

**BAMBOO PRODUCTION - TO - CONSUMPTION
SYSTEMS IN TANZANIA**

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INBARs Bamboo and Rattan Development Programmes.

The application of bamboo and rattan in enhancing the economic and ecological well being of resource-dependent communities in Asia has been extensive. Systematic studies of the potential of bamboo and rattan, previous and current uses, and the social, cultural and political perspectives of these resources have been invaluable in promoting development through innovative and sustainable use of bamboo and rattan. The International Network for Bamboo and Rattan (INBAR) has played a pivotal role in advancing the bamboo and rattan sector in this region. INBAR has facilitated and coordinated research (including action-research) on biodiversity and genetic conservation, production systems, processing and utilisation and socio-economics and policy, while promoting capacity building at the national level. A number of rural development programs are being implemented in the region. INBAR has also been instrumental in promoting technology transfer and information exchange between network partners.

The replicability in Latin America and Africa of the success stories from South and South-east Asia is yet to be assessed, despite the immense interest from the private sector, non-governmental organizations and government institutions in using bamboo and rattan to fuel rural development in the region. The dearth of information on the bamboo and rattan sector has been the main constraint to the development of systematic and sustainable development programs in this sector.

In order to do this INBAR has commissioned national studies from selected countries in, Africa and Central and South America. These national studies will provide a thorough review of the current state and future potential of the bamboo and rattan sectors in each country. Certain standard indicators will be documented in these studies to allow regional comparisons while other information will be country-specific. The national studies will help the experts decide the priority areas of study at the local, national and regional levels. This in turn will help INBAR clearly define its role within these countries as a facilitator and coordinator.

INBAR has developed an outline for these national studies. The outline serves two purposes. Firstly, it is meant to facilitate the data collection process and secondly, it should assist in the formulation of case study reports. The framework also guarantees that comparable information is provided in each national study. Information covered includes; general information on the country (geographical, topographical, climate, demography, political, environmental); the bamboo and rattan sector (biodiversity, production, utilisation, socio-economics, marketing, legislation); the institutional capacity at the national and local level; previous, ongoing and upcoming research and development interventions in the bamboo and rattan sector; and finally conclusions and recommendations.

After defining priority areas, case studies are undertaken in a number of carefully chosen, highly representative, locations within the country to collect raw data on all aspects of the present state of the bamboo and/or rattan sectors in those locations. The case studies investigate the Production-to-Consumption system of the resource. This involves the entire chain of activities to which the bamboo or rattan is subjected, from the production of raw materials (including the input market, where one exists) through the various stages of intermediate sales and processing, to the consumer of the final product. The system includes the technologies used to process the material as well as the social, political and economic environments in which these processes operate. These are all covered in the case study.

Once the raw data has been collected it can then be analysed. It is classified into two focus areas; constraints and opportunities. Possible options that could address the constraints or take advantage of the opportunities and thereby promote development are identified, and a plan for development formulated. This plan is then developed into an action-research project, which is actually a micro- or mini-level rural development project. It is effectively a trial project, and is intended both to test whether the interventions suggested by the study are appropriate and to obtain feedback from the local population on all aspects of the program. The methodology and development options (interventions) of these projects would be finalized at a stakeholders meeting in the country prior to the start of the project.

If an impact analysis study towards the end of the action research project indicates that the project is successful, and the community agrees, this would then form the basis for developing similar programs that could be multiplied in scope and applied in similar situations throughout the region or nation. In this way we go from fully tested small-scale trial project to multiple projects with large impact in a short time. At this national or regional level these programs would attract investment from donors interested in poverty alleviation and rural development.

TABLE OF CONTENTS

	<u>PAGE</u>
INBARs Bamboo and Rattan Development Programmes.....	i
Contents.....	iii
List of Acronyms.....	iv
List of Tables.....	v
Executive summary.....	vi
CHAPTER 1: CONTEXTS.....	1
1.1 Topography.....	1
1.2 Land use.....	1
1.3 Bamboo resources.....	3
1.4 People.....	5
1.5 Socio-economics.....	5
CHAPTER 2: ISSUES.....	6
2.1 Rationale for the study.....	6
2.2 The production-to-consumption system (PCS).....	6
2.3 Objectives of the study.....	7
2.4 Methodology.....	8
2.4.1 Study area.....	8
2.4.2 Questionnaires.....	9
2.4.3 Data collection.....	9
2.4.4 Limitations of the study.....	10
CHAPTER 3: MAJOR FINDINGS.....	12
3.1 Degree of use of different bamboo species.....	12
3.2 Socio-economic information on the villages surveyed.....	13
3.3 Land area systems.....	15
3.4 Labour cost/wage ratios.....	15
3.5 Bamboo handicrafts and price variation.....	16
3.5.1 Manufacturers.....	17
3.5.2 Retailers.....	17
3.5.3 Price variation of bamboo products.....	18
3.5.4 Profit margins.....	21
CHAPTER 4 POLICY AND INSTITUTIONAL ARRANGEMENTS.....	23
4.1 Land tenure systems.....	23
4.2 Privatization process.....	23
CHAPTER 5: ANALYSIS.....	24
5.1 Constraints in the bamboo PCS.....	24
5.1.1 Constraints in the bamboo raw poles PCS.....	24
5.1.2 Constraints in the handicraft PCS.....	25
5.2 Opportunities in the bamboo PCS.....	27
CHAPTER 6: RECOMMENDATIONS.....	29
CHAPTER 7 GENERAL CONCLUSIONS.....	31
References.....	33
Appendix 1 - Intervention matrix of the bamboo sector in Tanzania.....	34
Appendix 2 - Project 1: Establishment of a 100 ha bamboo plantation.....	36
Appendix 3 - Project 2: Furniture manufacturing model.....	38

List of acronyms

MNRT	-	Ministry of Natural Resources and Tourism (Tanzania)
FBD	-	Forest and Beekeeping Division
INBAR	-	International Network for Bamboo and Rattan
NGO	-	Non Governmental Organisations
NTFP	-	Non Timber Forest Products
SIDO	-	Small Industries Development Organization
DITF	-	Dar es Salaam International Trade Fair
PCS	-	Production - to - Consumption Systems
SUA	-	Sokoine University of Agriculture
TAFORI	-	Tanzania Forestry Research Institute
TSHS	-	Tanzanian Shilling (1, 000 TSHS = 1.2 US\$)

List of Tables:	Page
Table 1 Estimated bamboo resources distribution in Tanzania.	4
Table 2 Surveyed villages / areas in the PCS study	8
Table 3 Number of respondents in the PCS study zones	10
Table 4 Conceptual framework of the PCS	11
Table 5 Percentage of respondents reporting use of different bamboo species	12
Table 6 Baseline socio-economic information of villages surveyed in the PCS	14
Table 7 Distribution of respondents in the PCS study	14
Table 8 Estimated land area in PCS study villages.	16
Table 9 Variation in unit selling price (Tshs.) in the PCS	19
Table 10 Average prices of major bamboo products.	20
Table 11 Profit margins of different bamboo products in Dar es Salaam market	21

NOTE: This report has been edited by INBAR from the original form in which it was received.

EXECUTIVE SUMMARY

Bamboo has been increasing in importance as an NTFP in Tanzania over the last two decades. Locally, bamboo is sought for handicrafts, residential fencing, horticultural flower farming, farm props for banana plantations, furniture and other minor cottage industry products like basketry and toothpicks. Almost all of the bamboo products made in the country are used domestically. Bamboo raw materials are scarce due to over exploitation from public forestland. Therefore, there is a need to establish bamboo farms to ensure a sustainable supply for the handicraft, construction and horticultural industries amongst others.

However, this recently concluded study, commissioned by INBAR, has identified a number of constraints in the chain of production to consumption and marketing systems of bamboo in Tanzania. At the production level, the limited number of species and dwindling resources do not guarantee a sustainable supply of bamboo for the future. At the processing and utilization level, lack of production skills and limited markets hinder the generation of greater returns for the collectors, processors and retailers. However, with Government support, there are many opportunities for development with bamboo based subsistence and economic activities and these would also be highly beneficial to the environment.

The study of the PCS of bamboo has revealed the potential of this plant resource in improving the livelihood of the people, particularly those in rural areas and in the informal sector. Dependence comes through multiple use of bamboo in people's daily lives - culms are used for house construction and props, and for crafts to generate off-farm incomes. The bamboo can also be used to meet environmental goals. With improved production and marketing skills, the bamboo sector could attract many actors at subsistence and national levels.

It is necessary to develop strategies which will support the availability of raw materials in the bamboo sector and ones that will lead to the establishment of training programs to impart processing and marketing skills to various target groups involved in the sector. The study has also shown that market information does not flow from the traders to the processors or vice versa, and thus the processes seem not to be well coordinated. The bottom-up linkages between harvesters and formal institutions, or harvesters and craftmakers, also need to be improved.

From the study it is recommended that a framework be developed for the establishment of bamboo plantations in the country, either in the East Coast Zone or in the Western Zone. Bamboo is a natural material, with low capital requirements and can be managed with indigenous technologies, on short rotations, and can be used to target improving the welfare of poor rural communities. The role of the Government in instituting the smooth functioning of a PCS can not be overemphasized. Enforcement of policy legal framework and establishment of community based NGOs in the bamboo sector will step-up development in such rural areas. Local investments could be mobilized in the bamboo sector if suitable policy, legal and institutional incentives as suggested in the report are put in place.

CONTEXTS

Tanzania in East Africa is located between 2° and 12° South, and 29° and 41° East. It has 3,402 km of land boundaries and borders Kenya (769 km) in the northeast, Uganda (396 km) in the north, Burundi (451 km) and Rwanda (217 km) in the northwest, Zambia (338 km) in the southwest and Malawi (475 km) and Mozambique (756 km) in the south. It has 1,424 km of coastline on the Indian Ocean and a water border along Lake Tanganyika with the Democratic Republic of the Congo. There are also water borders with Kenya across Lake Victoria and with Malawi across Lake Nyasa. Tanzania covers 945,087 sq. km. of which 59,000 sq. km. is water.

1.1 Topography

Tanzania is divided by the Great Rift Valley which runs through the centre. The land rises from plains along the coast through the central plateau and up to the highlands in the north and south. The highest point is Mount Kilimanjaro (5,895) in the north and the lowest is sea level. Lake Tanganyika in the west and Lake Victoria in the north are the largest lakes. Rivers. Tanzania has natural resources of coal, diamonds, gemstones, gold, iron ore, nickel, phosphates and tin.

