officials of the Corporation, is mainly due to the decline of demand for reed. Surprisingly, many traditional workers in the northern districts in the state have experienced shortage of reed because of inadequate supply by the Corporation in these areas.

Table 3.5 Quantity of reed collected and supplied by Kerala State Bamboo Corporation during 1990-91 to 2004-05

Year	Quantity collected (No. of poles in million)	Quantity sold to SSI units (No. of poles in million)	Quantity sold in depots (No. of poles in million)	Price/ pole
1990-91	14.53	5.9	8.63	1.06
1991-92	16.21	7.0	9.21	
1992-93	14.58	6.1	8.48	
1993-94	16.27	6.4	9. 87	
1994-95	15.84	5.9	9. 94	
1995-96	15.93	5.2	10.73	1.51
1996-97	14.83	5.2	9. 63	
1997-98	16.28	6.0	10.28	
1998-99	15.89	5.9	9. 99	
1999-00	13.14	3.8	9. 34	
2000-01	13.86	4.3	7. 01	
2001-02	11.59	3.6	5.76	
2002-03	9.50	3.7	5. 61	
2003-04	8.04	2.4	5. 38	2.27
2004-05	8.10	2.5	5. 39	

Source: KSBC

3.5 The household sector

The average number of bamboo poles used per household per year in the selected strata is presented in Table 3.6. There is a marked difference in the use of bamboo poles in both the strata probably because of the difference in the availability of bamboo. For instance, in stratum I, where abundant bamboo is available, on an average, a household uses about 30 bamboo poles per year, while it is only 18 poles in stratum II. In the household sector, bamboos are used for making ladder, fences, cattle shed, firewood shed, fruit pluckers, banana props, vegetable *pandal* and winnows and baskets. As evident from the Table, props for banana cultivation is the major use of bamboo which is followed by construction of firewood shed and vegetable *pandal.*

Table 3.6 Uses of bamboo poles in two strata

Uses	Average No. of bamboo poles used/household/year	
	Stratum I	**Stratum II**
Ladder	1	1
Fences	4	2
Cattle shed	5	3
Firewood shed	4	2
Fruit pluckers	1	1
Prop in banana cultivation	9	5
Vegetable *pandal*	5	3
Winnows& Baskets	1	1
Total	**30**	**18**

As expected, the percentage of households which used bamboo products is found to be significantly higher in stratum I due to availability of bamboo (Table 3.7). In stratum I all the households used bamboo poles for fruit pluckers as against 56 per cent in stratum II. Similarly, households that used ladder and bamboo fences account for 90 and 80 per cent respectively in stratum I, while they are 53 and 60 per cent respectively in stratum II.

Table 3.7 Percentage of households/strata that used bamboo products

Uses		Percentage of Household	
		Stratum I	**Stratum II**
With in house	Decorative items	10	3
	Winnows	87	43
	Baskets	53	40
	Fire wood	27	13
In home garden	Ladder	90	53
	Fences	80	60
	Cattle shed	40	20
	Fire wood shed	36	16
	Fruit pluckers	100	56
	Prop in banana cultivation	43	26
In the fields	Vegetable *pandal*	13	7

3.5.1 Sources of bamboo for household uses

The selected households collect bamboo from different sources for their use of which the major source is their own homesteads, accounting for 67 and 36 per cent in strata I and II respectively (Table 3.8). In stratum II, 34 per cent of the households collect bamboo from multiple sources, whereas it is only 16 per cent in stratum I. Further, no household purchases bamboo from the open market for any uses in stratum 1.

Table 3.8 Different sources of bamboo

Source of collection	Percentage of households	
	Stratum I	Stratum II
Collection from common property land	7	12
Own cultivation	67	36
Purchase from local farmers	10	8
Purchase from open market	0	10
Extraction from forest	0	0
Multiple sources	16	34
Total	100	100

3.6 Export

Bamboo, mainly from homesteads, is extensively exported to other states to meet the requirements of agricultural and construction sectors. During 1989-90, export of bamboo constituted 52309 tonnes of which export to outside Kerala accounted for 83 per cent while it was 53398 tonnes during 2004-05 (Table 3.9). The export to other states is almost steady during the past years.

Table 3.9 Quantity of bamboo sold through the whole sale depots

Year	Quantity
1989-90	52309 tonnes (83.6% outside Kerala)
1993-94	43385 tonnes (86.4% outside Kerala)
2002-03	57102 tonnes (87.2% outside Kerala)
2004-05	53,398 tonnes (83 % outside Kerala)

3.7 Consumption of bamboo

The details on consumption of bamboo and reed in the state (sector-wise) are presented in Table 3.10.

Table 3.10 Sector-wise total Consumption of Bamboo and Reed in the state– Sector- wise (2004-05)

Consuming sectors	Consumption (in million tonnes)
Pulp industry HNL	0.085
Traditional sector KSBC Unorganized	0.001 0.075
Export (Neighbouring states)	0.031
Household & other uses	0.064
Total	0.256

The major consuming sector of bamboo and reed is pulp and paper industry (HNL). The consumption by the HNL was estimated as 0.085 million tonnes and that of KSBC was 0.001 tonnes. Unorganized sector consumed about 0.075 million tonnes. It is estimated that a rural household uses only less than 0.3 tonnes of bamboo poles per year. Total consumption constitutes 0.064 million tones during 2004-05 as against 0.061 during 1987-88 (Krishnankutty, 1991). Although there has been an increase in population during 1987-88 to 2004-05, consumption of bamboo by the household increased only marginally. Probably one reason was during 1987-88, the household sector used bamboo extensively for house construction, accounting for 43 per cent. But this has been significantly reduced now partly due to preference of other types of houses and partly due to large scale use of substitute products for scaffolding work (Muraleedharan *et al* 2004). Total consumption of bamboo and reed in the state is estimated as 0.256 million tonnes.

4. SOCIOECONOMIC AND LIVELIHOOD POTENTIAL STUDIES OF BAMBOO DEPENDENTS

4.1. The bamboo dependents

The last three or four decades have experienced a decline of bamboo resources both in home gardens and forests. This large reduction in the bamboo resources has badly affected the pulp and paper industry as well as the traditional bamboo weaving industry. The decline of bamboo resources will adversely affect the economic conditions of the bamboo dependents. An assessment of the socioeconomic conditions of the farmers having bamboo in their homesteads, the livelihood potential of the bamboo dependents especially the Marginalised Bamboo Dependents (MBDs) as well as the economic potential of the bamboo productive sectors was undertaken in order to understand the intricacies within the sector, its problems and opportunities.

4.1.1. Socioeconomic studies

Community profile of farmers: The socioeconomic data are presented in Appendix 4.1. Majority of the sample households are marginal holders with the average area of land being 0.25 ha**.** With an average family size of four, the total population of the selected sample is 785 people and 518 people in strata I and II respectively. The sex ratio of the sample in stratum I is 910 and in stratum II is 933 as against the State sex ratio is 1058. High literacy has been noted in both strata, although technical education status is very low. Interestingly, service sector dominance has been observed in both strata. More than 60 per cent (both strata) belong to this category of employment. The per capita income of the sample households worked out to in Rs.7213 and Rs.13049 in strata I and II, as against the state average of Rs.24,053.

Cropping pattern: By cropping pattern we mean the area of land diverted to different crops, the changes in the distribution over a period of time and the factors that determine this change in distribution. In two strata, majority are marginal land holders (97% in Stratum I and 96% in Stratum II) undertaking mixed cropping following traditional cultivation methods. With coconut the dominant crop in the

home gardens the other major crops are paddy, areca nut, banana, rubber, cashew and pepper. An important feature of cropping pattern in the study area is the secular trend of the shift in area from food grains to cash crops (Economic Review, 2004). In the study area most of the bamboo clumps were clear felled for the agricultural purposes and house construction.

Uses of bamboo in homesteads: Bamboo as a raw material serves as a basis for employment and income generation to many for a wide range of small and medium-scale enterprises. Today, over 2.5 million people live in association with bamboo. Its annual usage world wide is equivalent to US $ 2.7 billion. The current level of global and national trade in bamboo and bamboo products put together is estimated at over $ 4.5 million.

The survey identified the number of common uses /applications of bamboo within the households, within the adjoining home gardens and the agricultural fields that belonged to the households. The most prevalent household uses (strata I and II) of bamboo were as winnows, baskets, furniture, roofing/ceiling materials, firewood and kitchen utensils such as spoons and others. The home garden uses of bamboo enlist ladder, cattle shed, fruit pluckers among others (Table 4.1). Another traditional common use of bamboo observed is in construction of fences for which the thorny bamboo, locally known as `Illimula', *Bambusa bambos,* is used. Mats woven with bamboos as well as reeds are used for drying paddy and other agricultural produce such as pepper, coffee, etc. Bamboo is also used as props for banana plants. The uses of bamboo in fields are largely for vegetable pandal (support frames for vegetables, provide shade, etc.) general purpose pandals, bunds, fishing baskets, threshing rod and foot bridges. In stratum I, bamboo poles are mainly used for ladder, sheds, agri-cultural purpose. 36 per cent use bamboo thorns for fencing purpose. In stratum II, bamboo poles are mainly used for agricultural purpose, ladder, basket making and shed construction. Of the total, 29 per cent households use bamboo thorns for fencing purpose..

Table 4.1. Uses of bamboo (in %)

Uses	Stratum I	Stratum II
Fence	36	29
Agrl. Purpose	4	21
Fruit plucker	5	0
Shed	4	7
Basket	2	11
All purpose	27	5
No use	22	27

People's perception of the bamboo resources: Bamboo has been a potentially renewable resource and an inexhaustible raw material to the economically weaker sections of the society who have used bamboo for the production of a variety of products. The survey highlighted (Box 4.1) that majority of the small and marginal holders are not interested in the cultivation of bamboo in their home gardens. Majority bamboo households (stratum I) are not interested in the bamboo cultivation. As far as constraints in the cultivation of bamboo in home gardens is concerned, the sample opined that bamboo badly affects the growth of other crops and most of the small holders attributed a nuisance value to it. More than 90 per cent of the bamboo households do not depend on bamboo resources for their day-to-day needs. Thus, it is noted that the bamboo resources do not affect the income status of the bamboo households.

The socioeconomic attributes are very similar to any area in the State with a heterogeneous community feature and a purely agrarian economy. As far as dependence on bamboo is concerned, it is very low. Bamboo does not contribute to their gross income. They are a developing economy, fairly well-off with tenurial security and developed agriculture

4.1.2. Livelihood potential studies

Community profile of bamboo dependents: The socioeconomic profile details are depicted in Appendix 4.2. With an average family size of 4.16 the sample households

of bamboo dependants lack tenurial security. The sex ratio in both strata I and II is at par with the State ratio unlike the weavers in KSBC. The community feature in strata I and II highlights a homogeneous Scheduled Caste (SC) community (known as *Kavaras*, *Sambavans*, and *Parayas* from north to south of the State), whereas the weavers of KSBC portray a heterogeneous community where people from all communities work. Compared to both strata high literacy has been recorded from among the KSBC weavers. High school is the maximum level of education noted depicting a stagnant economy.

Occupation wise, primary sector dominance is noted with majority taking up wage employment. Employment in the bamboo sector is seasonal in nature and highlights 41 per cent dependency on bamboo based activities in stratum I, 44 per cent in stratum II (bamboo workers in and in Kannur districts) and 46 per cent bamboo workers with the KSBC. Maximum of 10 months employment is available in varying degrees depending on local demand; for instance, during the mango season there is a heavy demand for cheap mango baskets, use and throw away type. The male female Work Participation Rate in KSBC highlights majority of the weavers to be women when compared to strata I and II. The economic structure indicates a backward economy with a low income share from bamboo based activities. It is the lowest with the weavers in KSBC (9.81%) for whom this is just an additional source of income. The per capita income of the sample households is also very low in stratum I (Rs. 4665), stratum II (Rs. 4840) and in the KSBC (Rs. 5920) as against the State average of Rs. 24053 highlight a backward economy. The consumption expenditure indicates major share being spent on food. The savings pattern highlights low propensity to save among the target group, which is indicative of the fact that earnings from bamboo based activities, are not enough to meet both ends.

Bamboo based activities : The raw material requirement of the bamboo dependents is mainly sourced from the private depots, home gardens and forests (Table 4.2). Collection is basically a group activity and 98 per cent undertake weekly collections. For both strata I and II the major source is the private depots while the KSBC depots provide raw material to its weavers. Among the traditional weaving communities in

the bamboo sector there is no impact of technology. The entire bamboo related works are done by the manual labour (explained under production details). The traditional weavers have their own products such as *kotta* (basket), *Vatti,* muram *(Sifts) and Panambu*. Different varieties are there in accordance with the size of the products. The number of slivers and the time spent varies according to the type of the product. In stratum I they produce all the above mentioned items and in stratum II concentration is on the production of baskets while the KSBC weavers produce only *panambu*

Table4.2. Procurement of bamboo resources and dependency & extent of dependency

Stratum	Raw material sourced from			Extent of dependency*
	Natural areas	Private depots	Home gardens	
I	Marginal	Low	Moderate	Moderate
II	Low	Low	Low	Moderate
KSBC	Nil	High	Nil	Low

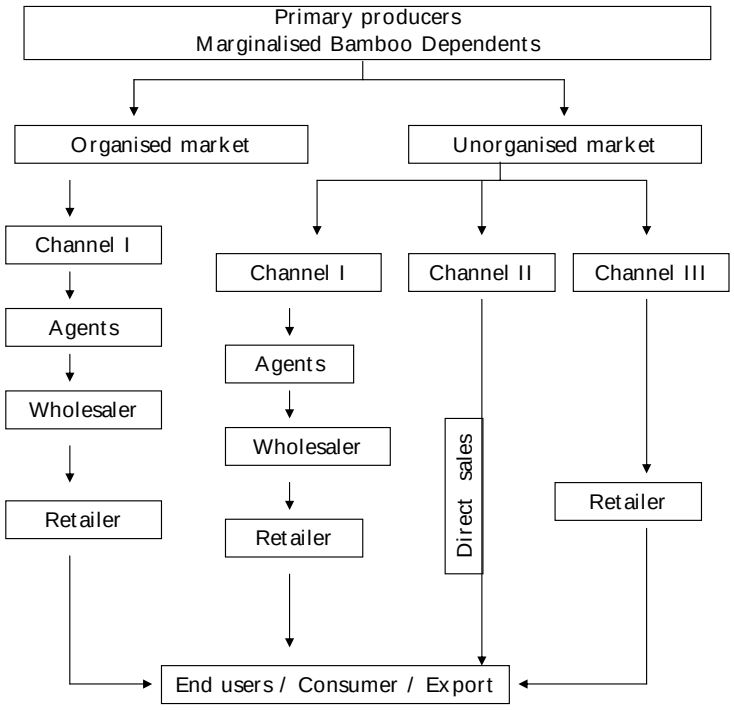
* (%): Marginal - 0-25; Low - 25-50; Moderate- 50-75; High- 75-100; nil- no dependence.