1.2 Land use

Three percent of the land is used for arable crops and one percent for permanent crops. Forty percent is pasture. Forests cover a total area of 33.5 million hectares representing about 40% of the total land area (Ministry of Natural Resources and Tourism, 1998). Over 96% of the forested land is classified as other wooded lands, 3.4% is closed forest and 0.3% mangroves. About 13 million hectares have been gazetted as forest reserves. An area of 80,000 ha of the gazetted area owned by the government is under plantation forestry and about 1.6 million hectares are under water catchment management. The main genera under plantations are *Pinus* and *Cupressus*. *Tectona* and *Eucalyptus* are planted on a smaller scale. Mangrove forest covers a modest area of 115,000 ha and is largely concentrated in the coastal zone. The productive area which accounts for 71% of the total land area, is fairly accessible while the remaining area is unproductive due to adverse physical reasons such as rugged terrain, and to legal reasons such as location within national parks or for catchment reasons (Ngaga *et. al.*, 1998). The average growing stock is estimated at 41m³/ha/year whereas the potential yield is 0.7m³/ha/year.

The major threat to the forest sector is accelerated deforestation estimated at 130,000 - 500,000 ha per year (MNRT 1998). Nevertheless, forests are important in Tanzania due to the myriad of goods and services they offer to the national economy and society to improve human welfare. Forests contribute to the basic needs for energy, building materials, communication and packaging. Some non-wood forest products,

though of high social value as they are used by rural and subsistence communities, do not enter into the main stream of national accounts. In fact, the statistics of the forest sector are lumped

together along with other agricultural products thereby depriving the sector its due priority. Wood-based energy consumption is estimated to account for more than 92% of total energy consumed in the country and per capita consumption is estimated at 1 m³ per year (Forest and Beekeeping Division, 1992; MNRT, 1998). Other non-wood benefits of forests include watershed functions, maintenance of soil fertility, conservation of biodiversity, sustaining cultural values, climate amelioration, creation of seasonal employment and ecotourism.



1.3 Bamboo resources

There have been a few studies that have documented the occurrence of bamboo forests in Tanzania. Bamboo forest covers an estimated 127,000 hectares in the high rainfall forests and in lowland areas receiving good rainfall. However, the bamboos *Arundinaria alpina* (African green mountainous bamboo), *Oreobambos buchwaldii* and *Oxytenanthera braunii* occupy the vast majority of the 127,000 hectares, with standing stock of about 1, 200 million linear metres (Lipangile, 1990). These are harvested from the wild and no cultivation of the former two species occurs. Most farmers are keen to undertake planting and cultivation, but they face problems with establishment and lack of effective management interventions.

A. alpina has hollow culms and is found at altitudes between 2290 and 3360 m.a.s.l. in the mountain forests of tropical Africa. It is a monopodial bamboo with solitary culms arising from running rhizomes and an average density of 5000 culms per hectare: The culms grow to 18 meters with an internal diameter of 5 - 8.5 cm in the green variety. The yellow bamboo has a larger internal diameter of up to 12.5cm and is much stronger than the green genus. The green species is preferred due to its abundance. New culms emerge in the rainy season and grow continuously for one or two months attaining full height and thickness. In the following season, the culm grows branches and matures. The life of a bamboo culm of *A. alpina* is about 15 years. In Tanzania it is found in the highlands of Mbulu in Arusha and Mbeya districts. It is also found in the highlands of Iringa, Lukwangule in Makete district and Ulugurus (Figure1).

Oreobambos buchwaldii is found between 300 - 1930 m.a.s.l. The medium-sized green hollow culms may reach 18 metres in height, though the culms are weak and poorly erect. In Tanzania it is commonly found at 450 - 1000 m.a.s.l. (Kigomo, 1988) in solitary clumps in more open parts of evergreen forests of the East Usambaras and Tukuyu (Poroto) highlands in Mbeya region. Other clumps occur scattered in Ifakara vegetation at 300 m.a.s.l. (Figure. 1).

Culms of *Oxytenanthera braunii* are semi-solid in young culms and become solid in older culms. It is commonly found in open patches in forests and often by rivers at altitudes between 1100 - 2100 m.a.s.l. *O. braunii* is a medium sized bamboo reaching 8 - 16 m in height, and is widely distributed in the country, mainly in Lindi, Kigoma (Kasulu, Kibondo), Biharamulo (Kagera region), Kisarawe (Coast Region) and Iringa. It is also found in Ruvuma region in the south. *O. braunii* has been planted in Iringa and Ruvuma regions for bamboo wine production. It is the hardiest of the three naturally occurring East African bamboo species

Other lesser known and localized indigenous bamboos include the locally known “misuni” which has hardy, hollow-centered green culms of small diameter (2.54 cm) and is found at altitudes of 500 - 800 m.a.s.l. It is common in Kemondebay in Kagera region, Kilosa district in Morogoro region, and Kisarawe district in Coast region. This species prevents soil erosion because it forms very dense stands. Another hardy, small diametered (2.54 cm) species with green culms is known locally as “nondo” has solid culms. It is found on poor sandy soils at 500 m.a.s.l.

Among the introduced species, *Bambusa vulgaris* var. *striata* (the golden yellow green and stripped, low altitude bamboo) is sparsely planted in the country. This ornamental bamboo was first introduced at Amani, Muheza district in Tanga region. *B. vulgaris* has a shorter distance between nodes of 25 - 30cm with a larger diameter than *A. alpina* of up to

15cm. *B. vulgaris* and other introduced species are more versatile in their uses than the local bamboo species and farmers have expressed interest in bamboo farming of these species on their land. Other bamboos of Asian origin tried at Amani arboretum that have shown adaptability to Tanzanian conditions include the small culm-diameter *Bambusa multiplex*, *B. nutans* and *Chimonobambusa hookeriana*. *B. multiplex* originates from India and China whereas the latter two species are of Indian origin. The only large-culmed bamboo that has shown good growth at Amani arboretum is *Bambusa bambos* from Thailand. This species, has also been planted on a smaller scale at Mzinga in Morogoro region. The large-culmed *Dendrocalamus giganteus* from Myanmar died after flowering.

In certain areas pure bamboo forests can be seen to the exclusion of other timber species. Usually bamboo grows as an understorey plant under other timber species in a natural forest. Normally one species of bamboo is found grows in pure stands and a mixture of two species or more is rare.

3.1 Estimated distribution of bamboo resources in Tanzania

Table 1 shows an attempt to estimate the bamboo resources in Tanzania.

Table 1: Estimated area of bamboo resources in Tanzania

Species	Northern zone (ha)	East Coast zone (ha)	Southern Highlands zone (ha)	Western zone (ha)	Total (ha.)
<i>Arundinaria alpina</i>	31,750	3,175	28,575	ns*	63,500
<i>Oreobambos buchwaldii</i>	8572.5	2857.5	2857.5	1,191.0	19,050
<i>Oxytenanthera braunii</i>	5334	4445	17,780	1,689	44,450
<i>Bambusa vulgaris</i>	40	480	ns*	280	800
Others	ns*	20 (Nondo)	ns*	4 (Misuni)	24
Total	45,696.5	10977.5	49,212.5	3,164	127,824

ns*: not significant

Source: Kigomo 1988; Lipangile, 1990 and field data.

It can be seen that the most widely distributed bamboo species are *Arundinaria alpina*, *Oxytenanthera braunii* and *Oreobambos buchwaldii*. *A. alpina* is mostly found in the Northern and Southern highlands zones. The species is also found in the Mahenge escarpment and on mount Uluguru and Ifakara formations of Morogoro region. *O. braunii* is common in the Southern highlands and the Northern and East coast zones southwards to Lindi region. *O. buchwaldii* is found in the Northern and Southern highlands as well as East coast zones. The ornamental bamboo *B. vulgaris* is sparsely cultivated in the East coast and Western zones. The East coast zone is also a habitat for the small diameter wild “Nondo” bamboos.

1.4 People

The population of Tanzania is 35, 306, 000 and is estimated to be growing at 2.57% per annum. Fifty-two percent of the population is between 15 and 64 years of age and 45% is under 15. The male/female ration of the 15-64 age group is 0.98. Ninety five percent of the population are Bantu, consisting of over 130 different tribes. A small proportion of other African

ethnic groups and those of foreign origin account for the rest of the people. Forty-five percent of the population is Christian, 35% is Muslim and 20% adhere to indigenous beliefs. The official languages are English and Kiswahili, but there are many other local languages in use. Eighty percent of men and 57% of women are literate.

1.5 Socio-economics

The GDP per capita in Tanzania is \$550 and the real growth rate is 4%, however just over a half of the population lives under the poverty line. Agriculture accounts for half the GDP. Many of the forest products that have recognized market value are traded. Their estimated contribution to the Gross Domestic Product (GDP) is in the range of 2 - 3% (including hunting) and accounts for about 10% of the country's registered exports. Such a contribution is meagre relative to the land area under forests. This underestimation is a reflection of both policy and market failure.

Potentially Tanzania could export a considerable amount of non-wood forest products such as honey, beeswax, herbal medicines, game meat, gums, tannins and resins. The non-wood forest products have high social and economic values and they also provide environmental services. Most non-wood forest products including bamboo are harvested for subsistence consumption and form a significant part of household economies and play a vital part in food security. Bamboo and rattan with their wood-like properties provide good substitutes for some wood products, eventually helping reduce demand on the dwindling forest resources.

ISSUES

2.1 Rationale for the study

Bamboo is a fast growing woody grass. It grows naturally on the major mountains and highland ranges of Tanzania and other East African countries. Bamboo forests play a vital role in soil protection and protection of water resources in afforested catchment areas. It is also important for construction, fencing, basketry, horticultural flower farming and many other uses. Bamboo as a non-wood forest product, is increasing in its importance though it is becoming scarce due to overexploitation from public forestland. This scenario requires the establishment of bamboo farms to ensure a sustainable supply for various cottage industries. However, though a wide variety of basic bamboo products such as baskets, trays, lampshades, chairs, tables etc. are crafted in the country to meet domestic demand, their socio-economic contribution remains unaccounted because no detailed study has been carried out. In many cases bamboo has been treated as poor-mans timber that continues to be an underutilized resource.