Marketing: The economic concept of market refers to the numerous purchase and sales decisions that result in a price level being determined for a product. The proper functioning of a market depends on many factors such as information, contract enforcement, application of the rule of law, freedom of movement of goods and people and market structure, i.e., the number of traders operating in markets and their relative size (Carney, 2001). Markets are critical to poor people's livelihoods but can increase vulnerability. Globalization, although has opened up as well as integrated local markets to a large extent, it has had devastating impacts on rural livelihoods. Under-developed market and widespread market failures have effectively isolated the MBDs from market opportunities.

Marketing is the weakest link in the production chain as far as the traditional workers are concerned where most often direct sales are undertaken in both strata. The indirect method refers to the sales through the retail or wholesale shops. There

exist different unorganised marketing channels (Figure 4.1), where maximum exploitation can take place as they are a vulnerable group.

Figure 4.1. Marketing channels



In strata I and II, 57.14 and 62.67 per cent of the population adopts the direct marketing respectively. The marketing is done through the KSBC for the weavers working for it. Area-wise distinctions in sales are very evident. They produce as much as possible from one collection and it takes at least 7 days. Due to this, weekly sales are most convenient for them. In stratum I weekly sales are conducted by 82.86 per cent of the sample and in stratum II, 94 per cent. During the mango and paddy seasons the bamboo products are much in demand. As indicated earlier, during this period the local market is very active and hence daily sales are carried out. Thus, the bamboo markets, as far as the MBDs are concerned are characterized by high 'transaction cost'. For instance, this being a household based rural enterprise it does not attract any trader to purchase these products from remote locations, stating many reasons such as poor road access, distance, among others..

In brief, the socioeconomics of the MBDs (Box 4.2) excluding those workers with the KSBC highlights a backward stagnant economy needing immediate government intervention. With no tenurial security and no other skills other than this traditional activity they are not left with much choice for a secure livelihood. The younger generation is not interested in this as a source of livelihood and interestingly, most of those working in this sector belong to the age (40 years and above). This being household-based, rural enterprise is highly labour intensive with almost zero capital intakes. The lack of an organised institutional setup, market failures, high cost of raw material, competition with similar groups in the organised sector and cheap substitutes in the market leave much to be desired for their upliftment and socioeconomic betterment.

4.1.3. Bamboo based production activities

Bamboo based production activities, as a market segment, have emerged only in the recent past. According to a study conducted by the Indian Council for Research on International Economic Relations (ICRIER) (Anonymous 1985), bamboo and rattan products made the largest single contribution in the handicrafts sector in India in terms of employment; for instance, 6,90,000 additional jobs (main workers) during 1961-81. Moreover, the growth of this sub-sector has been reported to be steady. Between 1961 and 1971, employment rose from 2,97,000 to 517 000. During 1971-81, it rose from 517 000 to 9,06,000. This sub-sector has also been noted for the high share of female employment. According to estimates, women employment in absolute terms rose from 1,69,000 to 3,62,000 between 1971 and 1981.

The growth of handicrafts sector in Kerala is mainly because of the promotional activities of the Kerala State Handicrafts Development Corporation and the Kerala State Handicrafts Co-operative Federation. The marketing facilities offered by these two agencies have also encouraged persons other than those from the traditional bamboo-working communities (Krishnakumar, 2004). In the bamboo sector, the major development is the small-scale handicraft units. The handicraft items

of bamboo or reed made by trained artisans have more marketing opportunities than that of the traditional weavers.

In order to understand the different facets of bamboo based production activities the value addition in different stages of production, the average benefit earned and its opportunity cost, difference in the production stages and an overall view of the economic and livelihood potential of bamboo resources, a SWOT (Strength Weaknesses Opportunities and Threats) analysis between the two groups, i.e., the trained artisans and the MBDs has been conducted.

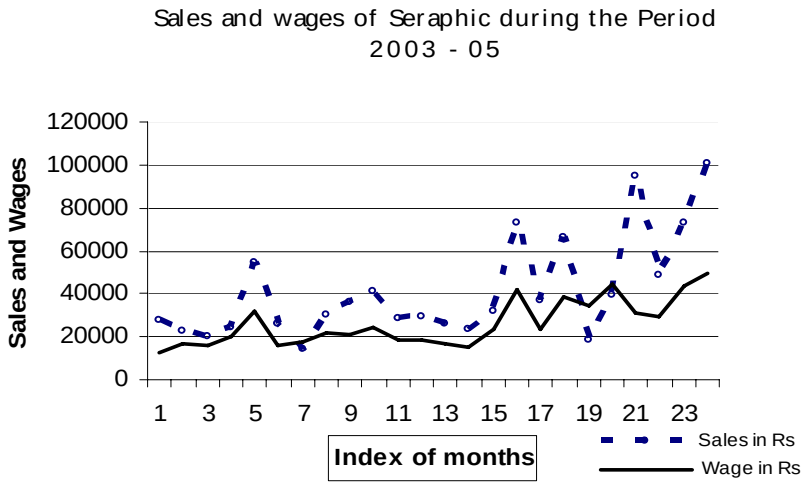
4.1.3.1 Trained Artisans (Seraphic handicrafts co-operative society)

The Seraphic Handicrafts started initially with its concentration on the welfare of the socially and economically backward women in 1972 and was known as *Social Bhavan*, with the main objective to prepare the women to live independently. The Seraphic registered as Co-operative Society in 1980s with a total investment of Rs. 1,35,000/- and since has been engaged in bamboo based activities. The Society is mainly concentrating on mat weaving. At present the total number of workers is 92 with 60 per cent regular workers and remaining part time workers.

It is interesting to note that women from different communities work here and among them there are no traditional weavers. They have more experience and can produce more compared to the MBDs. Their earnings also vary, according to the number of products they produce. The experienced earn up to Rs.100 and others earn on an average Rs.25/ day. There is no specific time for work; they start at 7 am and are on till about 7 pm. Monthly, they collect approximately 5000 reeds at the rate of Rs. 5.80 per reed (current rate) including transportation expense. Collection primarily is from the Kerala State Bamboo Corporation.

The sales and wages amount dispersed to the economy by the Seraphic shows an increasing trend during the period 2003-05 (Figure 4.2). Their production technique is labour intensive thus they produce more by employing more labour, i.e., an increase in the wage bill leads to an increase in production and consequently an

increase in the sales volume. On an average Rs. 3,13,445 /- (i.e., 2.3 times more than their total investment) is being injected into the local economy as wages per year.



Production details: The production process is divided into different stages like cutting, splitting, treating, ribbing, finishing and packing. In each stage a worker is paid per unit production. High amount of division of labour is employed in each stage, wherein the workers are allowed to specialize and enhance their skill in the particular stage of production. Stage one, i.e., (Plate 4.1) involves a maximum of two workers and payment is made per pole cut.

Slivering (Plate 4.2) is an activity where the cut and dried pole is split into small slivers as per requirement of product. This is more of a group activity wherein a worker is paid per 1000 slivers made. *Ribbing* (Plate 4.3) is a stage where the slivers are further made smaller and bundled. Each worker here is paid per kilogram. As far as *treating* (Plates 4.4 & 4.5) is concerned there are two types. The pre-treatment tank is one, wherein the sliver is immersed for a specified period depending on the type of product and the other is the dyeing process to enhance the colour of the product aesthetically. Products made to keep food stuff are not dyed

Production is where the actual weaving takes place at the loom (Plate 4.6) and payment here is per piece produced (unit). *Finishing* (Plates 4.7 & 4.8) is the

stage where the products are cut as per requirement and then heated to get the finer sticking out bits and pieces off and give a finish to the product.

Packing (Plate 4.9) is final stage where the products are packed based on demand. They are packed in sets neatly and are stacked up for the market. It must be noted here that value is being added with each stage of production.

Value Addition in different stages of production

The Seraphic is increasing its sales and earning profit by adding different types of value on the raw material (Table 4.3). Value addition is a necessary factor for increasing demand and ensuring profit. Figure 4.3 shows the value addition in aggregate by the Seraphic.

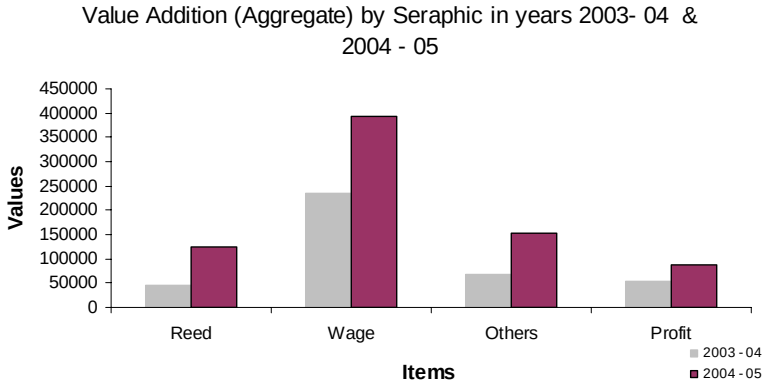
Table 4.3. Value addition in Rs.
(Aggregate)

	2003 -04	**2004 -05**
Reed	44,745 (11.2)	1,23,323 (16.3)
Wage	2,34,893 (58.7)	3,91,996 (51.8)
Others	67,280 (16.8)	1,53,032 (20.2)
Profit	53,117 (13.3)	88,272 (11.7)
Total	4,00,035 (100)	7,56,623 (100)

Source: The Seraphic

Profit is considered as a added value because it is the remuneration given to the entrepreneur.

Wages constitute a major share of value addition followed by other expenditure (thread, fevicol, copper sulphate, kerosene, dye color and varnish). A relative change is observed in the value addition in different years 2003-04 and 2004 – 05 (Figures 4.4 & 4.5).

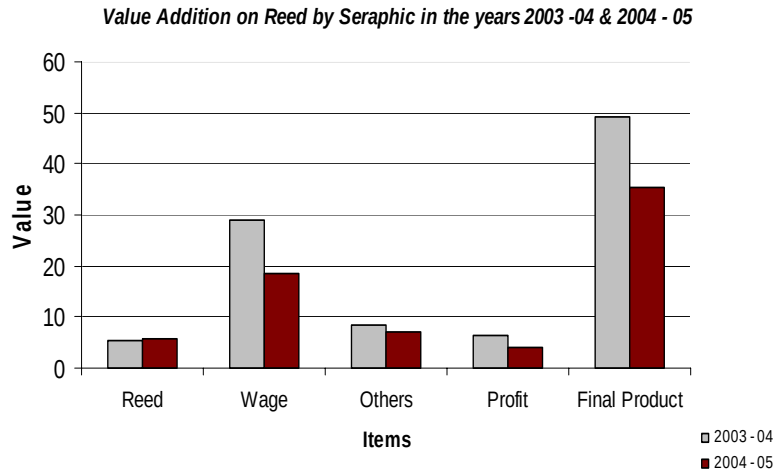


A comparison reveals that there is a decrease in the percentage share of wages in 2004 -05, an increase in the percentage share of reeds and others.

The percentage share of profit is also decreased in 2004 – 05. But, in the absolute term all these variables have shown an upward trend (Figure 4.2).

Seraphic is thus increasing sales, generating income and earning normal profits in a rural area.

Figure 4.6 illustrates the per reed value addition made by Seraphic in the years 2003-04 and 2004-05. The final product here is taken as the sum total of value added by the firm (Table 4.4).



It explains the per unit value addition. Cost of reed goes up due to due to increasing transportation cost, other related cost, wage requirement falls because the labour become more efficient due to the division of labour employed in the Seraphic, now the labour produces more due to increase efficiency. Their costs also fall due to the increasing efficiency and economies of scale of increased production. In the face of severe competition the Seraphic has cut down their prices by reducing per unit profit, falling price increases sales as seen earlier. This brings about an increase in the total revenue on one side and on the other lower wage and other expenses resulting in lower total cost. The net result is increase in the gross profit of the Seraphic. Labour intensive value addition thus ensures profitability and employment security.

Table 4.4.Value Addition / Reed
(in Rs.)

Item	2003-04	2004-05
Reed	5.5	5.8
Wage	28.9	18.4
Others	8.3	7.2
Profit	6.5	4.15
Final product	49.2	35.55

Source: The Seraphic

4.1.3.2 Marginalised Bamboo Dependents

As has already been explained bamboo contributes substantially to generating income and employment for the bamboo dependent communities, especially the MBDs. These communities are traditionally dependent upon this resource that they are unprepared for any alternative skilled labour. Despite low returns from this resource, they show strong affinity to their traditional occupation and continue to depend on it. Hence, any fluctuation or inadequacies related to bamboo based production activities can and will have a direct impact on their livelihoods often with grave consequences.

Production details of the MBDs : Bamboo based production activities in rural sector involving the MBDs also involve four stages as was seen in the case of the trained artisans but with the difference that here these MBDs are active in all the four stages without much value addition when compared to the trained artisans. Vital to livelihoods of the traditional weaving community is their ability to procure the raw material. Their major sources are the forests (Plate 4.10), bamboo depots and home gardens. Since most of the raw material have to be sourced from the forests, it is inevitable that the communities have to face a lot of hurdles imposed by the Forest Department for their supply of the resources and are often left wanting for the resource due to various restrictions. In certain cases they halt for days together in the fringes of the forest or in the catchment area (for instance, *Mangalam dam* catchment area (Plate 4.10) to have easy accessibility to the resource. Processing in their case involves splitting the bamboo into slivers (Plate 4.11), drying it for 24 hours in sunlight, and wet the same with water before production.

Production (Plates 4.12 & 4.13) is a time consuming laborious activity needing a lot of physical strength. This is seasonal activity in the rural areas. There is a high demand for bamboo baskets and the like (mats, baskets,) during the paddy harvest season and mango season. Once the products (Plates 4.14 & 4.15) are ready they are usually stacked up for sale. These finished products cater only the local demand and often the products are carried by head loads to distant markets (local) or to individual households for sale.

4.1.4 Economic potential of bamboo based productive activities

The Seraphic provides employment security to all its women workers. Table 4.5 depicts the average benefit earned and the foregone benefit during the peak period of sales in the different stages of production for both the trained artisans and the MBDs. The production stages involve collection, processing, production and marketing. In the first stage i.e., collection, here the raw material is procured through the Kerala State Bamboo Corporation and the earned benefit of the institution is 71 poles per day, requiring two labourers. The real wages in the nearby areas is Rs 50 per day thus, the foregone benefit is calculated as Rs 100/-. Similarly in the processing stage, they process approximately 284 pieces or 20,448 slivers, covering 42 labour days and thus the corresponding foregone benefit is Rs.2100/-. The average production of mats is 613 with 17 labourers involved and the corresponding foregone benefit works out to Rs.850/-. In the final stage, i.e., marketing, no additional expenditure is incurred because the marketing firms sell their product and thus don't spend any additional time for marketing. The aggregate foregone benefit or the opportunity cost is Rs. 3050/- while average earned benefit with respect to the price in the market is only Rs.3408/-.The opportunity cost which is the cost of foregone alternative is less than the earned benefit. Thus, through value addition the Seraphic ensures reasonable wages and employment security in the rural areas.