Though a number of variety of basic bamboo products are manufactured in the country, and sold wholly in the domestic markets, the contribution of the bamboo sector at household as well as national level remains unstudied. The skills that exist at community level and with a few craft makers in urban centers in Tanzania have not been exploited to the benefit of such communities. The land tenure arrangements existing in certain parts of the country do not give free access to bamboo raw material planting among women since the customary land laws favour males to own land. In order to understand the socio-economic contribution of bamboo sector in the livelihood of communities involved in this sector in Tanzania, INBAR supported this PCS study. The study was conducted between September and November 1999 and covered the four zones nationwide.

2.2 The production to consumption system (PCS)

Bamboos are one of the most important Non-Timber Forest Products (NTFPs). They are renewable, yield annually and are readily accessible to rural peoples. As a resource they have enormous potential to fuel rural development and this has long been recognized in many parts of the world. However any bamboo development program exists within the context of the society in which it is implemented and is subject to pressures and limitations (constraints) from many factors within that society not apparently directly related to growing, processing and selling bamboo. In order to develop a successful development program an understanding of all these factors (their effects, their magnitude and their potential (beneficial or detrimental)) is required. This necessitates investigations far more detailed than can be conducted at country or regional level.

Carefully focussed case studies do allow such detailed analyses to be made and can be very useful if they are chosen to be truly representative. Such case studies are often based in specific geographical locations, primarily due to the nature of the bamboo

resource. However because of the huge variety of raw material-management systems and processing techniques to which bamboos are subjected, and end products into which they are

made, it is necessary to use a reliable and standardized tool for analyzing all the processes involved, and all the factors impacting upon them. Thus the International Network for Bamboo and Rattan adopted the concept of the Production-to-Consumption System (PCS) (Belcher, 1995). This involves the entire chain of activities to which the bamboo is subjected, from the production of raw material (including the input market, where one exists) through the various stages of intermediate sales and processing, to the consumer of the final product. The system includes the technologies used to process the material as well as the social, political and economic environments in which these processes operate. These are all covered in the case study.

Subsequently analysis of the PCS enables identification of all the constraints limiting bamboo management and use, and highlights opportunities that, if taken, would promote bamboo-based development. Development programs can then be planned which utilize and develop the opportunities whilst circumventing, or even eliminating, the constraints. In ideal environments these programs may be limited to the bamboo PCS itself. In less favorable environments they may include policy shifts, infrastructural changes and even legal changes (for example relating to land tenure). In all cases the emphasis is on community-led development (by the community, for the community) with the maximum possible benefit remaining within the community. The Production to Consumption System analytical framework utilized for this study is based on that explained in INBAR working paper Number 4.

2.3 OBJECTIVES OF STUDY

The overall development objective was to study the production to consumption system of the bamboo sector in Tanzania in order to identify development interventions for increasing employment opportunities, income generation, and for developing a sustainable bamboo industry in Tanzania.

Specific objectives included the following:

- To provide detailed background information on the bamboo sector, and in particular, the socio-demographic profile of the host communities in Tanzania;
- To develop a comprehensive understanding of the production - to - consumption system of bamboo in Tanzania;
- To identify potential development interventions that will serve to transcend bottlenecks, problems, and inefficiencies in the bamboo system and improve the livelihood of the rural stakeholders in Tanzania; and
- To produce fully - costed activity models for several selected potential interventions.

2.4 METHODOLOGY

2.4.1 Study area

The study was carried out in three of the four zones: Eastern Coast zone covering Dar

es Salaam, Coast and Zanzibar regions; Southern Highlands zone consisting of Iringa, Mbeya, Ruvuma and Rukwa regions and Western zone comprising of Kigoma and Kagera regions. However, it is worthwhile mentioning here that rattan, *Calamus spp.*, is found growing naturally in Kigoma region of the Western zone. The Northeastern zone consisting of Tanga, Kilimanjaro and Arusha regions though selected, was not covered in the study due to limitations of funds and time.

Despite each zone specializing in different activities of the Bamboo production -to consumption system, these activities contribute only secondary sources of household incomes. These are all agriculturally rich zones in the country; for instance in the Western zone coffee, beans, maize and bananas are cultivated as the main cash crops in both Kagera and Kigoma regions. Farmers in the Southern highland regions are the main grain producers in Tanzania. They cultivate maize, wheat, coffee, tobacco, pyrethrum, and tea as cash crops and bananas to supplement food requirements. In the East Coast Zone cashewnut and coconut are grown as cash crops and sweet potatoes, rice, bananas and maize are cultivated for food at the household level. The northern zone, besides being

Table 2: Surveyed villages / areas in the PCS study

Zones	Districts	Villages/areas surveyed
East Coast	Kisarawe , Mkuranga, Kinondoni, Ilala, and Temeke	Maneromango, Boga and Mango Kaskazini Mitaranda, Mkuranga and Mwalusembe, Namanga, Mbweni JKT - Bunju, Oysterbay, Mwenge, Mlalakua JKT, and Kaunda Drive, Ilala market, Kariakoo Market, Samora Avenue - City Centre and Nyumba ya Sanaa - Upanga , Keko and Ukonga Prison Dar es Salaam.
Southern Highlands	Rungwe, Kyela, Mbeya urban, Iringa rural, Mufindi	Kimondo, Kikondo, Bujingila, Bumbilu, Igoma, Kyela township, Ipinda and Kingila, Ruanda Prison Soap Industry and Mwanjelwa, Mgama, Kibena, Lufuna, Kasanga, Nyangugulu, Itona, Matanana, Mtwango, Mafinga, Kibaoni and Mkinge.
Western	Bukoba urban, Bukoba rural, Muleba, Karagwe and Ngara.	Mishenye, Bukoba market and ELCT Church Bookshop Rwamishenye, Kyaka irabwa, Katoma, Omukashenye, Rugazi, Msitu mnene, Bugorola, Kajunguti, Kyaka, Kasisambya, Kakindo, Kikong'olo, Kikukwe, Bugombe, Nshumba, Kigarama, Kashenye/Bukwali, Luoko, Nyakibimbiri, Kaibanja, Kijongo, Ibwera, Kanazi, Kemondo bay, Kyetema, Kizi, Nkindo, Kagondo, Muhutwe, Kaboya, Kagoma, Kikuku, Muleba township, Izigo, Kamishango, Birabo, Magugu, Kihumulo, Kabale, Bugarawa, Nishanda, Kishanda, Rusama, Buganguzi, Butenge, Kitengule Prison, Kayanga township, Bisheshe, Nyaihozi, Ihembe, Nyakasimbi, Kiruruma, Rwabwere, Kyerwa, Nyakatuntu, Nyakahanga, Benaco, Ngara township and Kabanga.

agriculturally rich in coffee, wheat, vegetables, horticultural flower and fruit farming, is also rich in tourism. Specially designed bamboo handicrafts find a ready market as tourist curios. In each of the three zones studied a number of villages were covered, most particularly those whose communities are known to be engaged in the bamboo production - to - consumption system activities (Table 2):

In total 18, 22 and 63 villages that were engaged in bamboo activities were surveyed in the Southern Highlands, East Coast and Western zones respectively.

2.4.2. Questionnaires:

The questionnaires used in this study were modified from the production to consumption system (PCS) models as structured by INBAR (appendix 1). Some questions were added to address the local conditions in Tanzania. The interviews were addressed to specific stakeholders and therefore different questionnaires were administered by a team of researchers and assistants, aided by a social scientist. Village elders and guides also assisted in gathering data.

2.4.3 Data Collection:

Primary data was collected through questionnaires administered to different stakeholders mentioned in section 2.4.2. Formal interviews with selected samples of each of the above groups together with policy decision makers and forest managers provided data for the study. The interviews involved visits to villages, collection centres and manufacturing and market centres. All sampling of these interviews was random. In-depth studies, such as an inventory of raw materials or time taken to make various crafts, were not conducted during the data gathering process. Only village demography at household level and enterprises involved in bamboo activities were covered. No detailed demography was covered for those villages visited. For bamboo collectors, data on area of household land, land tenure, area of bamboo-land, incomes from bamboo and other activities, demography and number of persons engaged in bamboo activities were among the information collected. For bamboo planters the following household data were collected: Demography and number of persons engaged in bamboo activities, annual incomes from bamboo activities, percentage of land covered by bamboo plantations, land tenure, area of land planted to bamboo each year, time required for bamboo to reach harvestable maturity, bamboo cultivation or management and plantation establishment costs amongst others.

For bamboo processors, most of all the questions were covered, since most bamboo crafts makers are cottage industries. In the case of retailers, a wide range of questions were asked, particularly regarding the annual income from bamboo products sales, products sold, their purchase and sales prices and revenue from these products; demand for bamboo products etc. All questions were asked of a random sample of final consumers at the household level. Special emphasis was placed on discovering how bamboo products compare to similar products not made from bamboo in terms of quality,

price, lifespan and appearance. A summary of the number respondents interviewed in each zone is presented in table 3 below:

Table 3: Number of respondents in the PCS study zones

Group activity	East Coast zone	Southern Highlands zone	Western zone	Total
Planters	9	7	37	53
Collectors	34	44	9	87
Processors	14	41	3	58
Retailers	22	10	4	36
Consumers	11	1	11	23

Total	90	103	64	257
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2.4.4 Limitations of the study

The production to consumption system analytical frame work used in the villages surveyed in the study is similar to the one presented in INBAR Working Paper No. 4 (Belcher, 1995): and outlined by Carmelita *et al.* (2000). The framework discusses the flow of raw materials through various stages of development. To distinguish the system flow in terms of inputs it is necessary to identifying the major constraints that may hinder a particular aspect of the system from optimal economic performance. Certain PCSs may be labour intensive, others may be capital intensive. Some systems may be actively managed at various stages of raw material flow to enable efficient flow and maximum output, whereas others are haphazardly operated, resulting in minimal production outputs in relation to investment in time and labour inputs.

Table 4 shows a list of the key operating and contextual factors to identify within a PCS that formed the basis for studying the PCS in the three zones of Tanzania.

Table 4. INBAR Conceptual Framework of the Production to Consumption System

Raw Material sourcing:
- Collection from forest or natural stands with little management
- Selective cutting to encourage regrowth or enrichment planting
- Low intensity cultivation
- High intensity cultivation (plantation)
Transformation:
Low tech transformation vs. High tech transformation;
Capital intensive or Labour intensive
- Labour
- Capital (mechanization)
- Land (factory area)
- More specialized operations
- More transactions as material changes hands
- Transportation over greater distances
Main Constraints Faced by Target Groups
- Market
-Technology
- Government Policy
- Input Supply
- Institution
- Income Distribution
- Infrastructure
- Consumption - Quality, Price, Market access, Wide variety of final products
Proposed Interventions and Course of Action
- Technical
- Economic
- Social
- Institution
- Policy
- Other

CHAPTER 3. MAJOR FINDINGS

The PCS of the bamboo sector in Tanzania is generally simple in nature and not properly coordinated. There are basically two systems in operation - bamboo round poles and bamboo handicrafts. Additionally, split bamboo produced at Itende JKT Mbeya is supplied to Mlalakuwa JKT bamboo works in Dar es Salaam about 1100 km away. JKT Itende are collectors and semi processors of the bamboo. Though nationally the demand for bamboo comes in the form of handicrafts and furniture, these products are traded locally and hence their statistics do not enter the national accounting system. Bamboo round poles are harvested for local house construction as well as plant props, especially in the banana farms of the Kagera region. The most commonly used species are *Arundinaria alpina*, *Oxytenanthera braunii*, *Oreobambos buchwaldii* and *Bambusa vulgaris*. Others include the cultivated and locally called “Misuni” and “Nondo” species from the public land. A biological baseline study on availability of bamboo species shows that the three species- *Bambusa multiplex*, *B. nutans* and *Chimonobambusa hookeriana* are confined to the arboretum in the highlands of East Usambaras at Amani.

3.1 Degree of use of different bamboo species

Table 5: Percentage of respondents reporting uses of different bamboo species

Bamboo Species	Major Uses							Total
	Construction including scaffolds, fencing,	Weaving- Trays, mats, basketry etc.	Furniture	Household items, trays, lampshades etc.	Props	Wine	Others specify	
<i>A. alpina</i>	20	70	5	5				100
<i>O. buchwaldii</i>	80	20	-	-				100
<i>O. braunii</i>	15	-	-	-		85		100
<i>B. vulgaris</i>	33	10	2	-	50		5 ornamental use	100
Other species:								
Nondo	-	100	-	-	-	-	-	100
Misuni	95	-	-	-	-	-	5 Fishing rods	100

Table 5 shows the preferences for bamboo uses based on 268 respondents interviewed. *A. alpina* is mainly used for handicrafts (70%) and construction (20%) owing to its versatility, abundance, stiffness and its morphological attributes in which the culms reach 10 m in length with an internal diameter of up to 8cm and a wall thickness of about 1cm. This species has been used with success in the construction of water pipes in the Southern highland zone. *O. buchwaldii* has less straight and weaker culms than *A. alpina*. It occupies an area about one-third that of *A. alpina*. It is mainly used in construction (80%) and weaving (20%). However, in areas where there is shortage of *A. alpina* resources, *O. buchwaldii* is used in house construction as well. *O. braunii*, although a hardy species, is wholly used in the production of bamboo wine. It is only used in local buildings where there is shortage of other species of bamboo. This species is also good for soil protection measures. The Asian ornamental yellow bamboo *B. vulgaris* var. *striata* is mainly utilized for poles as unprocessed props for banana plants or split for local house

constructions and shade-roofs for passion fruit farming. Very few poles are used in the furniture

sector. About five percent of *B. vulgaris* clumps are grown for ornamental purposes, especially in urban areas. Of the lesser known bamboo species, Nondo is wholly utilized for weaving as the culms are weak and flexible, while culms of the hardy and elastic Misuni finds use in construction, particularly ceilings, fencing, shade-roofs for clone coffee nurseries and fishing rods.

3.2 Socio-economic information on the villages surveyed

In this study, a total of 102 villages were visited as shown in Table 2 above. The total number of respondents was 257 categorized by the five activity groups: Planters, collectors, processors, retailers and end-users. These respondents engaged in the bamboo PCS are distributed as follows: 32% in Eastern Coast zone, 42% in Southern Highlands zone and 26% in Western zone.

The 246 households interviewed have a total of 948 members, of which 387 (39.2%) are adult males, 196 (19.8%) are adult females, 151 (15.3%) are boys aged 0 - 17 years and 254 (25.7%) are girls aged 0- 17 years (Table 6). Adult males are the principal bamboo planters in all the zones surveyed, though in the Southern Highlands zone women also tend the clumps of *O. braunii* (Table 7). Adult males are also the main collectors of bamboo from wild sources, though in Iringa region female adults are also collectors of bamboo wine. In the processing stage both sexes are engaged, particularly in the Southern Highlands zone where adult males specialize in furniture making, basketry, grain storage huts and house constructions and adult females are engaged in tray making and bowl weaving. A few skilled adult females in Mbeya and Dar es Salaam regions manufacture high quality bamboo furniture. In Kagera region, all handicrafts made of bamboo are manufactured by adult males in Minziro ward and a limited number of Non Governmental Organizations (NGOs). Retailing of bamboo products is performed equally by both sexes. In Dar es Salaam where the market is relatively large, more adult males than females sell and resell bamboo products.

Boys and girls were not found to be engaged in any of the activities of the bamboo PCS.

The basic harvest / collection process is as follows: a large machete - like knife or “panga” is used to cut bamboo poles from clumps. The poles are cut at a point about 0.6 meters above ground on average. Straight, well formed poles are preferred, with an average age of 3 years. The number of poles harvested per person depends upon the distance from the assembly point, the size of bamboo poles cut and the means of transport available to the collection team, among other factors. In general, bamboo is transported from the forest to collection sites on foot by collection teams usually comprising 3 to 5 members. For the Governmental institutions such as: Ruanda Prison Soap factory, JKT bamboo works trucks are used for the collection of bamboo raw materials.

Table 6: Baseline socio-economic information of villages surveyed for the PCS study

Zones:	No. of	Estimated Adults:	Estimated
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	households	Sept. 1999		Children Sept. 1999	
		M	F	Boys	Girls
East Coast Zone:					
<u>Dar es Salaam region</u>					
. Kinondoni District (6 villages)	17	40	3	0	0
. Ilala district (4 villages)	17	22	14	0	0
. Temeke district (2 villages)	2	2	1	0	0
<u>Coast Region:</u>					
. Kisarawe (3 villages)	34	35	28	35	62
. Mkuranga (3 villages)	9	8	8	13	21
. Southern Highlands Zone:					
<u>Iringa region</u>					
. Iringa rural district (2 villages)	13	13	13	10	21
. Iringa urban district (1 villages)	3	2	1	-	-
. Mufindi district (9 villages)	29	26	23	20	38
<u>Mbeya region</u>					
. Rungwe district (5 villages)	47	49	41	29	46
. Kyela district (3 villages)	8	12	9	6	10
. Mbeya urban (2 villages)	3	82	5	-	-
. Western Zone:					
<u>Kagera Region:</u>					
. Bukoba urban (3 villages)	4	2	3	1	3
. Bukoba rural (27 villages)	31	29	25	19	20
. Karagwe district (11 villages)	9	9	9	5	9
. Ngara district (3 villages)	3	-	-	-	-
. Muleba district (18 villages)	17	16	13	13	24
Total	246	347	196	151	254

Table 7: Distribution of respondents in the PCS study

Zones	Planters		Collectors		Processors		Retailers		Users
	Adult Male	Adult Female	M	F	M	F	M	F	
East Coast	9	0	34	0	8	6	18	4	Both sexes
Southern Highlands	7	0	40	4	30	11	5	5	Both sexes
Western	35	2	9	0	3	0	2	2	Both sexes
Total	50	2	83	4	41	17	25	11	

There is no management of the natural stands of bamboos from forest reserves countrywide. For the planted *B. vulgaris*, *O. braunii* and Misuni, the extent of management has primarily been in the form of clearing the ground around the poles or clumps to maintain fire safety, especially during the dry season. The respondents noted the supply of bamboo from natural stands is decreasing overall due to over exploitation of resources and a shift in customer preference for plastic and wooden furniture over bamboo products.

3.3 Land area systems

Generally, only about 5% of the estimated total household land under cultivation is under bamboo, which indicates that most of the bamboo resources come from the wild. In the villages visited in Kagera region there are more planters than other groups. The major species planted is *B. vulgaris*, on approximately 10ha., and Misuni is planted on about 4 ha. The household land under bamboo represents only 8% of the estimated total land under cultivation

(Table 8). There are no bamboo plantations in the region except for the sympodial bamboo *B. vulgaris* that is found planted on small plots of less than 0.05 ha in rural Bukoba and Muleba districts. Karagwe district has a number of wetlands and has little or no bamboo area compared to the other two districts mentioned above. There is more *B. vulgaris* planted in Kabale village, Muleba district, about 83 km from Bukoba town, than elsewhere in the district. Collectively these small plots supply raw material to collectors and retailers of props for the banana farms in nearby villages. More than 75% of all poles harvested in Kagera region are for props. In the Southern Highlands zone, the estimated household land under bamboo is about 4%.

The major species planted in the surveyed villages include *O. braunii* which is found in Iringa rural and Mufindi districts for bamboo wine production. *B. vulgaris* is planted to a lesser extent in Kyela district for bamboo house construction. In this zone, there are equal numbers of collectors as well as processors (41 - 44 respondents). These depend mainly upon collection of *A. alpina* from the Government owned Kiwira Forest reserve in Rungwe district, Mbeya region. The main uses of *A. alpina* is in handicrafts production, baskets, trays and furniture. It is also used for mud-plastered house construction.

In the Eastern Coast region, there are more collectors and retailers than processors or even planters. The area under bamboo in the surveyed villages represent only 3% of the total estimated land under cultivation. All plantings of *B. vulgaris* are found in Mkuranga district. The collection of round poles is mainly done from the natural stands of *O. buchwaldii* and in Government owned Kwezimzungwi and other forests in Kisarawe district, Coast region. They are harvested essentially for just one end-market - basket (tenga) makers in nearby villages or are transported by lorries to Dar es Salaam 130 km away where the Umoja wa Wauza Matenga at Ilala manufacture baskets sold to various vendors of fruits, chickens and crops. Most of the skilled processors of handicrafts and bamboo furniture are based in Dar es Salaam, where there are ready markets for their products. These include: private cottage enterprises like Magreth bamboo works in Mwenge, Handico Kariakoo, Ilala, Handico Temeke, Mbezi beach bamboo works - Kinondoni and Umoja wa Wauza Matenga - Ilala. Government institutions that engage in bamboo works include Bunju JKT bamboo works in Kinondoni, Mlalakua Kawe JKT bamboo works and Ukonga Prison bamboo works in Temeke.