Table 4.5. Economic potential of bamboo based productive activity

Production stages	Earned benefit		Required labour days		Foregone benefit (in Rs.)	
	TAs	MBDs	TAs	MBDs	TAs	MBDs
Collection	71 poles	2-3 poles (30-35 slices)	02	5.5	100	275
Processing	20,448 slivers	390-396 slivers	42	12	2100	600
Production	613 mats	40 small baskets	17	4	850	200
Marketing	613 mats	40 small baskets	0	1	0	50
Total	Rs. 3408	Rs. 736	61	22.5	3050	1125

Primary data estimates
TAs-Trained Artisans; MBDs- Marginalised Bamboo Dependents

A Kavara bamboo worker requires 2 to 3 poles per month for which they spend 5.5 days labour for collecting the required poles. The daily wage here is Rs. 50 per day thus the foregone benefit is Rs.275 with respect to the raw material collection. In the processing stage they process 390 -396 slivers which require 12 labour days and the corresponding foregone benefit is Rs 600. In the production stage by using the processed slivers they can produce 24 big baskets or 40 small baskets or 12 *vatti* or 36 *cherumuram* or 20 *Kundumuram* and average labour time required is 4 days and the corresponding foregone benefit is 200, Even though there is no secured market for the product, if there is normal demand they can sell their product within one day of marketing thus the corresponding foregone benefit is Rs 50. The aggregate foregone benefit of all the production stages is Rs.1125 while the corresponding earned benefit is Rs.736. Thus, the opportunity cost is greater than the earned benefit thus it is very evident that the community is under-paid even during the peak period of sales.

A comparison between the basic characteristics of two bamboo based productive sectors involving the trained artisans and the MBDs (Table 4.6) highlights that labour intensive techniques of production and value added products ensure profitability and employment/ livelihood security. Marketing continues to remain the weakest link in the production chain for the MBDs. Furthermore, the lack of an organized institutional setup keeps the MBDs in a disadvantageous position. The economic potential highlights that the MBDs do not stand a chance in the face of stiff competition and the incidence of cheap substitutes.

Table 4.6. Basic characteristics of two bamboo based productive sectors

Production stages	Trained artisans	MBDs
Collection	Large scale Source- KSBC No labour involved	Small scale Highly time consuming and tedious Labour intensive
Processing	Division of labour Labour intensive techniques of production with mechanization	No division of labour, household based rural enterprise, Labour intensive mode of production with traditional tools

Production	High capital and modern techniques of production, acquired skill through trgn. Based on local, National & International market Large scale production High product diversification, produce premium products	Low capital and simple production techniques, indigenous knowledge Based on local market Small scale production Low product diversification.
Marketing	Caters to local, National & International market No particular cost involved	Caters to local market Self-labour
Value addition	High	Low
Benefits	Earned benefit > foregone benefit	Earned benefit < foregone benefit
Economic potential	High, Export potential, foreign currency earnings Labour intensive techniques of production and value added products ensures profitability and employment security.	Low, Community remains backward and underpaid even during the peak period, Community stands no chance in the face of stiff competition and the incidence of cheap substitutes.

Bamboo Products & substitutes: As has already been explained the bamboo products of the MBDs are yet to reach the larger markets and attract national as well global attention. As long as they are remain inferior goods the forthcoming generations may not even know this traditional activity which is already undergoing a change by way of an erosion of traditional knowledge. The market features of these products (Box.4.3) made by MBDs are not so encouraging and this calls for strategic initiatives for their improvement. Although bamboo is a natural, strong fibre, having aesthetic looks and the products are environment friendly the production rate is low and the cost of manufacturing is high. But, the major threat remains that these products are yet to establish themselves. Competition with products such as plastics and other substitutes also poses threats.

As far as the MBDs are concerned the major threat to their age old livelihood source is the prevalence of cheap substitutes like plastic and rubber products. The utility of bamboo and plastic product for the similar purposes is the same but there exists price difference (Table 4.7). The market price and durability of a single unit of plastic product is higher than that of a single unit of bamboo product. However, the relative cost reveals that the total economic cost over bamboo product is higher than

that of plastic product for the same utility, thus people always prefer plastic products to bamboo without considering the social cost.

Table 4.7. Bamboo products and their substitutes

Market name	Bamboo		Plastic / Rubber		Relative price * of bamboo product	Uses	Merits /demerits
	Price (in Rs.)	Duration (in years)	Price (in Rs.)	Duration (in years)			
Muram	35	1	65	2	105	Household purpose	Bamboo muram is more effective in drying as it absorbs water content easily, although is not long lasting
Basket	35	0.5	40	2	140	To carry fruits & vegetables	Freshness is retained in bamboo baskets unlike the plastic
Fish basket	75	0.5	400	3	450	To carry fish	Fish remains fresh in bamboo baskets for longer period when compared to plastic basket.
Panambu	125	1	200	3	375	To dry items	Panambu dries items easily by absorbing the water content.

Relative Price (RP)=P(BP) [D(Pp) / D(Bp)]
P(Bp)=Price of bamboo product ; D(Pp) =Duration of plastic product; D(Bp) = duration of bamboo product

Price elasticity and consumers surplus: The demand curve of two bamboo products and their corresponding plastic substitute products is derived from the primary data collected from the sellers and the consumers of these products. The price elasticity of bamboo *kutta* is equal to that of plastic *kutta.* While, in case of muram, the price elasticity of bamboo *muram* is higher than that of plastic *muram*. People prefer plastic products to bamboo because the consumer surplus of plastic product is higher than that of bamboo. Imposing a green tax equivalent to the difference in the consumer surplus of these products will help to induce the substitution of environmental hazardous plastic products by the environmentally friendly bamboo products to some extent. Since the price elasticity of the bamboo products is higher than one, the demand for the product is elastic in nature thus the price is an important determinant factor in the market demand of these products. Thus for making the sector more competitive adequate attention should be given to reduce the price and increase the quality of the products.

Table 4.8 shows the price elasticity and the consumer surplus of different bamboo and plastic products.

Table 4.8. Price elasticity of bamboo/plastic products

Products	Consumer Surplus	Price Elasticity
Bamboo Kutta	4.7	2.35
Plastic Kutta	5.7	2.35
Bamboo Muram	3.3	2.95
Plastic Muram	10	2.53

e = [dQ/dP] [P/Q] , i.e., Price elasticity of demand is equal to the ratio of proportionate change in quantity to proportionate change in price.

The SWOT analysis (Table 4.9) reveals that although the MBDs have innate traditional skills and indigenous knowledge they are caught in a diminishing circular flow of development. In spite of the immense opportunities and strengths, their inherent weaknesses and apparent threats do not permit adequate development of this sector. There are ample opportunities and with immense potential for product and technology diversity it is a good substitute for wood and comparatively cheaper. The strategy should be long term market development process. Product-education and market development are essential to enhance the image of bamboo products as well as bring a change in the mind set of the urban end-users. The household based rural enterprise with almost no value addition, poor bargaining power, low product diversification, small scale production, catering only to the local markets calls for immediate governmental intervention to enhance and strengthen their livelihood security.

4.1.5 Suggestions

The livelihood security of the MBDs can be enhanced and improved through increased accessibility to raw material and market, employment opportunity, skill development and adequate sustainable institutional support. However, immediate attention is drawn for governmental intervention to revitalize this sector focusing on value addition, enhancing income generation and alleviating poverty. This can be brought about by considering the following, viz., (i) fixing a green tax on plastic products and (ii) promoting bamboo cluster development through an organized institutional setup and training.

4.1.5.1 Green tax on plastic products

Plastic and plastic products occupy importance in the day to day life of the people and these products pose great threats to the sustainability of the environment.

Even though we cannot reject the sector altogether, we can encourage its substitution as far as possible by environment-friendly products. As all plastic products do not have perfect substitutes, the plastic industry should devote its resources for the production of those products which have no environment-friendly substitutes. The market price and durability of a single unit of plastic product is higher than that of a single unit of bamboo product (Table 4.7). But, calculating the relative price it is observed that total economic cost over the bamboo product is higher than that of plastic product for same utility (Table 4.7). In other words, the consumer surplus in case of the plastic product is higher than that of bamboo products thus people prefer plastic products to bamboo (Table 4.8).

One of the benefits offered by the bamboo sector is its environment-friendly product but the market forces do not take into consideration this benefit in fixing the price. The relative difference in the market scenario of the two products highlights the high environment cost on the part of the plastic product (Table 4.10). The market forces determine the price only by taking into account the private cost and benefit and not the social cost. Green Tax is a tax imposed on the environmentally hazardous products for reducing their unnecessary consumption and encouraging the use of environment-friendly products. In order to encourage the substitution the governmental intervention may impose a tax on the plastic product equivalent to the total consumer surplus gained by these consumers. In other words, let the plastic consumers pay the maximum what they are actually willing to pay.

Table 4.10. Relative difference in the market scenario of Bamboo & Plastic Products

Bamboo	**Plastic**
Consumer's point of view	
Low market price	High market price
Low consumer preference	Higher consumer preference
Low consumer surplus	Higher consumer surplus
Low demand	High demand
Social Point of view	
No environmental cost	High environmental cost
Policy initiative	
Improving the quality of the product	Imposing Green Tax

In Figure 4.7, X axis represents the `quantity' and Y axis `price'; ' ob' represents the total quantity requirement of the society, and out of this total, 'oa' amount is contributed by the bamboo sector , the rest 'ab' by the plastic sector. The

consumer surplus gained by the plastic consumers is equal to Δ efh. The Green tax should be equal to Δ efh.

A general fund can be created for the development of this sector by way of the tax (Green Tax) on environmentally hazardous products which can be substituted by bamboo products. By using the fund the self-help groups should be encouraged to cultivate bamboo along riverbanks, government lands and other wastelands. A portion of the fund can be set aside exclusively for the MBD development.

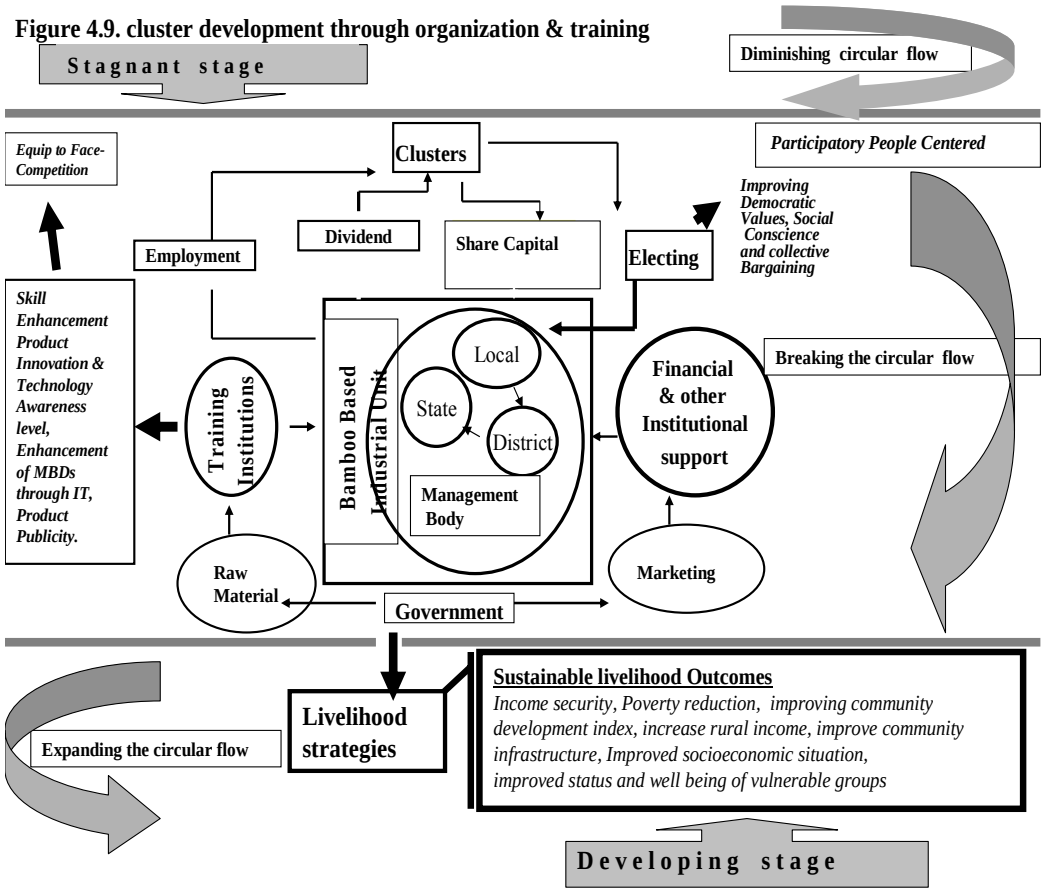
4.1.5.2 Developing a sustainable livelihoods framework for MBDs through organization and training

The traditional bamboo depending sector is labour intensive in nature. Its capital intake is almost zero which results in the low quality production. Since, the quality of products produced by the MBDs is low, MBDs are unable to market beyond the local market i.e., the supply of their product is stagnant thereby generating low income. But, the number of dependent people is high thus the per capita income is very low in this case. The impact of this deteriorating economic condition leads to the erosion of indigenous knowledge, labour force and social and economic security.

The insecure condition further reduces the quality, production and income of this community, the net result is a dimishing circular flow of development (Figure 4.8).

By organizing the people through Self Help Groups (SHG), Non-Governmental Organization (NGOs), Private sector, and local bodies and providing training and credit, we break this circular flow and put them in the path of sustainable development. Providing training to use capital intensive techniques of production will bring about product diversification, division of labour and large scale production. They can then enjoy various types of economies of scale like raw material cost. Thereby they can expand their market beyond the local level and generate higher income. The livelihood potential of this sector will automatically increase leading to further improvement in the quality and the market for the products. The net result of this is an expanding circular flow (Figure 4.9).

Figure 4.9. cluster development through organization & training



The existing circular flow is diminishing in character; in order to ensure sustainable livelihood to MBDs, we have to break the circular flow by organizing the sector and production activities. A people-centered institutional set up is necessary for ensuring a sustainable livelihood. Here, the MBDs must themselves be the key actors in identifying and addressing livelihood priorities. In the first stage we elect the representatives of MBDs representing local, district and state levels. The role of the institutional set up is to encourage the production of value added products, providing employment security, training, raw materials, etc. A reasonable amount of the share capital should be collected from the MBDs and in return ensure dividends to the share holders. The government should ensure training, raw materials and marketing facilities and encourage the financial institutions to provide credit to the sector. This organizational setup can ensure an expanding circular flow of development; resultantly livelihood strategies (Table 4.11) will facilitate realize the sustainable livelihood outcomes. In other words, following the Sustainable Livelihood principles (as of 1999) poverty focused development activity should be people-centered, responsive and participatory, multi-level, conducted in partnership, sustainable and dynamic (Ashley and Carney, 1999).

Table 4.11. Strategies for social and economic development of the MBDs

Short-term	**Long-term**
Improve social conditions, (community infrastructure, human development index)	Long term market development programme (product education)
Increase income security through bamboo based and other alternative employment opportunities	Impose Green Tax on environmentally hazardous product
Provide raw materials at low price	Publicize the long term benefits of environmentally friendly products
Proving Training in the value addition process	Promote cluster development based on Sustainable Livelihood principles.
Efficient use of available resources	Document and promote Indigenous Technology Knowledge (ITK) and identify which can be financially exploited.
Life insurance of MBDs	Organize production & encourage division of labour
Provide market information, marketing tools & market support	R&D for improving the quality of the product
Discourage child labour	Expand market size in national and international level.

Encourage savings through SHGs	
Encourage education among the Children	
Promote gender-based activities like tailoring, food processing, handicrafts, etc	

5. MARKETING OF BAMBOO CULMS FROM HOME GARDENS

Forests and home gardens are the sources of bamboo supply in Kerala. Bamboo from the forests is exclusively being utilised by the Hindustan Newsprint Limited whereas bamboo from the home gardens goes for industrial and non-industrial uses within and outside the State. Although bamboo from home gardens is used for various purposes in the household sector, most is being marketed as poles through the private bamboo depots in the State. Marketing channels of bamboo from home gardens, distribution of the bamboo depots, pattern of trade and retail markets are described in this section. Further, the profitability in trade and the role of the bamboo depots in developing the bamboo sector are also discussed.

5.1 Marketing channels of bamboo

Bambusa bambos is the most commonly found species and commercially important bamboo available in home gardens. It is used in construction, industry, agriculture, fishing and for miscellaneous purposes (Table 5.1). The marketing channels of bamboo from Kerala home gardens are shown in Figure 5.1.

Table 5.1 Sector-wise end-uses of bamboo

Consuming sectors	End-uses
Construction	Houses, sheds, *panthal*, concreting supports, scaffolding, etc.
Industries	Pulp, mats, baskets, handicrafts, furniture, etc.
Agriculture	Supports for banana, betel and grape vines; fruit pluckers, implements, fence, etc.
Fishing	Fish-net frames, fishing rods, etc.
Others	Framework for earthen bunds, ladders, cattle stays, platform for bullock-cart, gates, rowing poles for country boats, barge poles, ferry, etc.

Bamboo from home gardens is being utilised by growers themselves for making sheds, implements, fence, fruit pluckers (pole for bill hooks) and props of banana plants. It is purchased directly by users for making houses, sheds, galleries, supports for concrete form-work in construction and scaffolding. It is used by the

paper mill in the State for pulping. Weaver households mostly depend on bamboo from home gardens for weaving mats, baskets and handicrafts. Fruit pluckers, implement, fence and prop of banana plants are some uses in the agricultural sector. Poles are also used for making fish-net frame, fishing rod, frame-work for earthern bund, ladder, cattle stay, platform of bullock-cart, gate, punt for country boat, etc. For many uses listed above, bamboo goes to users directly.

However, most bamboo is marketed through primary as well as wholesale depots in Kerala. *B. bambos* is the only species of bamboo collected and traded by the depots. Primary depots are very few in most districts and cater the local requirements within the State. The wholesale depots sell bamboo to retailers, banana farmers and other users within and outside the State. Uses of poles outside Kerala are the same as discussed above. Demand from construction and other sectors in Tamil Nadu is being met from the retail depots there which purchase bamboo from the wholesale depots. Poles are directly purchased by Tamil Nadu farmers for using as props of banana plants to protect against wind. Green middle portions of the bamboo culms are used for weaving baskets to transport fruits such as tomato, orange and grapes. Poles are used in smaller quantities by industrial units for manufacturing ice-sticks and incense-sticks. Considerable quantity of residue was being sold to the paper mill in Karnataka State. Bamboo is being purchased by retail depots in Karnataka for sale in very small quantities to users there. Marginal quantities are also being sold to other States like Andhra Pradesh and Pondicherry for industrial and agricultural uses.

5.2 Bamboo markets in Kerala

Although bamboo from home gardens is utilised by growers themselves or purchased directly by users for a variety of purposes, most of the bamboo (*Bambusa bambos*) from home gardens is marketed through bamboo depots in Kerala. In this study, the depots are categorised into primary and wholesale depots. Primary depots are small depots where bamboo is purchased either directly from home-gardens or from village traders in small as well as large lots and sold in retail. They are established mainly in urban centres. The wholesale bamboo depots are those where bamboo is purchased in large lots and sold in bulk (truck loads) mostly to retailers and farmers outside the State. The primary depots are located in most of the districts in Kerala whereas the wholesale depots are concentrated at nearby places in Palakkad District in the State. The wholesale depots in Palakkad District form an organised wholesale market for bamboo from home gardens.

Bamboo depots are classified as very small, small, medium and big. The criterion adopted for classifying the depots is the annual turnover during the year 2004-05. The depots with turnover below 500 metric tonnes come under the category 'very small'. The depots with turnover of 500 to 1000, 1000 to 2000 and above 2000 metric tonnes come under the categories 'small', 'medium' and 'big' respectively. Table 5.2 shows the distribution of primary bamboo depots in different districts in Kerala. There were 95 primary bamboo depots existing during 2005. Of the total number of depots, 80 percent are very small, 16 percent small and the remaining 4 percent medium. There is no big primary depot. Most of the very small and small depots are located in Thrissur and Ernakulam Districts. Out of the 6 depots in Alapuzha District, two units are mainly for making rowing poles for country boats(*kazhukkol*), barge poles and ladders (single culm *yeni*) . In these units, green culms are made straight and strong by heating (*kachiyedukkuk*a) and hanging weight to make *kazhukkol* and *yeni*. Of the four medium size depots, one is located at Vytila in Ernakulam District and the other three at Valapattanam in Kannur District. There are two depots, one in Kasaragode District and the other in Ernakulam District, where *Dendracalamus strictus* poles are being sold.

The distribution of wholesale depots is presented in Table 5.3. During 2005, there were 35 registered depots. No such wholesale depots exist in other districts of Kerala. Of the total number of depots, there are 16 small, 16 medium and three big depots. Besides, there are a few unregistered very small depots which operate only seasonally. The depots are located at Mundur in Palakkad Taluk; Kalladikode and Alanellur in Mannarkad Taluk; Pathirippala, Cherppilassery, Pengattiri, Eliyapatta, Karalmanna, Thadukkassery, Varod and Vaniyamkulam in Ottapalam Taluk; Kunissery, Alathur, Kuzhalmandam and Thenkurissy in Alathur Taluk. Most of the depots are in Ottappalam Taluk. All depots are under individual proprietorship. A depot consists of a small office building or shed with a storage yard where bamboo poles and residue are stacked kept after sorting. Medium and large depots have a manager. Number of employees, including the proprietor (wholesaler), ranges from two in small depots to 12 in big depots. Depending upon the size, there are three to 30

bamboo supplying agents during sale season and one to 12 during lean season per depot. Some depots maintain cutting workers for directly cutting bamboo. In the wholesale trade, there is difference in prices charged by various depots for the same length, diameter and quality of poles. Availability of poles also varies among depots. Major buyers come from different places in the neighbouring State of Tamil Nadu. Due to the personal relationship of the buyers with the wholesalers, there is no great price competition among depots.

Table 5.2 Distribution of primary depots in different districts in Kerala

District	Size of the depot			
	Very small	**Small**	**Medium**	**Total**
Thiruvananthapuram	2	0	0	2
Kollam	2	1	0	3
Pathanamthitta	1	0	0	1
Alappuzha	6	0	0	6
Kottayam	8	0	0	8
Ernakulam	15	5	1	21
Thrissur	16	6	0	22
Palakkad	7	0	0	7
Malappuram	8	0	0	8
Kozhikkode	7	1	0	8
Kannur	3	0	3	6
Kasaragode	1	2	0	3
Total	**76 (80.0)**	**15 (16.0)**	**4 (4.0)**	**95 (100.0)**

Table 5.3 Distribution of wholesale bamboo depots in Palakkad District

Taluks	Size of the depot			
	Small	**Medium**	**Big**	**Total**
Ottappalam	11	10	2	23
Palakkad	2	2	0	4
Alathur	1	3	1	5
Mannarkad	2	1	0	3
Total (Palakkad District)	**16 (45.7)**	**16 (45.7)**	**3 (8.6)**	**35 (100.0)**

During 1940's, there were a few bamboo depots at Nilambur dependent on forest bamboo which were abundantly available there. Substantial quantities were harvested and sold to users in different places in Tamil Nadu. In late 1950's, a private pulp mill was granted the exclusive right of harvesting bamboo from forests. This had resulted in considerable shortage of bamboo for meeting the demand from Tamil Nadu. In this situation, the traders started collection of bamboo from home gardens. Since bamboo was abundantly available in home gardens in Palakkad District, the depots at Nilambur were shifted to places around Palakkad. Availability of bamboo in home gardens and nearness to consumption centres in Tamil Nadu were the main reasons for establishing such depots around Palakkad. Over the years since 1960's, the wholesale depots have been operating as a wholesale market for bamboo from home gardens. It has been reported by traders that such wholesale market does not exist elsewhere in South India.

5.3 Regions of bamboo supply

Marketing of bamboo consists of purchasing of bamboo from home gardens by the supplying agent, harvesting, transporting to the depots, sorting, grading and selling. Home gardens are the only source of bamboo to the depots. Bamboo is purchased by the depots from different regions in Kerala. Three regions: Kottayam, Palakkad and Kasaragode regions- were identified. Kottayam region includes the home gardens in both Kottayam and Ernakulam Districts. Palakkad region consists of home gardens in Palakkad, Thrissur and Malappuram Districts and private estates at Gudallur in Tamil Nadu. Kasaragode region includes home gardens in Kasaragode District and private lands in the border villages in the State of Karnataka. Table 5.4 presents the distribution of primary depots in Kerala according to the regions of bamboo supply. All the depots depend for bamboo on home gardens within the same district. Of the 95 primary depots in Kerala, 27 depots depend on home gardens fully within the same district. Two depots in Alappuzha District and three in Kottayam District mainly depend on Kottayam region for bamboo. Fifty six depots, most of which are in Ernakulam and Thrissur Districts, depend mostly on Palakkad region.

Four depots in Kannur District and three in Kasaragode District depend mostly on Kasaragode region for bamboo.

For the wholesale depots, home gardens in the Palakkad region are the sources of bamboo supply. It has been reported by veteran traders that bamboo harvesting in home gardens is not sustainable. Initially most of the bamboo coming to the wholesale market was collected from home gardens in Palakkad District. But of late, bamboo has also been collected from the neighbouring districts of Thrissur and Malappuram. Traders have collected bamboo from home gardens in Kasaragod. Dependence for bamboo from home gardens in far away places is an indication of decline in availability of bamboo in home gardens in and around Palakkad District.

Table 5.4 Distribution of primary depots in Kerala according to regions of bamboo supply

District	Home gardens			
	Within district alone	**Kottayam region***	**Palakkad Region****	**Kasaragode region*****
Thiruvananthapuram	0	0	2	0
Kollam	0	0	3	0
Pathanamthitta	1	0	0	0
Alappuzha	0	2	4	0
Kottayam	0	3	5	0
Ernakulam	4	0	17	0
Thrissur	8	0	14	0
Palakkad	7	0	0	0
Malappuram	3	0	5	0
Kozhikkode	2	0	6	0
Kannur	2	0	0	4
Kasaragode	0	0	0	3
Total	**27**	**5**	**56**	**7**

* Includes home gardens in Ernakulam District. ** Includes home gardens in Thrissur and Malappuram Districts and private estates at Gudallur in Tamil Nadu. *** Includes private lands in border villages in the State of Karnataka.

5.4 Bamboo products and prices

Bamboo clumps are purchased from home gardens either directly or through

the supplying agents. Culms are felled one at a time after a preliminary pruning of thorns. Bamboo products available during felling are poles and residue. Straight, matured and green pieces of 3 m and above, from the bottom to top of the culm, are referred as 'poles'. Other pieces below 3 m; bent, damaged and split pieces; deformed and immature culms are included under 'residue'. The bamboo residue is mainly used for pulping. Thorns obtained while pruning the culms are left in the home-gardens and are used for fencing. Felled culms are sized for maximum out-turn of good quality poles according to depot specifications. The sized culms are then finished into poles at the site itself and the finished products are transported to the depot. The trade classification is based on the length of the pole and type of culm portion. The lengths of poles are 3.0, 3.6, 4.2, 4.8, 5.4, 6.0, 6.6, and 7.2 m (10, 12, 14, 16, 18, 20, 22 and 24 feet respectively). After transporting the poles at the depots, they are classified first as bottom, middle and top portion. Poles of different lengths are further graded on the basis of diameter as well as weight and stacked in the storage yard. Prices are then fixed for each type of poles and sold. The residue obtained is also stocked in the yard. When the quantity makes up a full truck load, it is sold to paper mills.

Table 5.6 shows the general uses of bamboo poles and average wholesale price of different varieties during 2005. Although poles are priced per piece in the wholesale depots, they are bought in large numbers so as to arrange full truck-load transportation. Average wholesale price of poles per tonne during 2004-05 was Rs 3,178. Price of bamboo residue realized at the depots was Rs 1,050 per tonne during the same year. Now, the residue is completely bought by the Hindustan Newsprint Limited. Earlier, almost all the residue was taken by the paper mill in Karnataka. One of the reasons in the decrease in residue demand in Karnataka State is the increased availability of forest bamboo there. Although the residue price is lower than the price of poles, the wholesalers tend to see any income from residue as a bonus. Since bamboo residue is a by-product of the main trade of poles, the income from residue is considered as an added benefit to the wholesalers.

Table 5.5 General-uses of poles and wholesale prices during 2005

Trade classification	End-uses	Price (Rs per piece)
6.6-7.2 m (22-24 f) bottom	Beams, fish-net frames, framework for earthern bunds	70-115
3.0-7.2 m (10-24 f) bottom	Beams, pillars	23-105
3.0-6.0 m (10-20 f) bottom	Pillars, scaffolding poles	18-80
3.0-4.8 m (10-16 f) bottom	Props of banana plants	12-16
3.0-3.6 m (10-12 f) bottom	Supports for concrete form-work in construction, rafters, ladder	13-32
3.0 m (10 f) bottom	Ice-cream stick, incense-stick, platform for bullock-carts, bamboo powder for polishing needles	13-23
3.0-7.2 m (10-24 f) middle	Mats, baskets, handicrafts, beams, rafters	10-34
5.4-6.6 m (18-22 f) middle	Mats, baskets, handicrafts, beams, rafters	18-46
3.0 m (10 f) middle	Ice-cream stick, incense-stick	10-17
4.2-6.0 m (14-20 f) top	Rowing poles for country boats	11-16
3.0-4.8 m (10-16 f) top	Fruit pluckers, rafters	8-12

5.5 Pattern of sale and retail markets

Of the total quantity of 74,000 metric tonnes of bamboo marketed through both the primary and wholesale depots in Kerala during 2004-05, 48 percent was sold by the primary depots and the remaining 52 percent was sold by the whole sale depots. When the primary depots depend for bamboo on home gardens in border villages in Karnataka in small quantities, the wholesale depots depend on private estates in border villages in Tamil Nadu in small quantities (Table 5.5).