3.4 Labour Cost/Wage rates

This study has shown that labour is not costed in rural areas, although the shadow price of Labour is about 1,200 Tsh. per man-day. On the other hand, the shadow price of labour in urban centres is about 1500 Tshs per man-day. In the villages surveyed, bamboo

activities are done by family members and they usually do not cost their labour. Since this is a part-time job for bamboo collectors and manufacturers in the rural communities, there is no difference between peak and slack season labour costs.

Table 8. Estimated land area in PCS study villages

Zones	Estimated total Land area under cultivation (ha)	Size of land holdings in villages surveyed (ha)		
		Under Agricultural crops	Under Trees	Under Bamboo

. Eastern Coast Zone: <u>Coast region</u>				
. Mkuranga district (3 villages)	57.5	53.2	NA	4.3
. Kisarawe district (3 villages)	100	100	NA	0
. Southern highlands zone: <u>Iringa region</u>				
. Iringa rural (2 villages)	62.0	58.4	NA	3.6
. Mufindi (9 villages)	87.5	83.3	NA	4.2
<u>Mbeya region</u>				
. Kyela district (3 villages)	7.0	5.9	NA	1.8
. Rungwe district (5 villages)	69.0	68.5	NA	0.5
. Western zone: <u>Kagera region</u>				
. Bukoba rural district (27 villages)	96.0	91.8	NA	8.20
. Muleba district (18 villages)	63.0	8.25	NA	4.87
. Karagwe district (11 villages)	9.0	NA	NA	0.75
. Ngara district (3 villages)		58.13	NA	NA

3.5 Bamboo handicrafts and price variation

Usually the production to consumption system for the craftmakers should begin with the market. In Tanzania, there is no export market for bamboo handicrafts. The handicrafts produced in the country are sold to meet domestic market demand. Domestic retailers at village level seldomly place their orders with manufacturers at the village processing centres. In fact most cottage-industry scale processors produce handicrafts without orders from traders and hence the order can not flow backwards in the system for production to move forward. The traders / retailers set the price at which crafts are sold.

The PCS of the handicrafts trade is thus non-coordinated. However, skilled and better organized furniture manufacturers produce their items after receiving orders from retailers who are found in urban centres. All the handicrafts produced in the country are handmade and thus production is labour intensive not capital intensive. Labour costs are not regarded as part of the production process, since in many cases craft making involves the whole family and labour is not paid for.

3.5.1 Manufacturers

About 71% (58 respondents) of all processors in the study area are found in Mbeya and Iringa regions of the Southern Highlands zone. The major products processed include trays, baskets, dustbins, bowls and lampshades. With the exception of the Government owned Ruanda Prison soap factory that makes furniture, the rest of the processors are either private traders or cottage industries. Usually the adult members of craftmakers' families are involved in the entire process of craft production. Adult members harvest, transport, cut and split, weave and finish the crafts. The main private manufacturers of bamboo furniture include Mama Sawati in Mbeya town and the Njombe Prestige works in Iringa region.

These manufacturers produce their bamboo crafts after receiving orders from buyers

who are mostly found in Dar es Salaam, Zanzibar, Moshi and Arusha, more than 1000 km. away. Most of these craftmakers do this job as part time work during the farming off-season. Twenty four percent of all processors are based in the coast zone, particularly Dar es Salaam. Major products include furniture, lampshades, trays, baskets, dustbins and flower holders. The main processors in Dar es Salaam together sell bamboo articles worth more than Tshs. 50 million annually to meet domestic demand. The domestic market begins at the Dar es Salaam International Trade Fairs (DITF) whereby orders from buyers are passed to these manufacturers. Moreover, processors at village level in rural sites near urban centres produce their articles according to seasonal demand. Demand for baskets is high during the harvest period of the dry season because farmers use them to transport their produce to market places. Baskets are also in high demand during the tomato harvesting period in the Southern Highlands and East Coast zones. Baskets are also needed for tea picking in the Southern Highlands zone.

Only five percent of the processors in the surveyed areas are found in Kagera region of the Western zone and the main reason for this is the limited bamboo resources in the area. Bamboo handicrafts are made to a limited extent in the Minziro ward by the Baganda Kyaka craftmakers. The rest of handicrafts traded here came from places as far away as Mbeya, Iringa and Dar es Salaam. The primary set of inputs for craftmaking include a saw, sizer, knife, scissors, tape measure, shaver, glue, wire, hammer and nails. From the study it is evident that there is a limited degree of bamboo products versatility because only a small range of products is made from bamboos in the country (Table 9). Most of the craftmakers have acquired specific skills handed down through family generations, whereas a handful have acquired their skills from what was the Small Industries Development Organization (SIDO) Craft Centre, Njombe in Iringa region.

3.5.2 Retailers

About 14% (36 respondents) of all respondents in the study were retailers. Sixty one percent of these are found in Dar es Salaam; 28% in the Southern Highlands zone and 11% in Kagera region, Western zone. Of the urban centres, Dar es Salaam offers ready markets for bamboo products. The main retailers of bamboo products in Dar es Salaam are Handico - Ilala at Kariakoo Market and Umoja Green Garden at Namanga area,

Oysterbay. Together these receive annual sales of Tshs. 5.72 million. Although most of these retailers purchase the crafts from manufacturers themselves, middlemen are engaged in the trade on many occasions. Traders purchase handicrafts from producers and sell these on wholesale terms to retailers in market places in urban centres, who in turn transport them to distant markets where final retailing is done.

3.5.3 Price variation of bamboo products

Generally prices obtained for raw bamboo and manufactured handicrafts depend upon the type of bamboo species used. Culms and products produced from *B. vulgaris* fetch lower prices than those of *A. alpina*. The latter species is more versatile than the other species of bamboo found in Tanzania. The distance from the source of supply to manufacturing centres and finally to market places also determines the prices for the final products. Retail prices for bamboo products directly reflect the quality of the handicrafts. Scarcity or abundance of raw bamboo

found in a particular area also affects the price. For example, bamboo poles of *B. vulgaris* fetch 500/- a piece in Dar es Salaam compared to 70/- a pole in Mkuranga or Kisarawe only 120km away; while a pole of *A. alpina* sells at 150/- and 300/- in Tukuyu and Mbeya towns respectively. These towns are about 1100 km from Dar es Salaam. Bamboo poles fetch higher prices of about 300/- each. (Tables 9 and 10). In Mafinga and Iringa towns, 500km from Tukuyu, trays are sold at 500/- and 1000/- each respectively. Retailers of the same products from Mbeya sell trays at 1875/- and 2500 - 3,000/- a piece in Dar es Salaam (1100km away) and Bukoba (1850km away) respectively. The variation in prices is attributed to transport charges together with the taxes these traders must pay.

A set of four chairs sell at an average price of 153,750/- in Dar es Salaam whereas in Mbeya town a set sells at 80,000/- (Tables 9,10). These chairs, and tables, are made mainly by the Ruanda prison bamboo works who obtain raw materials from nearby Kiwira Forest reserve, using free prison labour. There is also an element of transport cost that is not accounted for since the factory uses their own trucks to transport handicrafts to markets in Dar es Salaam and elsewhere. These activities are done for an additional source of income. These handicrafts are purchased by tourists, tourist resorts and to a lesser extent by high-income households. The only product that does not show much price variation is baskets (tenga) because these are produced in places where markets are readily available.

Table 9: Unit Sell Price (Tshs.) Variation in PCS of the study areas

Product Item	Zones	Areas				Average prices
		1	2	3	4	
	East Coast zone:					
1. Poles	Mkuranga district	70	70	70	-	70
	Kisarawe district	100	100	100	-	100
	Dar es Salaam	500	500	500	500	500
	Southern Highland zone:					
	Iringa urban	200	200	200	200	200
	Iringa rural	150	150	150	150	138
	Mufindi district	150	150	100	150	138
	Mbeya urban:	300	300	300	300	300
	Kyela district	100	150	100	-	117
	Rungwe district	150	150	150	150	150
	Western zone:					
	Bukoba urban	300	300	300	300	300
	Bukoba rural	300	300	100	100	200
	Muleba district	100	100	200	300	175
	Karagwe district	300	400	300	500	375
	Western zone:					

2. Handicrafts: Trays	Bukoba urban	3000	-	-		3000
	Muleba town	2000	-	-		2000
	Bukoba rural	2500	-	-	-	2500
Lamp shades	Bukoba urban	1800	-	-		1800
	Muleba town	-	1500	-		1500
Shopping baskets	Bukoba urban	4000		-	-	4000
Bowls	Bukoba urban	2500		-	-	2500
	Southern Highlands zone:					
Chairs	Mbeya	80,000	-	-		80,000
Trays	Iringa, Mbeya	1000	500	200	200	475
Baskets	Iringa, Mbeya	300	300	250	250	275
Shopping baskets	Iringa, Mbeya	450	400	400	260	375
Dustbins	Iringa, Mbeya	800	-	800	700	750
Bowls	Mafinga	-	1500	-		1500
Lampsheds	Mbeya 2	NA	NA	-		1000
	East Coast zone					
Chairs (set of 4)	Dar es salaam	150,000	150,000	150,000	165,000	153,750
Tables	Dar es Salaam	35,000	30,000	35,000	30,000	32,500
Lampshades	Dar es salaam	4,000	3,000	2500	2500	3000
Trays	Dar es Salaam	2,500	2,000	1500	1500	1875
Baskets (tenga)	Kisarawe	500	500	450	500	488
Baskets (tenga)	Dar es salaam	300	300	250	-	283
Shopping baskets	Dar es Salaam	3,500	3000	3000	2500	3000
Dustbins	Dar es salaam	1500	1000	1500	-	1333
Flower holders	Dar es Salaam	1500	1500	1500	-	1500

NA: Not available

Table 10: Major bamboo products and their average prices (manufacturer and retailer in different locations)

Products	Locations									
	DSM	Iringa	Mafinga	Mbeya	Kibaoni	Tukuyu	Bukoba urban	Bukoba rural	Muleba	Karagwe
Chairs (a set of 4)	75,000 (150,000)	-	-	65,000 (80,000)		-	-	-	-	
Tables (per unit)	15,000 (30,000)		-	-		-	-	-	-	
Lampshades (per unit)	1,500 (2,500), 3,000 (4,000)	1,000	-	1,000		-	1,800	-	-	
Trays (nyungo) per unit	1,500 (2,500)	1,000 (1,500)	500(1,000)	250(300)	350 (500)	200 (250)	3,000 (4,500)	-	2,000	
Baskets (tengas) per unit	300 (500)	300(450)	300(400)	250 (400)	300 (400)	250 (300)	-	-	-	
Shopping baskets (per unit)	2,500 (3,500)	-	-	2,000	-	-	4,000	2,500	-	
Building poles (per unit)	500	200	150	300	150	150	(300)	(300)	(300)	(300)
Bamboo wine (per litre)	-	(50)	(40)	-	-	-	-	-		
Mats (per unit)	600 (800)	-	-	600	-	-	-	-	-	
Dustbins (per unit)	1000 (1500)	500(800)	-	800	-	700	2,000	-	-	
Flower holders (per unit)	1,000 (1,500)	-	-	500	-	-	-	-	-	
Bowls (per unit)	1,500 (1,800)	-	-	1,000 (1,500)	-	-	2,500	-	-	

3 Figures indicate unit cost of product or manufacture. Sales price/retail price shown in brackets

3.5.4 Profit margins

Table 11: Profit margins of different bamboo products in Dar es Salaam market.