Table 5.6 Bamboo sold through the primary and wholesale depots in Kerala (Quantity in tonnes)

Bamboo depots	Source of supply			
	Kerala	Tamil Nadu	Karnataka	Total
Primary depots	34, 862	0	972	35, 834
Wholesale depots	37, 118	960	0	38, 078
Total	**71, 980**	**960**	**972**	**73, 912**

Table 5.7 Trade of bamboo through the wholesale depots

Year	Quantity (metric tonne) sold			Total
	within Kerala	outside Kerala State		
		Tamil Nadu	Other States	
1989-90	8,586 (16.4)	33,340 (63.7)	10,383 (19.9)	52,309 (100.0)
1993 – 94	5,896 (13.6)	28,718 (66.2)	8,771 (20.2)	43,385 (100.0)
2004 – 05	7,540 (19.8)	30,394 (79.8)	144 (0.4)	38,078 (100.0)

 # The figures in brackets are percentages to annual total.

Annual quantities of bamboo traded through the wholesale depots during 1989-90, 1993-94 and 2004-05 are shown in Table 5.7. Of the total quantity sold during 2004-05, bamboo used within Kerala was only 7,540 metric tonnes which accounted for 19.8 percent. The quantity exported to Tamil Nadu was 30,394 metric tonnes (79.8%) and that to other states was very negligible (0.4%).Over the years since 1960, quantity of bamboo sold within Kerala was below 20 percent. More than 85 percent of the annual quantity traded through the depots has been moving out of the State. The steady retail markets are in different places in Tamil Nadu and other States (Table 5.8). From the wholesale market in Palakkad, bulk quantities of bamboo are available at any time. The steady retail markets of *B. bambos* poles over years in different places in South India clearly indicate the prominence of bamboo from Kerala.

As can be seen in Tables 5.7 and 5.8, the movement of bamboo poles to Tamil Nadu is declining. It is reported by bamboo traders that the growing stock of bamboo has been declining rapidly. Initially most of the bamboo coming to the markets was collected from home-gardens within the district only. Later, bamboo was collected from the neighbouring districts. Very recently, bamboo is being collected from places in distant districts and even from border villages in the neighbouring States. These facts reveal that the bamboo resource in home gardens is getting depleted and the reduction in the quantity and export may be due to decline in supply.

5.8 Export of bamboo poles from the wholesale depots to different placesin Tamil Nadu during 1996-97 to 2004-05(Quantity in metric tonnes)

Places	1997	1998	1999	2000	2001	2002	2003	2004	2005
Salem	2765	2746	2544	2400	2218	1709	1565	1834	1536
Pollachi	2621	3082	2995	2842	2851	2102	2218	2400	3168
Dindigal	1440	1843	1795	1421	1594	1382	1373	1248	1037
Andhoor	1430	1450	1354	1162	1258	931	922	864	845
Erode	960	1056	872	835	1104	941	902	739	691
Madurai	902	1114	1181	1517	1498	1104	1421	1574	1402
Thottiyam	826	413	211	384	154	96	0	77	202
Parimathivelur	624	288	403	442	624	394	0	96	470
Pothannur	470	634	470	461	662	374	624	182	115
Kattu puthur	470	643	250	269	202	192	10	38	0
Komarapalayam	432	682	547	461	365	307	317	240	211
Mohannur	422	845	77	29	0	86	58	38	38
Ambur	278	221	173	182	134	125	96	77	19
Thirupur	211	288	269	307	461	317	326	77	48
Trichi	211	250	250	259	278	134	0	58	134
Coimbatore	202	230	125	202	384	67	10	240	288
Palli palayam	144	134	173	278	154	211	250	0	0
Perundurai	86	163	221	182	211	115	221	58	134
Namakkal	77	307	154	106	211	173	173	0	0
Kovilpalayam	58	134	29	96	86	134	374	211	326
Odenchathram	29	230	643	557	259	211	307	202	288
Vedasanthur	19	10	134	182	211	173	211	211	250
Other Places	10742	10310	8957	7526	6768	7536	7142	6461	8669
Pondicherry	317	192	557	173	134	67	77	48	58
Karnataka	1997	10	10	10	29	0	29	10	48
A.P	96	10	10	19	10	0	163	19	10
Total	25910	27283	24403	22301	21859	18883	18787	17002	19987

* This does not include the quantity of bamboo sold from depots in Alathur Taluk and moved to Tamil Nadu through the inter-state exits where there are no forest check-posts. The total quantity given does not tally with that in Table 5.7.

5.6 Farm price, marketing costs and profitability in trade

Estimates of average farm price, marketing costs, net margins and wholesale price of bamboo per tonne during 2004-05 are presented in Table 5.8. Farm price of bamboo refers to as the lump sum amount at which standing bamboo clumps in home gardens are bought by supplying agents for harvest. It is the price of the standing utilizable portion of the bamboo culms (poles and residue) available in the clumps. Farm price, the net income received by an average bamboo grower, accounted for 40 % of the wholesale price of Rs 2,878 per tonne green weight during 2005. This indicates fair returns for the grower from a crop for which no inputs or expenditures were incurred.

Table 5.9 Average farm price and marketing margin in bamboo wholesale trade (Rs per tonne green weight)

Component	% share	Amount
Farm price of standing bamboo clumps	39.6	1,140
Marketing costs incurred by supplying agent[#]	36.8	1,059
Net margin of supplying agent	7.3	210
Marketing costs incurred by wholesaler	9.7	279
Net margin of wholesaler	6.6	190
Wholesale price of bamboo	100.0	2,878

[#] Harvesting cost alone accounted for 18.1 % of the wholesale price.

Marketing costs accounted for 46 percent of the wholesale price. Marketing costs include two components: i) expenditures by supplying agent from the point of harvest to the point of supply at the wholesale depot and ii) expenditures by the wholesaler from the point of buying bamboo (poles and residue) from the agent to the point of sale at the wholesale depot. Expenditures by the agent include costs of harvesting, transportation permit for cutting, travel and miscellaneous expenditures. Expenditures by the wholesaler consist of the rent of office building and storage yard, interest on working capital, salary and other expenses of the wholesaler himself, wages, expenses of export-way permit and miscellaneous expenditures. About half of the marketing costs was accounted by harvesting cost including informal expenses for

forest department's cutting permit, when the permit fee itself was very negligible. Harvesting cost alone was Rs 702 per tonne which accounted for 18 percent of the wholesale price. The bamboo market can be encouraged by liberalisation of the present permit system which seems to add to the marketing cost. Net marketing margins accounted for 14 percent of the wholesale price. This was the margin received by supplying agent (intermediary) and wholesaler. Net margin of an average supplying agent was Rs 210 per tonne (7.3% of the wholesale price). It was the net margin per tonne retained by him after meeting all his costs.

Net margin of an average wholesaler was Rs 190 per tonne during 2004-05. A wholesale price of Rs 2,878 per tonne during the same year resulted in a net margin to the wholesaler of 6.6 %, after deducting his salary and all expenses incurred by him for depot management of Rs 279 per tonne. Based on an average 1,087 tonne of bamboo sold per depot during 2005, net annual profit of an average wholesaler was estimated as about Rs 2,06,720 which is modest, considering the goodwill created and markets served.

5.7 Need for resource development

Bamboo trade is profitable to both supplying agents and traders. Bamboo growers also receive reasonable income. Substantial amount of employment is being generated from the point of harvest to the point of sale. Profitability of a trader depends on the quantity of bamboo sold whereas grower's income depends on the quantity harvested from his home garden and supplied to the depots. It has been reported by veteran traders that bamboo harvesting in home gardens is not sustainable and enough quantity of bamboo was not supplied to the depots to meet the demand. Initially most of the bamboo coming to the wholesale market was collected from home gardens in Palakkad District. But of late, bamboo has also been collected from the neighbouring districts of Thrissur and Malappuram. Primary depots have also been collecting bamboo from far away places. Dependence for bamboo on home gardens in far away places is an indication of decline in the availability of bamboo in home gardens. It has been reported by growers that growing stock of bamboo in home

gardens has been declining rapidly over the years. Most bamboo growers do not properly manage bamboo clumps in home gardens. Important reason for the poor management is the ignorance of the growers on species preference in the market, quality specifications for different end-uses, relative prices and management techniques for better product-mix. These factors suggest that the bamboo resource in home gardens needs to be developed through better management techniques. This can be achieved by disseminating market information among growers which will encourage them to improve the resource through better clump management.

6. VALUE ADDITION AND PRODUCTION TECHNOLOGY

6.1 Bamboo based industries

Bamboo-based industrial activities in Kerala are carried out in the traditional and non-traditional sectors. In the traditional sector, production of mats and baskets is the major activity undertaken by traditional workers including those working under Kerala State Bamboo Corporation. Non-traditional sector mainly involves in the production of handicraft products which are produced by traditional and non-traditional workers. Although both the sectors use bamboo or reed as raw materials, they cater to the requirements of different consumers. Thus, the working of these two is separately dealt with here.

6.2 Basket and mat production

Production of reed/bamboo mat and basket is one of the earliest bamboo based activities in Kerala and in the past it was carried out at household level. This activity is spread throughout the state but is more concentrated in Ernakulam, Thrissur, Thiruvananthapuram and Palakkad districts. Angamaly-Kalady areas in Ernakulam district and Nedumangad- Aryanad areas in Thiruvananthapuram district are the major centres of reed mat production. The production of fruit basket is concentrated in Thalappilly Taluk of Thrissur district. Fish basket, another item of the bamboo based industry in Kerala, is located at Vithura in Thiruvananthapuram district and coastal areas of Karunagappilly and Haripad in Kollam and Alleppey districts respectively. There are a number of bamboo clusters in different districts in the state (for instance, 160 clusters in Palakkad district) which, produce mats and baskets for agricultural and other household purposes. One of the features of this sector is that most of the workers undertake this job as a leisure time/ off season activity to supplement income from other sources.

In Angamaly and Kalady areas, the bamboo based activities are more than a century old. In olden days reed collection and mat weaving were being carried out by individuals in households and they were unable to market their products in the distant places. This resulted in the dominance of private traders in the marketing scene. In

1970, the State government appointed a commission to examine the operation of industry and suggest measures for streamlining the activity with the primary objective of enhancing the well-being of the traditional workers (Nair and Muraleedharan, 1983). The Commission stressed the need for establishing appropriate organization for solving the problems of the industry, which paved the way for setting up of Kerala State Bamboo Corporation. The Corporation is a public limited company owned by the Government of Kerala.

KSBC was given the right of reed collection from the forests from 1977 onwards. It was also assigned the responsibility of supplying reed to the weavers, co-operative societies and traditional users such as small scale industries and *bona fide* consumers. Accordingly, the government provided 30000 Metric Tonnes of reed free of cost to the Bamboo Corporation. KSBC supplies reeds at a subsidized rate (on a credit basis) to the weavers. The Corporation has more than 100 reed-distribution and mat collection centers, mostly located in the central and southern Kerala. There are over 15,000 mat-weaving families, 2,500 reed-cutters and 1,000 loading and unloading workers under the Corporation. Mat weavers associated with the Corporation are known as "registered weavers".

There has been steady decline of number of poles collected from forests since 2001-02 (Table 6.1). According to the officials of KSBC, this was due to two reasons: low availability of reeds in the forests and also decline of demand from the traditional workers.

Table 6.1 Quantity collected and sold (price/pole) to SSI units and Depots

YEAR	Quantity collected (No of poles/ In Lakhs)	Quantity sold to SSI Units (No of poles /In Lakhs)	Quantity sold in Depots (No of poles/In Lakhs)	Price/pole
1900-91	145.33	59	86.33	1.06
1991-92	162.12	70	92.12	
1992-93	145.81	61	84.81	
1993-94	162.76	64	98.76	
1994-95	158.42	59	99.42	
1995-96	159.35	52	107.35	1.51
1996-97	148.31	52	96.31	
1997-98	162.83	60	102.83	
1998-99	158.96	59	99.96	
1999-00	131.42	38	93.42	
2000-01	138.66	43	70.1	
2001-02	115.92	36	57.61	
2002-03	95.07	37	56.1	
2003-04	80.42	24	53.87	2.27
2004-05	81.01	25	53.92	

Source: KSBC

The reeds have been collected mainly from Malayattor, Chalakudy, Vazhachal, Munnar, Nilambur, Ranni, and Konni forest ranges. There were about 92 procurement depots in Angamaly (77) and Thiruvananthapuram (15) regions (Appendix 6.1). The corporation has its own marketing network. The mats produced by the weaving families are collected in the depots of the Corporation. Earlier mats were supplied mainly to government agencies such as Food Corporation of India and the Central Warehousing Corporation. When they set up Bamboo Ply unit, mats have been predominantly used for meeting the requirements of this unit.

As far as reed collection and distribution are concerned, the Corporation faces a number of problems. The Corporation has not set up collection or distribution centres in all the districts in the state. Recently the expenditure on collection has increased and consequently, the price per pole has increased from Rs. 1.06 in 1990-91 to Rs. 1.51 in 1995-96 and to Rs. 2.27 in 2003-04. Due to over harvesting by pulp and paper mill, the Corporation does not get quality materials and are forced to move to

inaccessible areas. During the rainy seasons, extraction from these areas is difficult, resulting in cost escalation.

During 2003-04 the Corporation produced goods such as bamboo ply and bamboo mats of 34.71 million sq.ft valued at Rs. 97.35 million. Sales turn-over for the period 2003-04 was Rs. 89.29 million as against Rs. 99.62 million in the previous year. The loss of the Corporation increased by Rs. 14.42 million reaching a high level of Rs. 25.68 million registering 128 per cent increase. The main problem faced by the Corporation is marketing of the product. The demand for bamboo mats and bamboo ply are dwindling due to the entry of low cost and artificial substitutes (State Planning Board, 2005).

6.3 Co-operative societies

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During 1982- 83, there were about 40 co-operative societies engaging in the bamboo based activities. The members of the societies were mostly scheduled caste people who were traditionally dependent on reed mat and basket production (Nair and Muraleedharan, 1983). Due to a variety of reasons, the number of societies has now dwindled to 15 of which only very few are working regularly.

6.4 The employment scenario

There are projections regarding number of workers who really dependent on bamboo based activities for their livelihood. For instance, it was reported that there were about 300,000 workers in the bamboo sector during 1982-83 (Nair and Muraleedharan, 1983). According to State Planning Board (2005). Bamboo industry provides direct employment to one-lakh workers. The Directorate of Industries and Commerce in the state has estimated that bamboo and cane sector provided employment to 87,000 artisans during 2004-05 of which bamboo sector accounted for the major share. Total number of bamboo workers registered in Panchayats in Kerala constituted 40000. According to National Council of Applied economic Research-NCAER- (2002), bamboo and cane handicraft sector provided employment to 1356 during 2002.

Thus, there is no consensus on the exact number of bamboo workers in Kerala. It is generally agreed that the number of artisans in the bamboo sector has declined rapidly over a period of time due to variety of reasons such as low availability of raw materials, low income, marketing problems among others. In order to understand total number of workers in the sector, it is very essential to undertake detailed census survey among the artisans.

It is beyond the scope of this study to undertake a census survey among the bamboo workers for this purpose. The estimation of number of workers (both fulltime and part-time) in the sector through a sample survey poses problems, partly because they are all traditional workers who are less systematic in their work schedule and partly due to the fact that for the majority, this is a leisure time/off-season work. This often reduces the accuracy of the estimation. However, we attempted to estimate total number of full time workers among the traditional artisans in Kerala, excluding workers in the Bamboo Corporation, based on information generated from the sample survey. A full time bamboo dependent was defined as those workers who work eight hours a day continuously for about 15 to 20 days in a month. It was estimated that the number of full time artisans ranges between 6,000 and 8,000, depending upon number of days worked (20 or 15 days) in Kerala. If we reduce the number of working days, for example, 15 days to 10 days in a month, total number will be higher. Another interesting fact is that about 70 per cent of the workers are at the age of above 40 years, indicating that middle aged/old people are dominating in the workforce.

6.5 Handicraft industry

According to International Trade Centre (1999) handcrafted items are artisans' products which are produced by artisans, either completely by hand or with the help of tools or even mechanical means. However, the direct manual contribution of the artisans remains the most substantial component of the finished products. The special nature of artisans' products derives from their distinctive features which can be 'utilitarian, asthetic, artistic, creative, culturally attached, decorative, functional,

traditional, religiously and socially symbolic and significant'. Although most of the features mentioned above can be applied to bamboo based industrial production in Kerala (excluding pulp and paper unit), for the analysis purpose, non-traditional bamboo based activities are included under the heading of handicraft.

Bamboo handicraft sector produces products such as table mats, baskets, bamboo curtain, flower baskets, bottle cover, furniture, notepads, etc. It is claimed that the artisans have the knowledge of producing more than 100 products. About 20 curtain making units are located between Vytila in Ernakulam district and Ambalapuzha in Alleppy district and 15 handicraft units are situated in Thrissur, Ernakulam, Kollam, Thiruvananthapuram, Wayanad and Kannur districts. In addition, a number of unorganized handicraft units are also functioning along the national highway which are run by artisans from other states. According to the list of Capable manufacturers prepared by Office of the Development Commissioner (Handicrafts), there were about 28 bamboo and cane units in Kerala in 2002. Our survey covered about 39 bamboo units in the state but this number is not complete because some of the units were found to be temporarily closed down during the survey. According to National Council of Applied economic Research surveys (1999 and 2002), average number of artisans per production unit (average size of unit) in cane and bamboo sector was 2.37. But in our survey this was found to be 5, excluding trainees and other part time workers (the low size of unit in NCAER surveys is due to the inclusion of cane units as they generally use less number of workers compared to bamboo units). If we include the latter categories of workers also the average size of unit in handicraft sector enhances to 15.65 (many units employ trainees who constitute cheap labour and a source of increasing profit).

6.6 Structure and composition of capital

Majority of the handicraft units are very small with low investment. Productive capital consists of fixed assets and working capital. Fixed capital constitutes items such as land, factory buildings (including furniture) and machineries, while working capital consists of stock of raw materials, fuels, and stock of finished

and semi-finished products, cash in hands and bank, etc. The valuation of working capital does not pose much problems since its value can be worked out from the books of account. On the contrary, the valuation of fixed capital is a stupendous task partly because non-availability of accurate data on values of various items of fixed capital and partly due to lack of uniform method of depreciation.

In this exercise, the valuation of fixed assets of the units is carried out on the basis of historical cost. During the survey, it was found that a number of units had maintained accounts on the values of the fixed assets they possessed and therefore, this has been taken the historical cost of fixed capital in their case. In the case of others who had not maintained the accounts, the historical cost was worked out on the basis of values of the similar items given by other units in the locality. There has not been any uniform method of estimation of depreciation among the units, therefore a uniform rate of 5 per cent is provided for machineries and factory building.

About 80 per cent units have their own land and building. A few units have machineries also. Fixed and working capital, two constituents of productive capital, employed per unit amounted to Rs 2 lakhs and 0.75 lakhs respectively. The stock of raw material was found to be very low, amounting to Rs. 20,000. Cost of land accounts for 60 per cent of the fixed capital and building and machineries share the rest. It was reported that borrowing both from the organized and unorganized sectors, is the major source of investment, accounting for 65 per cent of the productive capital. The investment-employment ratio is estimated as Rs 17187, indicating that with low investment, this sector can generate more employment.

6.7 Profitability of selected bamboo handicraft items

The industry produces a number of products at varying quantity based on demand and marketability. The profitability of four handicraft items, viz. bamboo curtain, table mat, lamp shade and oval basket has been worked out and given in Table 6.2.

Table 6.2 : Estimation of cost of production of selected handicraft products

	Bamboo curtain		**Tablemat**		**Lampshade**		***Oval basket***	
	Amount (Rs)	Total	Amount (Rs)	Total	Amount (Rs)	Total	Amount (Rs)	Total
	Per unit	Amount (Rs)	Per unit	Amount (Rs)	Per unit	Amount (Rs)	Per unit	Amount (Rs)
Direct cost								
Raw materials (bamboo, etc)	11.00 (36.70)	82500.00	3.00(56.60)	52500.00	15.00(18.75)	1500.00	5.00(18.52)	2000.00
Chemicals	1.00 (3.34)	7500.00	0.25(4.72)	4375.00	2.00(2.50)	200.00	2.00(7.40)	800.00
Dyes	2.16(7.20)	16200.00	0.50(9.43)	8750.00	3.00(3.75)	300.00	0.00(0.00)	0.00
Wages	13.00(43.38)	97500.00	1.30(24.53)	22750.00	50.00(62.50)	5000.00	18.00(66.68)	7200.00
Direct consumables used in the production process	2.50(8.34)	18750.00	0.25(4.72)	4375.00	10.00(12.50)	1000.00	2.00(7.40)	800.00
Rentals	0.23(0.77)	1725	0	0	0			
Indirect costs (allocated costs)								
Utilities (electricity, water, etc.)	0.08(0.27)	600	0	0	0	0	0	0
Cost of production	**29.97 (100)**	**224775.00**	**5.3(100)**	**92750.00**	**80.00(100)**	**8000.00**	**27.00(100)**	**10800.00**
Gross profit margin	**5.03**	**37725.00**	**1.70**	**29750.00**	**10.00**	**1000.00**	**3.00**	**1200.00**
Selling cost	**35.00**	**262500.00**	**7.00**	**122500.00**	**90.00**	**9000.00**	**30.00**	**12000.00**

The cost of production of one sq.ft of bamboo curtain amounts to Rs. 30 and selling price is Rs. 35. In the case of table mat, lamp shade and oval basket, the cost of production worked out per unit amount to Rs. 5.30, Rs. 80 and Rs.27 and the selling prices of these products amount to Rs.7, Rs.90 and Rs.30 respectively. This indicates that production of handicraft items is profitable and the profit varies from product to product; for instance, the profit margin of bamboo curtain is 14 per cent, table mat, 24 per cent, lamp shade 11 per cent and oval basket 10 per cent. Among the four items, table mat gives more profit mainly because the production units get orders both from within and outside the state. In contrast, the curtain get less profit as most of the production units are located along the national highway and thus face severe competition. There is only limited demand for lamp shade and oval basket that restricts earning higher profit.

The raw material cost and wages are the two major items of cost, accounting for 80 per cent. Similar is the case regarding other products also. It was reported that there has been cost escalation during the last five years in the sector, accounting 60 per cent. But the selling price increased only 35 per cent during this period, resulting in low surplus generation. Further, payment of interest on borrowed capital also makes the investment in this sector less attractive.

6.8 Cost and value added ratios

There are no published information on estimates of value of production, cost of production and value added by manufacture for bamboo handicraft separately. But The NCAER gives the estimates for cane and bamboo sector in Kerala. Generally, the cane units in the state are more efficient and some are export oriented and thus a combined figure will not give a true picture for the bamboo sector. Thus value addition (value of production-cost of materials), cost ratio (cost of production as % of value of production) and value added ratio (value added/value of production)* 100] for the handicraft sector are worked out (Table 6.3). The cost and value added ratios of bamboo handicraft account for 84 and 16 percentages. The cost ratio worked out for the handicraft sector is found to be very high probably due to higher paid-out cost

for raw materials, interest, etc. Further the value added ratio estimated for the sector constitutes only 16 percent which is unfavourable for the growth of the industry. In other words, the value addition or surplus generation by manufacturing of bamboo handicrafts is very low in Kerala. This conclusion coincides with that of NCAER surveys carried out during 1999 and 2002 (Subrhamanian, 2004).

Table 6.3. Production, cost and returns of selected handicraft products

	Bamboo curtain	Tablemat	Lamp shade	Oval basket
Sq.ft/ unit made/ day	375	875	5	20
Monthly production quantity	7500	17500	100	400
Cost of production/ unit	29.97	5.30	80	27
Cost of production/month	224775	92750	8000	10800
Profit margin / product	5.03	1.70	10	3
Selling rate (at the first point of sale at the production unit)	35	7	90	30
Total sales value	262500	122500	9000	12000
Gross profit	37725	29750	1000	1200
Wages earned / person/day	325	45.50	25	36
Wages earned / month/ person	6500	910	500	720

6.9 Production technology

Production of mats and baskets has been carried out with primitive technology that is developed locally. Processing of bamboo/reeds involves: cutting of bamboo/reeds into pieces, splitting, slivering, and weaving. The traditional tools used for these processes are bill hook and knives. In the handicraft sector also, the production is mostly labour intensive and except very few units, majority uses only primitive technology. There are several reasons for poor development of technology in this sector; probably, the most important being scarcity of capital as this is carried out by socially and economically weaker sections in the society

Since in the later part of 1990's, some bamboo handicraft units in the state have used modern tools. The pioneering attempt was done by URAVU, a non-governmental organization, working in Wayanad district in Kerala. This unit was established in 1996 and production of handicraft items with bamboos and reed was started in 1998. In the production process, the following tools have been used (Table 6.4).

Table 6.4. Implements used in different production stages

Stages of production	Implements/ Tools used
Cutting	Electric cutter
Slivering	Ordinary knifes
Ribbing	Ordinary knifes
Treating	Borex, Boric acid
Dying	Colors, Fevicol
Production	Electric tools, Machineries
Finishing	Compressor

The important electric tools/machineries in the unit are: Electric cutter, planer, sanding machine, drilling machine, hacksaw blade, knife, hand drill, file. In addition to URAVU, a few handicraft units in the state have also used modern tools for production. Tools/ machineries used by the handicraft units in the state are listed below (Table 6.5).

Table 6.5 Tools/ machineries used by the handicraft units in the state

Sl.No	Items
1	Large knife
2	Half round knife
3	Small knife
4	Hack saw (large)
5	Hack saw (small)
6	Balde (large)
7	Blade (small)
8	File round 8*
9	10* flat bustard ruff
10	ruff saw file 12*
11	Half round file 10*
12	Hand drill (box type) 3/8
13	Bits (2 sets and selected nos. additional)
14	Blow lamp
15	Measuring tape
16	Chisel-assorted (selected nos. sets)
17	Steel scale (1 Ft)
18	Cutting plier
19	Nose plier
20	Ball pien hammer
21	Hammer large
22	Jigs and fixtures

One of the problems in the production of bamboo products in Kerala is the lack of quality and homogeneity due to low mechanization. Keeping this in view, Industrial Design Centre of Indian Institute of Technology Bombay designed about 30 tools, aiming to produce 'new generation craft products' which could compete with plastic products (IDC, 2001). Some of these tools are adopted from traditional craftsmen in India and China and also from other areas like woodwork and some are newly innovated. The major advantages of this tool kit are that they are handy and affordable to middle class entrepreneurs as well as small units.

There is a possibility to use more machineries in bamboo handicraft units to produce new generation products to meet the growing demand of the modern societies. A list of such machineries that can be used in a unit without affecting employment much is given below (Table 6.6).

Table 6.6 Machinery used in a unit

Machines
Bamboo hydraulic splitting machine
4 side sizing machine
Belt sander
Grinding machine/ buffer
Drilling machine large/ small
Electric hand drill
Spanner set
Screw driver set
IDC tool kit
Hand operated width-sizer
Hand operated slivering machines
Room for mat/ curtain weaving
Power generator
Standard factory tools and accessories
Fire/ safety systems
Workshop furniture
Treatment facility

Source: URAVU, Wayanad

Approximately, about Rs.0.5 million is estimated as cost of above machineries.

One of the arguments against mechanization is that it is not acceptable from employment point of view as this industry is considered as an avenue for providing

employment in labour surplus economy (Jayasankar, 2004). This may be, to some extent, true in the case of traditional mat and basket production, but not in the case of handicraft sector. In the context of globalization, demand for the products, to a great extent, depends on their quality which can be achieved only through use of appropriate technology. This will not only reduce the cost of production but also boost up the demand and consequently, the profit.

The details on average product wise cost of production, sale value, production time per unit, number of labour involved and machineries used are presented in Table 6.7.

Table 6.7. Types of products, cost of production, production time and labour and tools used

Type of product	Cost of production and sale value(in Rs)		Production time/per unit	Labour involved		Tools used
	Cost	Sales		Male	Female	
Pen	27	35	1 .30 Hrs		1	Knife, drill, file
Lamp shade	180	250	8-10 Hrs		1	Knife, drill
Pen cup	6	15	25Minutes		1	Knife, drill, file
Puttu maker	25	40-50	30 Minutes	1	1	Knife, drill, file
Flowervase	20	28-30	1 Hour		1	File, Knife
Hair clip	6	10	30 Minutes		1	File, Knife
Vissile	3.50	5-10	20 Minutes	1	1	File, Knife, Hacksaw blade
Wall hangings	70	100	90 Minutes	1		File, Knife, Hacksaw blade
Note pad	80	100-120	4 Hours	1	1	Knife, drill, Cutter
Bottles	120	180-200	8Hours		1	Knife, drill, Cutter
Measures	10	15-20	90 Minutes	1	1	Knife, drill, Cutter
Curtains	20/Sq feet	25-30	30 Minutes (1 sq. feet)	1	1	Knife, File, Hand drill, Cutter

It is to be noted that most of the items given in the above Table can be made with the help of tools/machineries. In other words, there should be proper mixing of labour and appropriate technology to produce quality handicraft products. An attempt was made to compare the number of workers and profit margins in units which use modern tools and and non-users. For instance, it was reported that the units which used looms in a curtain making received about 30 per cent more profit than that of non-users, mainly due to improved quality of the products. At the same time, average number of workers employed by both the units is found to be more or less same, indicating that use of appropriate tools will not replace labour in handicraft sector.