Items	Quantity produced per year No.	Unit Cost (Tshs.)	Market price (Tshs.)	Total cost (Tshs.) mill.	Total Revenue per annum (Tshs.) mill.
Chairs	576	18,750	37,500	10.8 mill	21.6 mill
Tables	12	15,000	30,000	0.18	0.36
Lampshades	240	1,500	2,500	0.36	0.60
Trays	12,000	1,500	2,500	18.00	30.0
Tengas	12,000	300	500	3.6	6.0
Shopping baskets	240	2500	3,500	0.6	0.84
Flower holders	240	1000	1,500	0.24	0.36

The following products have higher profit margins (%) and higher benefit-cost ratios (Table 11): Chairs, tables, tengas, lampshades, trays and flower holders (listed in descending order). This shows that chairs and tables are far more profitable than flower holders. Shopping baskets have low profit margins of less than 50% and lower benefit-cost ratios.

These high profit margins are questionable as most of the processors do not cost labour because they use family labour that is not paid for. In addition, Government bamboo institutions do not cost labour in their production processes. Other inputs which are part of household tools / equipment are not included in the material costs. In addition to labour not being costed, sale prices are not fixed, they are based on bargaining - which depends on the purchasing abilities of the buyers.

However, an attempt to cost itemise production stages for various major bamboo products at two locations Dar es Salaam and Mbeya township is presented in Table 11. For chairs, manufacturers in Mbeya receive a better profit margin than those in Dar es Salaam because more of raw material base is found in Mbeya than Dar es Salaam. The same pattern is true for lampshades that utilise *A. alpina* as resource base. Tables are usually manufactured in Mbeya and being sold in Dar es Salaam markets, whereby retailers sale their products at higher prices than those set by the manufacturers. For products like poles, there is scarcity of poles in Dar es Salaam that accounts to higher prices for such items.

Monthly revenues accrued from tenga/baskets trade in Maneromango, Kisarawe district and Dar es Salaam markets are shown in Table 12 below:

Table 11: Profit margins in different bamboo products:in two localities

COSTS	CHAIRS	TABLES	POLES	LAMP-SHADES
DSM (Mlalakuwa, JKT) – Manuf.				

Monthly costs:				
Raw mat. Cost (2 sets)	80,000	15,000	100	1500/-
Labour cost 200	28,000/-	2000	75	-
Transport 2000/- x 7 days x 1400				
Fees	3000/-	-	100	-
Overheads (10%)	11,100	-	-	-
Total cost	122,100	17,000	275	1,700
Revenue	159,000	30,000	500	2500
Net profit	36,900	13,000	255	800
Profit margin%	30.22	76	82	47
MBEYA				
Luanda Prisons				
Raw material cost	228,000*	900	100	60
Labour cost	-	7,500	75	500
Transport cost	40,000	-	50	-
Fees	-	-	-	-
Overheads (10%)	26,800	800	-	40
Total cost	294,000	9,200	255	600
Revenue	715,000*	15,000	300	1,500
Net profit	421,000*	5,800	75	900
Profit margin %	143	63	33.3	150

* Annual figures

Table 12: Monthly revenues from trade in baskets “tenga” profit/loss

Cost/Revenue	Maneromango/Kisarawe	Dar es Salaam
Total Revenue (200 tengas)	40,000/-	70,000/-
Costs:		
Village fee	1,000/-	3000/-
Opportunity costs of labour – 1500/- per day	45,000/-	45,000/-
Transport of raw material	On foot	6,000/-
Total cost	46,000/-	62,000
Profit/Loss	(6,000)	18,000/-

When tengas are sold at 200/- a piece at Maneromango village an individual gets a loss of 6000/- per month. Hence it is worth selling tengas in Dar es Salaam than Maneromango where markets are limited. When tengas are sold in Dar es Salaam at 350/- a piece there is a Net profit/benefit of 8,000 per month. Many tenga manufacturers of Maneromango village in Kisarawe District transport sliced bamboo to Ilala market in Dar es Salaam whereby they make these baskets (tengas) for sale even if there is cost of food and accomodation incurred while keeping up in Dar es Salaam.

CHAPTER 4: POLICY AND INSTITUTIONAL ARRANGEMENTS

4.1 Land tenure systems

In the surveyed areas, and in Tanzania as a whole, the land tenure systems used at village level is through the customary ownership of land. Bamboo resources are collected at no cost from the Government forest reserves. However, collectors must pay tax if the village administration has established tax systems for all products harvested from village forests. (e.g. Tsh 100/-). Generally, there is no land tax, and land ownership is through customary laws in which men alone have the rights to own land, and hence they are the principal planters of bamboo at the household level. Women have no access to land ownership. Very recently the new Land Policy of 1998/99 gives equal opportunities to both sexes as regards land ownership. With these changes, women shall actively access the land and other resources.

Before the Forest Policy of 1998 came into place, there was no legal access to the forests by local communities. This situation caused the illegal harvesting of forest products including bamboo, as revealed by some respondents around Kiwira Forest reserve in Mbeya region. In such cases bribes were paid to the forest guards. However, the revised land and forest policies provide room to access such resources by establishing joint resource management between the Government and NGOs or communities bordering forest reserves. Villagers will own land through specified land tenure systems. Under the economic reforms taking place in Tanzania, investment in land by the private, as well as the NGO sector, is expected to grow after the provision of appropriate user rights as incentives.

4.2 Privatization process

Under these economic reforms, greater involvement of the private sector is taking place in Tanzania. Privatization of all major means of production in the Tanzanian economy brought in policies that will encourage participation of the private sector as well as communities to own land and natural resources including forests. Once such policy changes are instituted, villagers and commercial investors will have access to resources that would enable investment in activities such as establishing bamboo plantations. The private sector can play a major role in reducing the stress on resource-use and the environment. The role of women in environmentally related activities will be promoted with the aim of increasing women's involvement in such areas as forestry, agriculture and water management programmes.

The withdrawal of the government from involvement in direct production activities will enable the provision of more resources to the social services sector. Since the villagisation programme of mid seventies, the government started allocating the public land to registered villages with the aim that land titles to villages or individuals would alleviate the problems associated with deforestation. However land clearing for agriculture, overgrazing, wildfires, charcoal burning and over-exploitation of wood resources have persisted.

ANALYSIS

CONSTRAINTS AND OPPORTUNITIES

5.1 Constraints

This study of the bamboo PCS in Tanzania has revealed a number of problems. These problems constrain the PCS in a number of ways that prevent greater production, efficiency and, eventually, income generation. The discussion below outlines these constraints and how they affect the PCS chain at large.

5.1.1 Constraints in the bamboo round poles PCS

Lack of Management of bamboo resources

Currently there is no proper harvesting and management of natural bamboos in Tanzania. This results in over-exploitation and a lack of proper management of the bamboo stands. Consequently, there is a decline in the supply of bamboo resources from the natural stands. The small scale of *B. vulgaris* and *O. braunii* plantations is insufficient to meet market demand. Even for these planted bamboos, management by planters is limited to clearing the ground around the clumps to maintain fire barriers. Planters do not use fertilizers to improve yields from the clumps.

Lack of tenure rights on forestland

Collectors harvest bamboo for free on publicly-owned land. The only cost incurred is paying bribes to forest guards who in some cases restrict access to the forest reserves. Local communities have no management rights on neighbouring forests and are not involved in proper management. Women are not allowed to own or cultivate land due to customary laws of land ownership.

Low income of collectors

The price collectors obtain for harvested bamboo poles is mainly determined by the scarcity of the resource in a specific region and varies between 100 and 500 Tshs.(see chart 9). Collectors only cut and take the poles out of the forest by hand but do not add any value to the harvested poles that they sell to craftsmen and retailers. They sell a product that processors and consumers could obtain themselves with only a little effort. Consequently the market for poles is relatively small. Moreover, owners of banana farms, particularly in the Kagera region, plant their own bamboo and do not need to buy poles. It was also noted that most of the craftmakers of Mbeya and Iringa regions harvest poles themselves from wild sources rather than buying from collectors.

Seasonal character of bamboo harvesting

Seasonality was also noted as a problem for the bamboo collectors. Collection occurs during the dry season at the same time that peasants harvest their farm products. At that time, the demand for bamboo baskets used for agricultural crops is at its highest and many bamboo poles are required. Furthermore, during the dry season farmers take up bamboo harvesting as well as processing as part-time jobs.

5.1.2 Constraints in the handicraft PCS

Lack of Management of bamboo's resources

All respondents particularly collectors and processors indicated that there is a decline in the supply of bamboo resources from the natural stands. This trend will have a long-term impact on raw material supplies that in turn will not be sufficient in meeting any future demand. Currently there is no proper harvest and management of natural bamboos in Tanzania being practiced. Insufficient harvest and management techniques finally will constrain the production of quality handicrafts. As a result more rejected crafts shall be prevalent. The same trend is true with the rattan resources in Kigoma region, whereby raw material are declining owing to over exploitation and non management techniques employed.

Low and non-standard pricing

From the PCS study it is evident that the annual income for the planters, collectors and unskilled processors is meager, while the income for skilled processors and retailers is medium to high as shown in chapter 3 (Table 9 and 10). Labour costs are not included in the setting prices because craftsmen use family labour. If all the parameters of handicraft production are taken for a detailed cost analysis it becomes clear that craftmaking is not a profit making activity for the processors.

Monopsonic position of retailers

Raw and semi processed bamboo and bamboo handicraft are transported over long distances to consumer markets. Middlemen and retailers in many cases set the prices for handicrafts made, thus depriving the craftmakers the role of price setting.