During the survey it was informed that many units were willing to adopt new tools/machineries in their units. The major constraints for the adoption of new tools are found to be lack of capital for investment, skilled labour and quality raw materials. The absence of opportunity for training to use modern technology is another reason for its non-adoption. Thus availability of adequate financial support and training to use modern tools play important role in the adoption of tools/technology

Kerala Bureau of Industrial Promotion (K-bip) is a body under the Ministry of Industries to promote industries in various sectors including the traditional sector. K-bip has entered into a Memorandum of Understanding (MOU) with Asia Pacific Centre for Transfer of Technology (APCTT), a UN body. The MOU has envisaged establishment of a small business centre and evolved demonstration programmes for the promotion of traditional/rural sectors in the state. APCTT would provide technologies available in the Asia Pacific region. Bamboo has been identified as one of the sectors for development and K.bip has started to develop clusters of traditional bamboo workers and impart training to them. The initiative taken up by UNDP to promote cane and bamboo in the country also deserves special mention. It has sponsored projects through Development Commissioner (Handicrafts), Ministry of Textiles, Government of India. Under one of its projects, a common facility centre was set up in Kerala also which helped to extend technological facilities to nearby bamboo clusters.

STRATEGIES AND ACTION PLAN

Major strategies and action plan for the development of bamboo sector are discussed under following heads: Sustainable development of resources, Industry development, Livelihood security of the Marginalised Bamboo Dependants (MBDs), Scientific support, Marketing of bamboo and bamboo products, Publicity, and extension, Human Resources Development, Bamboo Information System, and Institutional arrangements

I. SUSTAINABLE DEVELOPMENT OF RESOURCES

Strategies

1. Managing the existing resources scientifically
2. Establishing nurseries and plantations

Action Plans

Managing the existing resources scientifically

- Manage the clumps by removing side branches, unhealthy and deformed culms, harvesting over matured culms and introducing maturity marking and selective annual extraction.
- In addition to clump management, improve productivity by soil working, fertilizer application, irrigation and pest/disease control.
- Extract edible shoots selectively without compromising sustainability.
- Collect and process seeds for storage.
- Practice scientific harvesting (eg. Horse-shoe method of extraction).

Establishing nurseries and plantations

- Establish units for seed storage in bulk.
- Produce planting stock of selected species using macro- and micro-propagation techniques developed by research institutions.

- Establish decentralized nurseries for large-scale multiplication of planting stock.
- Conduct trials with selected species for plantation establishment in different agro-climatic regions.
- Identify suitable areas and establish large-scale plantations in forest and non-forest areas with peoples' participation.

II. INDUSTRY DEVELOPMENT

Strategies

1. Promoting bamboo industry
2. Identifying products
3. Ensuring raw material supply
4. Ensuring skilled manpower
5. Facilitating availability of tools/machinery/technology

Action Plans

Promoting bamboo industry

- Provide entrepreneurship development where required.
- Provide single window clearance for starting industrial units.
- Simplify procedures for securing loans.
- Categorize the industry into cottage, small, medium and large scale to ensure development at each level.

Identifying products

- Identify the products which are in demand (present and prospective) for local and export markets
- Match the products with the level of industry. A guideline is provided.

Cottage (traditional and semi-mechanised): handicrafts, woven products, curtains, bamboo shoot and other food products

Small (semi-mechanised): tooth picks, incense sticks, chopsticks, charcoal, curtains, bamboo shoot and other food products

Medium (mechanised): bamboo shoot, furniture, curtains, preservative-treated poles, charcoal

Large: ply board, corrugated sheet, floor board, paper pulp, activated carbon, building components

Joint Venture : floor board, specialty paper

Ensuring raw material supply

- Ensure assured supply of raw material both in raw and semi-processed forms.
- Streamline collection of reed and bamboo from forests.
- Set up distribution points for all the industries, especially to the cottage industry including MBDs.
- For optimal utilization of resources, species-product matching should be carried out. For example, reed bamboo with long internodes, should be used preferentially for woven products.

Ensuring skilled manpower

- Ensure availability of trained/skilled manpower.

Facilitating availability of tools/machinery/technology

- Facilitate availability of hand tools and semi-mechanised and mechanised machinery for cross-cutting, slivering, slat/stick making, etc.
- Set up Common Facility Centres (CFCs) for pre, primary and secondary processing.
- Facilitate transfer/procurement of technology.

III. LIVELIHOOD SECURITY OF THE MARGINALISED BAMBOO DEPENDANTS (MBDs)

Strategies

1. Increasing income security through bamboo based and other alternative employment opportunities
2. Improving social conditions
3. Promoting ITK (Indigenous Technology Knowledge)

Action Plans

Increasing income security through bamboo based and other alternative employment opportunities

Bamboo based

- Review, revive and restructure, if necessary, the existing Bamboo Cooperatives.
- Assure supply of raw materials (both in raw and semi-processed form) at subsidised rates.
- Promote bamboo cluster development.
- Provide market support.

Other alternatives

- Ensure employment opportunity for the MBDs in any public/private enterprises.
- Promote bamboo cultivation as a community activity.
- Promote production of organic manure.
- Promote gender-based activities like tailoring, food processing, handicrafts, etc.

Improving social conditions

- Improve community infrastructure (eg. roads, markets, etc.).

- Improve Human Development Index (eg. Literacy, health and nutrition, housing, potable water, women empowerment, etc.).

Promoting ITK (Indigenous Technology Knowledge)

- Document ITK and identify which can be financially exploited.

IV. SCIENTIFIC SUPPORT

1. Establishing germplasm, live collections and seed storage units
2. Enhancing resources
3. Providing input for technology/product development
4. Conducting market research

Action Plans

Establishing germplasm, live collections and seed storage units

- Record flowering details of different species and populations of bamboo within and outside the State.
- Identify different flowering cohorts of the same species based on flowering records.
- Identify elite clumps from each cohort.
- Establish germplasm to conserve intra-specific variability.
- Establish live collections of bamboo species.
- Develop and standardize protocols for long term seed storage.

Enhancing resources

- Estimate raw material demand of present and prospective industries for planning resource enhancement.
- Develop tissue culture protocols for commercially important species.

Providing input for technology/product development

- Develop appropriate tools and technologies.
- Upgrade tools and technologies.
- Innovate products and add value to products.

- Product design diversification
- Efficiency improvement

Conducting market research

- Evaluate the existing market mechanism.
- Carry out market surveys to understand the players, preferences and potentials.

V. MARKETING BAMBOO AND BAMBOO PRODUCTS

Strategies

1. Providing market information
2. Marketing quality bamboo and bamboo products at fair price

Action Plans

Providing market information

- Collect, analyse and disseminate market information periodically.

Marketing bamboo and bamboo products

Seeds and planting stock

- Market quality seeds through seed storage units.
- Market quality planting stock through decentralized nurseries.
- Organise and conduct bamboo fests periodically.

Food Products

- Marketing bamboo-based food products including shoots through local and super markets.

Bamboo culms

- Strengthen existing market mechanisms.
- Encourage setting up of new depots throughout the state.
- Market graded bamboo for different end uses.

Semi-processed products

- Market treated and dried slivers, slats and sticks.

- Market treated poles.

Bamboo products

- Market handicrafts through existing mechanisms.
- Promote marketing through tourism destinations.
- Market Woven products and industrial products.

Market and market information

- Establish appropriate institutional arrangement

VI. PUBLICITY AND EXTENSION

Strategy

1. Popularising cultivation and utilization of bamboo and bamboo products

Action Plans

Popularising cultivation and utilisation of bamboo and bamboo products

- Prepare materials (audio-video and print) to publicise the importance of bamboo and bamboo industry.
- Create awareness on the importance of bamboo, its environmental, ecological and industrial utility among all stakeholders including planners and policy makers.
- Create appreciation on bamboo and bamboo products by conducting exhibitions at different levels of Panchayathi Raj Institutions.
- Organise bamboo familiarisation meetings and establishment of bamboo clubs to network all stakeholders.
- Motivate stakeholders to cultivate bamboo and, use bamboo and bamboo products.
- Establish demonstration plots of nurseries and plantations.
- Support participation of stakeholders in local, national and international fairs/exhibitions.
- Organise and conduct bamboo fests periodically

VII. HUMAN RESOURCES DEVELOPMENT

Strategy

1. Creating necessary human resources in the bamboo sector

Action Plans

Creating necessary human resources in the bamboo sector

- Enhance local capability entrepreneurship through training in
    a. Confidence building
    b. Leadership
    c. Managerial skills
    d. Accounting, costing, pricing
    e. Market analysis development
    f. Business management
- Organise and conduct training programmes for farmers in
    a. Seed technology and planting stock production
    b. Establishment and management of plantations
    c. Harvesting techniques
- Organise and conduct training programmes for artisans in
    a. Product design
    b. Tools
    c. Manufacture of new and appropriate tools
    d. Post harvest management

VIII. BAMBOO INFORMATION SYSTEM

Strategy

1. Creating, updating and disseminating information on the bamboo sector

Action Plans

Creating, updating and disseminating information on the bamboo sector

- Develop databases on:
  a. Different bamboo species (Taxonomy, Flowering cycle, Ecology, Distribution, Silviculture, Properties, Uses etc…)
  b. Demand and supply
  c. Human resources (Experts, artisans, traders, etc…)
  d. MBDs
  e. Technologies
  f. Industries
  g. Products and markets
  h. Rules and regulations
  i. Policies and Institutions
  j. Bibliography
  k. Photo archive

- Develop an interactive Bamboo Information System by integrating data bases.
- Disseminate the information through electronic and print media periodically.

IX. INSTITUTIONAL ARRANGEMENT

Strategy

1. Putting in place an institutional arrangement which supports sustainable development and management of the bamboo sector and marketing..

Action Plans

Putting in place an institutional arrangement which supports sustainable development and management of the bamboo sector

- Prepare a Bamboo Policy catering to the sustainable management of resources, industry development, livelihood security of the Marginalised Bamboo Dependants, Human Resources Development and marketing.

- Strengthen or set up, where necessary, institutional arrangements for
    a. Bamboo research in centres like KFRI, TBGRI and Universities
    b. Technical input to prospective entrepreneurs
    c. Industry services
    d. Common Facility Centers
    e. Cluster development and management
    f. Financial support
    g. Bamboo Theme Park establishment

- Set up an institutional arrangement exclusively for MBDs aimed at
    a. Providing incentives to utilize improved technology.
    b. Encouraging private investments in the bamboo sector.
    c. Providing machines like cross cutting, slivering, etc. on a grant or loan basis.
    d. Providing timely adequate market information and access.

    e. Protecting the rights of the workers/weavers by substituting bamboo/reed products for plastics; making it mandatory for the

government owned units of agro processing, fishing, etc. to use these products.

f. Creating a general fund for the development of this sector by way of levying a tax (Green Tax) on environmentally hazardous products which can be substituted by bamboo products. (By using the fund, encourage the self-help groups to cultivate bamboo along riverbanks, government lands and other wastelands. A portion of the fund can be set aside exclusively for the MBD development.)

CONCLUSIONS

In the forgoing sections, the attempt was to present some basic data generated on resources, consumption pattern, and livelihood potentials of bamboo workers, marketing and value addition and production technology and highlight some of the problems in the bamboo sector. This section brings together major findings of the study.

1. Total standing crop of bamboo in homesteads in Kerala is estimated as 13.61 million culms and its green weight is 0.331 million tonnes. There are six species of bamboo available in homesteads including reed of which *Bambusa bambos* is the dominant species, accounting for 96 per cent. This is followed by *Bambusa vulgaris* and reed, constituting 2.23 per cent and 1.38 per cent respectively.
2. Due to massive harvesting of bamboos in recent past, 95 per cent of the bamboos found in homesteads are of very small, small, and medium categories. This is an indication that availability of matured clumps is not high in the state. An attempt was also made to compare growing stock of bamboo and area occupied in homesteads during 1987- 88 and 2004-05. This indicates that there has been a reduction in growing stock by about 0.077 million tonnes from 0.408 million tonnes during 1987-88 to 0.331 million tonnes during 2004-05.
3. 3. Based on 1997 satellite imagery, bamboo resource in forest areas was estimated as 2.63 million tonnes. Further, a comparison of the availability of bamboo and reed in central forest regions in Kerala during the period 1997 and 2005 project only 10 per cent variations in bamboo resources in the study area.
4. Major consuming sectors of bamboo in the state are pulp and paper industry, traditional sector, export and households of which the consumption of pulp and paper is the major one, constituting 0.085 million tonnes. The total consumption of bamboo and reed in the state is estimated as 0.256 million tonnes.
5. The socioeconomic attributes of bamboo homesteads are very similar to any area in the State with a heterogeneous community feature and a purely agrarian economy. Bamboo does not contribute much to the gross income of the farmers.

They are fairly well-off with tenurial security and developed agriculture. In comparison, the Marginalised Bamboo Dependents (MBDs) project a backward stagnant economy needing immediate government intervention. The per capita income of the artisans/MBDs is estimated as less than Rs.6,000 which is significantly lower than that of the state average (Rs.24,053) and thus they live below the poverty line. With no tenurial security and no skills other than this traditional activity, they are not left with much choice for a secure livelihood.

6. A comparison between the basic characteristics of two bamboo based production sectors involving the trained artisans and the MBDs highlights that labour intensive techniques of production and value added products ensure profitability and employment/ livelihood security. The economic potential highlights that the MBDs do not stand a chance in the face of stiff competition and the incidence of cheap substitutes. The market features of these products made by the MBDs are not so encouraging and this calls for strategic initiatives for their improvement. The lack of an organised institutional setup, market failures, high cost of raw material, competition with similar groups in the organised sector and cheap substitutes in the market leave much to be desired for their upliftment and betterment.
7. The Strengths Weaknesses, Opportunities and Threats (SWOT) analysis reveals that although the MBDs have innate traditional skills and indigenous knowledge they are caught in a diminishing circular flow of development. In spite of the immense opportunities and strengths, their inherent weaknesses and apparent threats do not permit adequate development of this sector. Product-education and market development are essential to enhance the image of bamboo products. The household based rural enterprise with almost no value addition, poor bargaining power, low product diversification, small scale production, catering only to the local markets calls for immediate governmental intervention to enhance and strengthen their livelihood security.
8. The livelihood security of the MBDs can be enhanced and improved through increased accessibility to raw material and market, employment opportunity, skill development and adequate sustainable institutional support. However, immediate

attention is called for governmental intervention to revitalize this sector focusing on value addition, enhancing income generation and alleviating poverty; by fixing a green tax on plastic products and promoting bamboo cluster development through an organized institutional setup and training. This organizational setup can ensure development that result in sustainable livelihood outcomes.