Lack of capital

Almost all the interviewed craftmakers, particularly in village households, indicated they lack both cash and capital. In order to obtain cash they are forced to accept lower prices for their products from middlemen or retailers. Lack of capital investments in machines is also a problem for the middle - sized craftmakers.

Lack of business management skills and expertise

One the main problems is that craftmakers do not fully cost the inputs in handicraft

production. Most of the manufacturers do not cost the inputs such as raw materials, labour and capital, and for those who do so, they hardly recover the cost of raw materials and produce only a marginal profit. Their major preoccupation is to convert products into cash for basic daily requirements.

Additionally, the skill level of the craftmakers especially at village level is quite low as shown in the limited number of items they produce. This restricts them in the marketing of their produce, thus creating a wide gap between them and retailers with regard to selling prices and in market access as a whole. A limited number of craftmakers have acquired skills from the Njombe SIDO craftworks in Iringa region and Ihungo sisters craftmaking centre in Bukoba.

Lack of government support

There is no support from the local or central government for development of the bamboo sector. In all the villages visited, there is no construction of roads to the resource base, no capacity building and no access to capital. The craftmaking respondents recommended government support in terms of capital finance and marketing as a part solution to their problems.

Difficult accessibility of bamboo resources

The collection of bamboo from forests requires human labour and transport is on foot. The actual distance traveled to access the raw materials is 3-8km. For the craftsmen who collect their own bamboo this requires one entire working day (8 - 10 hours) to harvest the materials needed for production. Long distances separate the bamboo forests from the manufacturing centres and markets such as Dar es Salaam, resulting in high transport costs.

Lack of technology in processing

Every aspect in the production of handicrafts is completed by hand. Too great a reliance on labour has a direct impact on the volume of production and the potential for income generation. This was shown in the Ukonga prison in Dar es Salaam, where the once serviceable bamboo splitting machine is obsolete and not working. The volume of production from the bamboo works at this centre is quite low.

Limited markets

The PCS study showed also that limited markets presents a big problem. As stated elsewhere, most craftmakers do not make crafts according to orders made by traders. For the high quality products, tourists together with tourist hotels offer attractive prices. Market surveys show, which products are in demand in the market, hence could help the

craftmakers to manufacture them in bulk. It was found out that Dar es Salaam alone has about 22 traders that buy about 11 kinds of products. The number of craft items traded countrywide shows that the bamboo trade is still untapped since there are less retailers than processors (Table 7). This situation allows retailers to have more control over the craft processors' access to the market and ensures increased prices, and so they receive higher incomes than the craftmakers. Most craftmakers do not advertise their products at all.

No coordinated market information

There are limited markets for bamboo crafts produced locally. Wherever they are found, the market chains are not coordinated owing to lack of market information in such a way that the craftmakers produce their handicrafts without prior orders from traders. This has an impact on the volume and quality of the final product. There is a need for an improved marketing strategy to promote outputs, and increase the quality and variety of bamboo products in Tanzania. The Government can offer small loans to cottage craftmakers in the bamboo sector, provide training for skill improvement and help link them to the markets. From the findings of this study, research and development of bamboo will be required to develop resource establishment and management skills.

5.2 Opportunities within the bamboo PCS

The foregoing has listed a number of constraints prevailing in the PCS in Tanzania. In order to address these problems, support shall be needed to improve what seems to be an uncoordinated bamboo production to consumption system in the country in order to meet the needs of all actors in the sector. There are number of opportunities that exist in the Bamboo PCS which once improved and institutionalized at different stages of the PCS (from cultivation to marketing as presented under Appendix. 2) could effectively address these constraints. Further more, through various interventions (Appendix 2), the expected output at each PCS stage could be realized. Some opportunities are:

Market Segment opportunities

Tourists and tourist hotels pay attractive prices for high quality products, The development of this market segment could boost handicraft processing by upgrading quality. The lack of information at the craftsman level could be solved by market surveys to indicate which products are in demand in the market, and hence could help the craftmakers to manufacture them in bulk.

Presence of large bamboo manufacturers

The involvement of government institutions involved in bamboo processing such as the prison factories producing furniture (Ruanda prison factory; Ukonge Prison in Temeke) and Bunju JKT and Mlalakua Kawe JKT could be an opportunity to launch new initiatives. They possess sufficient labor and logistics to start innovative techniques, courses, etc. The crucial factor will be to sensitise them to investing in upgrading all stages of bamboo production.

Training

A limited number of craftmakers have acquired skills from the Njombe SIDO craftworks in Iringa region and the Ihungo sisters craftmaking centre in Bukoba. These associations show that training programs can be successful and require more dissemination.

Privatization process

Under the economic reforms, which the central government is yet to implement in support of the bamboo sector, some improvement are likely to be achieved. It will encourage the private sector to invest in bamboo production and plantation. If the land adjacent to homesteads were to be planted with bamboo, less time and effort could be spent in harvesting and transporting the bamboo, and more time could be used in managing and producing handicrafts.

New land tenure system

The new Land Policy of 1998/1999 offers local communities the possibility of owning land and forest resources. The new land policy also gives equal rights of land ownership to both men and women though this has not yet been implemented. It enables the creation of joint resource management between local communities and the forestry department.

Bamboo shoots

With research it may be possible to introduce into Tanzania exotic bamboo species that produce edible shoots in order to guarantee household food security during emergencies.

CHAPTER 6:
RECOMMENDED INTERVENTIONS (ACTIVITY MODELS)

A shift in the functioning of the chain of PCS activities could bring greater productive efficiency. The following are the recommended interventions for improvements to the bamboo sector in Tanzania. The overall goal of the PCS – bamboo study is to increase the livelihoods of communities in Tanzania and contribution of the sector to national economy. The entry points for overcoming the constraints facing the bamboo industry are Management of bamboo resources, skills training, marketing and diversification of products. From these entry points, some of the commended interventions relevant to Tanzania as outlined in appendix 2 include the following:

Project Goal: Increased livelihood and creation of sustainable enterprises of bamboo industry

Intervention 1. Resource Management training

Purpose: To ensure sustained natural resource base into future in order to supply demand for bamboo – based products.

Related problem/constraints: Lack of resource management, pests, product quality and durability. Most of collectors interviewed have never indicated that the management of existing stands of bamboo could be made possible through various interventions. This calls for need of training to harvesters on techniques used in stand management. Early harvest does not encourage regeneration and effects material quality and durability. Plantation establishment using both local species as well as exotic bamboo species would ensure sustained resource supply for various bamboo crafts. Bamboo at the moment in the country is used in furniture and handicraft, housing and propping for banana plants.

The various cottage bamboo industries in existence now, can not be guaranteed of continuous operations due to dwindling of supply of bamboo raw materials from the publiclands.

The resource management would ensure higher quality material that could command better prices and expand market of poles. In resource management training these components ought to be included:

1. Proper maintenance of natural stands near to the villages engaged in bamboo activities.
2. Proper harvest techniques
3. Establishment and management of bamboo plantations.

Intervention 2: Crafts hands on production training (Bamboo production model)

Purpose: to build management capacity decision making skills and awareness

Related problems/constraint(s): lack of business and other skills, lack of marketing power. On job training is the focal point of the crafts making center. Skills training in the bamboo craft production and production processes, management and costing are largely required to empower processors of bamboo products to be more productive.

In the process of training the artisans become more active owners of business rather than just producers. There are various production training models as utilized successfully elsewhere, that could as well be designed for use in Tanzania: these include Innovation and creativity skills; product development and enabling technologies; manufacturing processes; and Planning, strategy and allocating resources. The hands-on production training allows the participants to learn the innovative techniques for managing the process, produce crafts while earning fair wages for their inputs and outputs. Up to 1995, there used to be the SIDE Bamboo Crafts Centre in Njombe, Iringa that offered such production training. As of lately, this important centre has been closed, entailing artisans to rely on job training at various bamboo works in the country, particularly in Dar es Salaam and Mbeya (for bamboo products); Maweni, Kigoma (for rattan products).

These two activity models: Establishment and management of bamboo plantations together with Bamboo Furniture Manufacture and Cost Analysis involved are detailed in Appendices 3 and 4.

Other models could be developed addressing marketing strategies for the bamboo products in the country. The above activity models save to be examples that a lot of investment is required to make the bamboo sector contribution in Tanzania. At large the bamboo industry could as well support the low cost housing as well as development of cottage industries in offering employment to local communities in the long term.

CHAPTER 7:
RECOMMENDATIONS

The overall goal of the bamboo PCS study is to increase the livelihoods of communities in Tanzania and the contribution of the bamboo sector to the national economy. The entry points for overcoming the constraints facing the bamboo industry are: Management of bamboo resources, skills training, marketing and diversification of products. From these entry points, the recommended interventions relevant to Tanzania include the following:

1. The first concern is to ensure a sustained natural resource base into the future, in order to guarantee a sufficient supply of bamboo for the development of a bamboo based processing industries:

Related problems / constraints: Lack of resource management, pests, product quality and durability. Most of the collectors interviewed did not indicate that the management of existing stands of bamboo could be made possible through various interventions. This illustrates the need for training harvesters in techniques used in stand management. Early harvesting does not encourage regeneration and affects pole quality and durability. Plantation establishment using both local species and exotic species would ensure sustained supply of resources for various bamboo crafts. Presently bamboo is used in furniture and handicrafts, housing and props for banana plants. The various cottage bamboo industries in existence now can not guarantee continuous operations due to a dwindling supply of bamboo raw materials from the public lands. Management of the resources would ensure higher quality raw material that could command better prices and expand the market for poles. The following components ought to be included in resource management training:

- Proper maintenance of natural stands near to the villages engaged in bamboo activities.
- . Proper harvesting techniques.
- . Establishment and management of bamboo plantations.

2. The second major intervention should concentrate on establishing management capacity, decision-making skills and awareness in the handicraft sector through training:

Related problems / constraints: lack of business and other skills, lack of marketing power. On-the-job training is the focal point of the crafts making centres. Skills training in the bamboo craft production and production processes, management, and costings is mainly required to empower processors of bamboo products to be more productive. During the process of training, the artisans become more active owners of business rather than just producers. There are various production training models as utilized successfully elsewhere, that could as well be designed for use in Tanzania: These include: Innovation and creativity skills; product development and enabling technologies; manufacturing processes; and planning, strategy and allocating processes. The hands-on production

training allows the participants to learn the innovative techniques for managing the process and produce crafts while earning fair wages for their inputs and outputs. Until 1995 there was the

SIDO Bamboo Crafts Centre in Njombe, Iringa, that offered such production training. Lately this important centre has been closed, entailing artisans to rely on job training at various bamboo works in the country, particularly in Dar es Salaam.