9. 9. Market study of bamboo from home gardens points out that bamboo is sold through primary and wholesale depots in Kerala. There are 95 primary depots which are located in most of the districts and cater the local requirements whereas the 35 wholesale depots located in Palakkad District fulfil the demand mostly from the neighbouring State of Tamil Nadu. The study maintained that quantity of bamboo exported to Tamil Nadu has been declining considerably mainly due to the shortage in supply. Profitability analysis of wholesale depots showed that bamboo trade is profitable to traders
10. The profitability worked out for selected handicraft products indicates that they give marginal products. The main problems in this sector are: lack of adequate raw materials, low level of adoption of technology, low investment, inadequate marketing facilities, etc. There is scope for using improved technology in handicraft sector with out affecting employment. It also helps to improve quality of the products which would ensure better marketing.

Solution to all these problems requires implementation of an action plan with active participation of the stakeholders. Based on the study, suitable strategies and action plan for the overall development of the bamboo sector in Kerala have been developed and presented in the next part of the study.

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Appendix 1.1

Method of estimation of growing stock

Here panchayats and wards within each panchayats were considered as 'first stage units' and 'second stage units'respectively. The estimates of the population total and its standard error were obtained using the formulae given by Sukhatme and Sukhatme (1970).

$$\hat{y} = \frac{N}{n\overline{M}} \sum_{i=1}^{n} \frac{M_i}{m_i} \sum_{j=1}^{m_i} y_{ij} \qquad (1)$$

where y_{ij} is the bamboo resource (total bamboo resource of all households) for the *j*th ward in the *i*th panchayat.

$\hat{y}$ is the estimate of population total

$\overline{M} = \frac{\sum_{i=1}^{N} M_i}{N}$ is the average number of wards per Panchayats

M_i is the number of wards in the *i*th panchayat

N is the number of panchayats in the population

n is the number of panchayats selected

m_i is the number of selected wards from the *i*th panchayat (*i.e.*, two)

The variance estimate of $\hat{y}$ is given by

$$\hat{V}(\hat{y}) = \left(\frac{N^2}{n} - N \right) s_b^2 + \frac{N}{n} \sum_{i=1}^{n} \left(\frac{M_i}{\overline{M}} \right)^2 \left(\frac{1}{m_i} - \frac{1}{M_i} \right) s_{w_i}^2 \qquad (2)$$

where $s_b^2 = \frac{1}{(n-1)} \sum_{i=1}^{n} \left(\frac{M_i}{\overline{M}} \overline{y}_i - \overline{y} \right)^2$ is the variation between the panchayats.

$s_{w_i}^2 = \frac{1}{(m_i - 1)} \sum_{j=1}^{m_i} \left(y_{ij} - \overline{y}_i \right)^2$ is the variation within the panchayats.

The estimate of standard error of $\hat{y}$ is given by

$$S\hat{E}(V(\hat{y})) = \sqrt{\hat{V}(\hat{y})} \qquad (3)$$

The estimates were computed using one of the three modules *viz.,* SAMPLE, a user friendly software package developed by Jayaraman (1996).

Appendix 1.2 (A) List of selected panchayats in stratum I

District	**Panchayath**
Thrissur	Varvoor
	Mundathikkodu
	Panjal
	Mulamkunnathukavu
	Vallachira
Palakkad	Parli
	Thenkurissi
	Mundur
	Sholayur
	Ananganadi
	Trikkaderi
	Cherpulassey
Malappuram	Mankada
	Thenjippalam

Appendix 1.2 (B) List of selected panchayats in stratum II

District	Panchayath
Thiruvananthapuram	Anduekonam Pulimath Vilappil Perumkadavila Vamanapuram Uzhamalakkal Ottasekharamangal am
Kollam	Thevalakkara Alayamon Arienkavu
Pathanamthitta	Nedumpuram Omallur Anikkadu Kalanjoor Aruvappulam
Alappuzha	Nedumudi Vayalar
Idukki	Kanthallur Vathikudi
Kottayam	Kallara Kooroppada Chirakkakadavu Erumeli
Eranakulam	Karumallur Elamkunnappuzha Manjapra
Thrissur	Parappukkara Avinissery
Palakkad	Karimba
Malappuram	Anakkayam Elamkulam Peruvalloor Parappur Wandoor
Kozhikkode	Kunnummal Azhiyur Elathur Thiruvambadi Kodiyathur Thikkodi Valayam
Kannur	Mattoor Munderi Keezhallur Panniyannur Malur Chengalai
Wayanad	Mananthwadi
Kasaragod	Cheruvathur Kayyur-cheemeni Peelikkode

Appendix 1.3 Details of survey – Stratum I

Appendix 1.3 A: No. of households/ward (Mundathikkodu Panchayat)		
Sl. No.	Wards	No. of house holds
1	I	498
2	II	530
3	**III**	**595***
4	IV	408
5	V	534
6	**VI**	**505***
7	VIII	431
8	IX	640
9	X	437
10	XI	541
11	XII	590

Appendix 1.3 B: Ward / Resource availability details (Mundathikkodu Panchayat)			
Wards	Name	Bamboo availability	No. of households
I	Puthiruthi	01	498
II	Puthiruthi	01	530
III	Thiruthipparambu	01	595
lV	Palakkad, Mundathikode	01	408
V	Pallikkad, Mundathikode	01	534
VI	Kuranchery	01	505
VII	Minaloor, Athani	02	*408*
VIII	Ambalapuram	01	431
IX	Ambalapuram	01	640
X	Aryampadam	01	437
XI	Aryampadam	01	541
XII	Aryampadam	01	590

Appendix 1.4 (A) Socioeconomic survey questionnaire

A. FORESTRY AND HUMAN DIMENSIONS PROGRAMME DIVISION
KERALA FOREST RESEARCH INSTITUTE
PEECHI , THRISSUR-680 653.

BAMBOO SECTOR IN KERALA: BASELINE DATA GENERATION FOR DEVELOPING AN ACTION PLAN

Socioeconomic Survey of Bamboo Households Questionnaire

A. IDENTIFICATION DETAILS

a. District : Taluk :

b. Village : Panchayat :

c. Ward : House No. :

d. Names of Investigators :

B. BASIC HOUSEHOLD DETAILS

1) Name and address of the Head of the family:

…….

……

…….

2) Religion of the respondent : ☐ Hindu(01), Christian(02), Muslim(03), Others(04)

3) Caste : ☐ General(01), OBC(02), SC(03), ST(04), Others(05)

4) History of land occupation :

5) Family details

Sl. No	Name	Sex	Age	Relationship with Head	Educat-ion	Employ-ment	Income (monthly / daily)

Education: LPS (01), UPS (02), HS (03), SSLC pass (04), HSC (05), Degree (06), Technical Education (07), Illiterate (08), Others (09) (specify) ,

Employment: Govt. employee (01), Cultivation (02), Agriculture labourer (03), Forest labourer (04), NTFP collection (05), others (06) (specify),

6) Consumption Expenditure (a month)

Item	Amount	Item	Amount	Item	Amount
Food		Consumables		Maintenance of vehicle	
Health (medicine)		Tobacco		Others	
Alcohol		Education			
Total		**Total**		**Total**	

7) Savings: ☐ Yes (01), No (02)

8) Indebtedness

Any loans: ☐ Yes (01), No (02) If yes, give details:

Sl. No	Sources	Amount	Interest	Purpose	Amount repaid	Loan outstanding

9) Livestock / Poultry

Livestock/Poultry	Number	Fodder source	Purpose
Cow			
Buffalo			
Goat			

10) Health care and Medicine

1) Most commonly occurring diseases: ……

2) Access to medicine system :

Medicine system	Distance	Rank
Allopathic		
Ayurveda		
Homeo		
Others		

11. Miscellaneous

1) House Type: Kacha ☐ Pucca ☐ Tiled ☐ Concrete ☐
(Plinth Area : …….Sq. Ft.)

2) Ration card : ☐ Yes (01), No (02)

3) Type of toilet : ☐ Nil (01), Cement (02), Septic tank (03),
Openpit (04) Others (05) (specify)

4) Energy for cooking : ☐ Firewood (01), Gas (02), Kerosene (03),
Bamboo residue (04), Others (05) (specify)

5. Quantity of Bamboo residue used as firewood ----------kg

6) Energy for lighting : ☐ Electricity (01), Kerosene (02), Gober gas (03)
Solar energy (04), Others (05) (specify)

7) Household assets Level : ☐
Nil (01), Radio and bicycle (02), tape recorder (03), TV (04),
Fridge (05), Telephone (06), Jeep / Car (07), Others (08) (specify).

C. LAND USE AND CROPPING PATTERN

1. Total area: ……. Wet land: ……... Dry land: ……

2. Extent of land owned (acre, cent): Home garden ----------Wetland----------

   Fallow land ----------Others----------

3. Land conversion during the past 25 years

   a. Extent of paddy lands converted :

   b. Reasons for converting lands :

   c. Present condition of converted lands :

   d. Impact on bamboo resources, if any :

4. Soil erosion : ☐ Nil (01), Low (02), Medium (03), High (04), Very high (05)

5. Soil conservation measures : ☐ Nil (01), Field bunds (02), Planting (03), Others (04)

6. Home stead Farming - Cropping Pattern

Sl.no	Name of crops.	Total Number/ area	Yield	Purpose**
1				
2				
3				
4				
5				
6				
7				
8				
	Total			

7. How do you meet the cost of cultivation: ☐ Self (1), Govt. aid (2), Loan (3)

8. If through loan, from which source : ☐ Bank(1), Private money lenders(2), Others(3) (specify)

9. Cultivation Details

1) Method of cultivation : ☐ Traditional(1), Scientific(2), Mixed(3).

2) Fertilizer application : ☐ Bio- fertilizer (manure) (1), Chemical fertilizer (2) , Mixed(3).

3) Pesticides application : ☐ Bio – Pesticides(1), Chemica(2), Mixed(3).

10. Tree species along the homegarden boundary

Sl.No	Common Name	Total No	Remarks
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

11. Availability of Water

1) Distance to the water source: ……. (Main water sources)

2) Sources of potable water : ☐ Own well (01), Pond (02), River (03), Public well (04), Neighbor (05), Pipe water (06) Canal (07), Others (08) (specify)

3) Sources of irrigation : ☐ Own well (01), Pond (02), River (03), Public well (04), Neighbor (05), Pipe water (06) Canal (07), Others (08) (specify)

4) Motive forces for lifting water : ☐ Electric pump (01) ,Solar pump (02), Diesel pump (03), Water wheel (04), Bullock power (05), Human labour (06), Others (07).

5) Period of water scarcity if any : ……..

12. Constraints for bamboo cultivation in HG:

13. Intensity of harvesting/ clearfelling

Year	No. of culms removed	No. of clumps Clearfelled	Revenue generated (Rs.)	Method of harvesting (horse shoe,any other)
2000				
2001				
2002				
2003				
2004				

14. Reasons for clearfelling of bamboos: ☐ Fragmentation of homegardens(01), Construction purpose(02), Competition with surrounding plants(03), Non-aesthetic problem (04), Marketing(05), Others(06) (specify)

15. Use of bamboos in the households:

D. **MARKETING**

1. Marketing of bamboo from Homegarden.

Parts marketed				Total
Thorns		Poles		
Qty.	Rate.	Qty.	Rate.	

2. Type of Market.

Type			Location of Market
Direct	Indirect	Export	

E. RESPONDENT'S OPINION

1.Whether interested to grow bamboo if it is profitable?

Yes	No	Indifferent

2.How much of bamboo clumps destroyed in his locality?

3.Is it necessary to protect bamboo resources in the households?

Yes	No	Indifferent

4.How rural bamboo resources in Kerala can be conserved?

5.Any other relevant information

Appendix 1.4 B Bamboo Resource Survey Questionnaire

B. FORESTRY AND HUMAN DIMENSIONS PROGRAMME DIVISION
KERALA FOREST RESEARCH INSTITUTE
PEECHI , THRISSUR-680 653.

BAMBOO SECTOR IN KERALA: BASELINE DATA GENERATION FOR DEVELOPING AN ACTION PLAN

Bamboo Resource Survey Questionnaire

I. Location

District : Taluk :

Village : Panchayat :

Ward : Household No. :

Names of Investigator :

II. Basic household details :

1. Name and address:

2. Extent of land owned (acre, cent): Homegarden ---------- Wetland----------

Fallow land---------- Others----------

3. Soil type: ☐ Alluvial(01), Laterite(02), Clayey(03), Sandy(04), Red loam(05)

4. Other than homegarden: ☐ Private Plantations (01), Fallow lands (02), Clayey (03), Sandy (04), Red loam (05)

Details:

5. Cultural operations: ☐ Soil working (01), Trenching (02), Manuring (03), Thorn removal (04), Others (specify) (05)

III. Details on Bamboo clumps in the home gardens and in other areas owned by the household

Species	Clump No.	Number of culms by diameter												Remarks (HG/others, Scattered, boundary, area occupied etc)
		Green						Dry						
		Very Small	Small	Medium	Big	Very Big	Total	Very Small	Small	Medium	Big	Very Big	Total	

Bambusa bamboos (Bb)(01), *Bambusa vulgaris* (Bv) (02), *Dendrocalamus strictus* (Ds) (03), Reed(04)

Very small (< 5 cm) (01), Small (5- 7.5) (02), Medium (7.5- 10) (03), Big (10- 12.5) (04), Very big (12.5<) (05)

Appendix 4.1

Socioeconomic profile of farmers

Indicators	Stratum I	Stratum II
Community feature	heterogeneous	
Average family size	4	4
Average land holding (acres)	0.54	0.74
Average annual income (in Rs.)	29801	48629
Literacy	90 %	95 %
Employment (Tertiary sector)	63.5 %	78 %
Work Participation Rate	42:16	39:18
Expenditure pattern (Food)	55 %	50 %

Appendix 4.2

Socioeconomic profile of the bamboo dependents

Indicators	Stratum I	Stratum II	KSBC
Population dynamics			
Total population	292	558	181
Sex ratio	1116	1022	989
Average family size	4	4	5
Community feature	Homogeneous	Homogeneous	Heterogeneous
Average annual income form different sources (in Rs.)	11795	10340	24160
Average income form bamboo based activities (in Rs.)	7665	9665	2628
Total (in Rs.)	19460	20005	26788
Literacy	63.7 %	71.3 %	84 %
Employment (Primary sector dominance)	99 %	98 %	97 %
Work Participation Rate	42:43	39:42	45:42
Work Participation Rate in bamboo based activities	32:68	44:56	16:84
Expenditure pattern (Food)	75.3 %	48 %	57.3 %
Primary data estimate * Kerala State Bamboo Corporation			

PLATES