3. There is a need for strategic resource management of bamboo stands in order to support the availability of raw materials.

Proper harvesting techniques are important tools for ensuring regeneration of the bamboo resources and preventing loss of species from over-exploitation. Given the knowledge which farmers have, there is potential for communal cultivation of bamboo as a homestead crop. Incentives from the Government may be needed to attract people and private investors to engage in the bamboo sector. Meanwhile, under the economic reforms taking place in Tanzania, investment in land by the private as well as NGOs is expected to grow after the provision of appropriate user rights as incentives.

The private sector can play a major role in reducing the stress on resource use and the environment. Policy statement on the development of NTFP would enhance development of bamboo especially by local communities.

Bamboo planting to rehabilitate degraded lands on marginal areas should be emphasized. In order to tap the existing potential for development of the bamboo industry, the Government should be able to support replenishing the existing bamboo stock through planting of bamboo, and coordinate the production of bamboo from public forests to ensure that sustainable harvesting will be guaranteed.

For the development of the bamboo sector in the rural areas, provision of basic infrastructure including roads between the forests collection and production sites is a pre requisite. As these shall enable more raw materials to be transported and thus increase the production volumes.

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APPENDIX 1: ANALYSIS OF CONSTRAINTS, CAUSES, OPPORTUNITIES AND INTERVENTIONS FOR THE BAMBOO SECTOR IN TANZANIA

PCS-Stage	Data/Findings	Causes	Constraints	Opportunities	Interventions	Output
1. Cultivation	Scarce bamboo resources including planted <i>B. vulgaris</i> and <i>O. braunii</i> Less women involvement in bamboo cultivation	No effective policy on NTFPs including bamboo No planting of bamboo Unawareness of planters on bamboo contribution to livelihood. Lack of knowledge in bamboo management by stakeholders	Ineffective land Tenure system Ineffective Forest Policy of NTFPs	Existing new Forest Policy Existing new Land Policy Better understanding of stakeholders on role of bamboo sector	Empowerment of stakeholders to lobby for better policies New land policy Empowerment of women in land ownership Develop packages of better bamboo cultivation	More land on bamboo cultivation Awareness created on role of bamboo on rural livelihood Homestead cultivation for job creation Regular and reliable supply of planting material, Planting material for soil conservation available.
2. Collection	Declining stock Walk longer distances to collect bamboo from wild Harassment, evasion of permit fees	Habitat destruction Improper harvesting Poor management Overexploitation No effective policy	Depleting bamboo resources Inflexible permit system	Existing policies (Land and Forest) Desire of collectors to cultivate & Manage bamboo Technical knowledge from Forestry sector	Stakeholder on powerment for better policies Develop better management on bamboo plantations Nursery establishment	Increased bamboo resource base
	Low volumes collected Injuries	Lack of suitable harvesting equipments Long walking distances	Laborious harvesting skills	Availability of manpower skills	Improve harvesting tools and equipment	Improved harvesting efficiency injuries minimized Injuries minimized
	Limited business capital	Resource poor	Inadequate finance/capital	Rural banks and existing NGO associations	Empowerment to lobby for financial assistance	Improved business capital
	Lack of bamboo association/ Groups	Lack of mobilization	In effective bamboo collection/harvesting, uncoordinated trade	Association formation for bamboo products	Empowerment to creation of Bamboo stake holders Groups	Active/Effective association formed
Processing (Primary)	Irregular supply, occasional shortage Increased price	Depleting bamboo stock	Scarcity of raw bamboo	Technical know how from Forestry Institutions Desire of collectors to cultivate & manage bamboo Stakeholders Groups	Sustainable harvesting Nursery establishment Plantation establishment	Increased resource base of bamboo
Processing (Primary/ Secondary)	Insects (powder post beetles) damage raw bamboo. Also fungal attack	Poor storage facilities	Lack of storage facility/lack of mean for proper preservatives	Availability of technical skills	Construct proper facility for bamboo storage and treatment	Storage facility improved/Next for preservative reduced
PROCESSING (Secondary)	Low productivity Poor quality and low volumes of raw bamboo	Inadequate technical know-how & working capital Lack of suitable equipment	Laborious processing methods	Technical knowhow from public & private institutions Availability of manpower and skills	Better processing tools Training/technology transfer Improve finance	Improved productivity & quality of products
	Insect (powder post beetle) infestation of raw bamboo & products	Inadequate working capital	Improper shelter for processing	Land availability	Adequate financing	Better working environment
	Inability to	Resource poor	Inadequate	Rural banking	Mobilization to	Improved financing

	purchase some essential inputs poor productivity and quality of products		finance	Existing selected NGOs	lobby for financial assistance	
	Limited designs of products made	Not exposed to other product designs	Lack of variety of product designs	Willingness of manufacturers to diversify their product range. Existing Trade fairs for bamboo products	Training workshops, exchange visits & catalogue usage	Diversified products designs
4. MARKETING	Long selling periods	Lack of marketing strategy – product quality, price, place & promotion	Irregular demand & low selling prices	Existing market outlets at local urban.	Improve marketing strategy	Improved marketing of products
	Products sold only to domestic market	Lack of marketing skills. Inadequate working capital	Lack of Export market	Existing export markets. Existing Trade fairs, Tourists	Establishment of display or marketing centres Create export skills	Marketing skills improved on bamboo products
	Low profit margins	Resource poor, lack of associations	Inadequate business capital	Rural banking NGOs National small Scale Industries Organization (SIDO)	Mobilization to lobby for financial assistance	Improved financing Improved processing sector
	Products sold along roadsides by retailers/Individual producers	Lack of marketing principles	Lack of marketing strategy	Existing trade fairs/displays	Encourage collective selling points	Marketing of products improved, prices standardized & Buyers attracted
Policies	Additional expenses in the form of bribes	Harassment by police, Foresters, villagers	Lack of effective regulatory framework	Existence of policy for other NTFPs	Put in place a flexible permit system	Resource management sustained

APPENDIX 2**PROJECT I: ESTABLISHMENT OF A 100 HECTARE BAMBOO PLANTATION**

PROJECT GOAL: Increased livelihood and creation of sustainable bamboo enterprises and industries.

Assumptions: 1. Land is available at 50,000/- per ha. payable to the Government.
2. Bamboo produces 1, 600 culms/ha.

Nursery phase:

	<u>COST</u> (Tshs.)
<u>Propagule requirements:</u> 50kg/ha of culm cuttings	
Price per kg: 100/-	
Number of kg needed: 50kg x 100ha i.e. 5000 kg.	
Total for propagule procurement: 5,000kg x 100/- =	500,000/-
<u>Seed treatment</u> (2% of propagule cost) =	10,000/-
Potting soil cost: 10/- per pot	
Cost for 100ha = 1600 x 10 x 100 =	1,600,000/-
<u>Maintenance:</u> (3% of seedling cost)	15,000/-
Infrastructure (roads, vehicles) -	100,000,000/-
Tools/equipment	
. Pangas 10 pcs	
. Saws 2 pcs	
. Knives 10 pcs	
. Wheel barrows 2 pcs @ 50,000/-	100,000/-
Maintenance total	<u>200,000/-</u>
NURSERY PHASE SUB TOTAL	<u>102,325,000/-</u>

Plantation phase: (10 year rotation)

. Surveying/demarcation (blocking)	1,000,000/-
. Land preparation 20 labourers x 10 days @ 2,500.-	500,000/-
. Planting/sampling/Inventory	1,600,000/-
. Maintenance (3% of seedling cost)	15,000/-
. Infrastructure (roads, vehicles)	50,000,000/-
. Tools/equipment	<u>200,000/-</u>
PLANTATION PHASE SUB TOTAL	<u>53,315,000/-</u>

Harvesting phase: (at 10 years)

. Labour 20 labourers for 20 days @ 2,500/- day =	1,000,000/-
. Tools/Equipment 20 pangas @ 2,000/-	40,000/-
. 10 Bow saws @ 5,000/-	50,000/-
. 20 knives @ 3,000/-	60,000/-

Labour and tools sub total **1,150,000/-**

. Others: (ropes, transport/vehicles) **1,000,000/-**

HARVESTING PHASE SUB TOTAL 2,150,000/-

TOTAL ESTABLISHMENT COSTS

155,640,000/-

• Harvesting costs **1,150,000/-**

TOTAL COSTS FOR 10 YEARS 156,790,000/-

EXPECTED REVENUE

Activity	No. of units produced.	Sale price per unit (Tshs).	Total expected Revenue (Tshs).
Raw bamboo	10,000 x 100ha 1.0 million culms.	300/-	300,000,000.00

EXPECTED PROFIT AFTER TEN YEARS

143,210,000.00

APPENDIX 3**PROJECT 2: FURNITURE MANUFACTURING MODEL**

Target: To manufacture 12 sets of bamboo chairs per month

Assumption: Each set comprises 4 units (pcs)

	<u>COST</u> (Tshs.)
Raw material cost 10 pcs/ of 2m length each @ 1,500/-per piece =	15,000/-
Raw material transport cost (Uporoto/Mbeya/Dar es Salaam) 15,000/x12 =	180,000/-
Cost of splitting machine (depreciation over 15 years) =	1,000,000/-
Labour costs	
Full time 6 labourers x 35,000/- p.m. =	210,000/-
Part time 1 labourers x 15,000/- p.m. =	15,000/-
Supervisor 1 labourers x 60,000/- p.m. =	60,000/-
Total	285,000/-
• Other inputs	
Pattex }	
Chipboard }	Total 64,000/- per month
Plywood }	64,000/-
Varnish }	
Overheads }	
House rent } (4 - 5% of other inputs raw material labour)	9,000/-
Electricity }	
Water }	

PRODUCTION COSTS PER MONTH: **378,555.50/-**

EXPECTED REVENUE PER MONTH:

• Sell 12 sets @ 75,000/- each per month **900,000.00/-**

GROSS PROFIT PER MONTH **521,444.50/-**

Other models could be developed addressing marketing strategies for the bamboo products in the country. The above activity models serve to be examples that a lot of investment is required to make the bamboo sector contribution in Tanzania. In general, the bamboo industry could also support the low cost housing as well as development of cottage industries in offering employment to local communities in the long term.