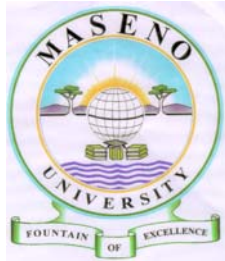


Project Name: Diversification of Household Livelihood Strategies for Tobacco Small-holder Farmers: A Case Study of Introducing Bamboo in South Nyanza Region, Kenya



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1.0 Abstract

In Kenya, tobacco is grown in four provinces, namely, Nyanza (Migori, Kuria, Suba and Homa bay districts), Western (Bungoma, Busia, Teso and Mount Elgon districts), Central (Kirinyaga, Muranga, and Thika districts) and Eastern (Meru, Kitui and Machakos districts). However, 80% of the country's tobacco production comes from South Nyanza region (mainly in Kuria, Migori and Homa bay districts). This research project was carried out in the above four (4) districts of South Nyanza region. The overall goal was the investigation of the sustainability of traditional and modern household livelihood strategies of tobacco farmers and how they would be diversified through the introduction of bamboo as an alternative crop to tobacco production in the region.

This research has attempted to go into considerable depth in its objectives to promote local enforcement of the Framework Convention on Tobacco Control (FCTC). The study has indicated that though most households engage in tobacco farming to improve their standards of living in the region, tobacco farming seems to have added little or no difference to their livelihood when compared to non-tobacco households in the region. Field experiments have shown that bamboo can do well in soil, agro-climatic and topographical conditions similar to those of tobacco and will fetch 4-5 times more in terms of income. The market potential for bamboo products is huge because most of those sold in the formal retail market in Kenya are imported entirely from China, India and Thailand. Besides numerous economic advantages of bamboo, social and environmental problems associated with tobacco farming can be reduced through bamboo production. The Basic Training on Bamboo Treatment, Handcraft Weaving & Furniture Processing Technologies carried out to the farmers was a major impetus to the acceptance of bamboo in the region. This is because it acted as an eye opener on the multiple and wide market potential of bamboo at local, regional and international markets in the long run.

It is recommended that research issues that emerged from the last three years project activities, should be addressed in the next Phase of the Project in 2009-2012. Key issues include: surveying household livelihood strategies used by tobacco and non-tobacco farmers in the other three (3) tobacco farming clusters in Kenya as compared to the South Nyanza region, up-scaling of the project to other small-holder tobacco farmers, development of a marketing structure for bamboo products through a cooperative system and building local capacities in bamboo production industry. In brief, the shifting from tobacco to bamboo is possible because the majority of tobacco farmers are willing and about 50% have already embraced the new industry during the first 3 years of experiment.

Keywords: *Tobacco, bamboo, alternative livelihoods, small-holder farmers, South Nyanza, Kenya*

2.0 The Research Problem

Most of the tobacco production in Kenya takes place in the Southern Nyanza region mainly in Kuria, Homa Bay and Migori Districts. Despite the global policies aimed at reducing world tobacco production and use, the Kenyan Government's policies aimed at

poverty reduction, seem to encourage more tobacco production in the country. This is evidenced by the current plans by the British American Tobacco Company Ltd (BAT) of expanding its activities to other high-agricultural potential districts in the Nyanza Region, i.e. in Bondo and Siaya in Central Nyanza region, Borabu in Kisii, Bomet, Transmara and Narok south in the southern part of Rift Valley province. It is also estimated that the number of farmers contracted by tobacco companies in Kenya increased by 67% in the period 1972 to 1991, 36% from 1991 to 2000 and by about 15% from 2001 to 2008. Alongside, the land under tobacco grew in acreage at the expense of food crops because farmers have been shifting to tobacco production. Due to time and land constraints, traditional crops like cassava, millet and sweet potatoes that were important in periods of drought and famine are scarce in the region. Child labour, increased HIV/AIDs and other human health ailments associated with tobacco production are prevalent in this region. Livestock production activities have also drastically reduced.

The type of tobacco grown in the proposed study area demands a lot of wood-fuel for curing. Consequently, a lot of indigenous trees are felled for curing purposes. Soil erosion is rampant in these areas. Most of the indigenous trees have disappeared over time due to the high demands for fuel wood in tobacco curing. This has further led to reduction in food crop production, hence, increased poverty levels in the area. Widespread deforestation activities have also led to the change of the local natural streams from permanent to seasonal, hence water scarcity for agricultural and domestic uses. The remaining seasonal rivers are further polluted by chemicals used in tobacco that flow from nurseries and farms every season of the year.

This kind of scenario called for research that can solve a multiple of problems, i.e. food insecurity, social-cultural conflicts, poverty and environmental degradation. This research project was formulated based on this rationale with an *overall goal of investigating the sustainability of traditional and modern household livelihood strategies of tobacco farmers and how they would be diversified through the introduction of Bamboo as an alternative crop and source of alternative livelihood to reduce tobacco production in the South Nyanza region.*

3.0 Research objectives

Specific research objectives of the study were: -

1. To examine the current and historical changes in household livelihood strategies used by tobacco and non-tobacco farming households.
2. To experiment on the potential and people's attitudes of adopting bamboo as an alternative crop to tobacco or source of livelihood to small-holder tobacco farmers in the region.
3. To undertake an assessment of marketing dynamics as a feedback to investment in the bamboo industry in the region and Kenya, and
4. To develop community action plans to ensure a reduction of tobacco production in the region through livelihood diversification/poverty alleviation strategies.
5. To build the capacity of tobacco small-holder farmers in bamboo production and processing to ensure improved livelihoods.

The last objective evolved during the study period to fill a missing gap after bamboo proved to be an economically viable industry in the region.

4.0 Research Methodology and Project Activities

This section describes the study area, research methodologies used in undertaking the above objectives and relevant project activities. The section has been sub-divided into the following sub-headings:-

- *Study area*
- *Household Surveys among tobacco and non-tobacco households*
- *Assessment of bamboo growth performance*
- *Bamboo Market Surveys*
- *Community Action Planning*
- *Research capacity building of small-holder tobacco farmers in bamboo production and processing*
- *Dissemination of project outputs*
- *Research Methodology changes in Orientation*

4.1 Study Area

The study was carried out in Kenya in the four (4) districts of South Nyanza region (Migori, Suba, Kuria and Homa Bay) (Figures 1 & 2). The region is located in south-western Kenya, and covers an area of about 7,778 sq. km, which is 48% of the Nyanza Province's land area. This region is mainly inhabited by the Luo and Kuria communities. Majority of the rural population depend on agricultural crops such as tobacco, sugarcane, maize, sorghum, sweet potatoes and cassava among others.



Figure 1: Location of the Study Area

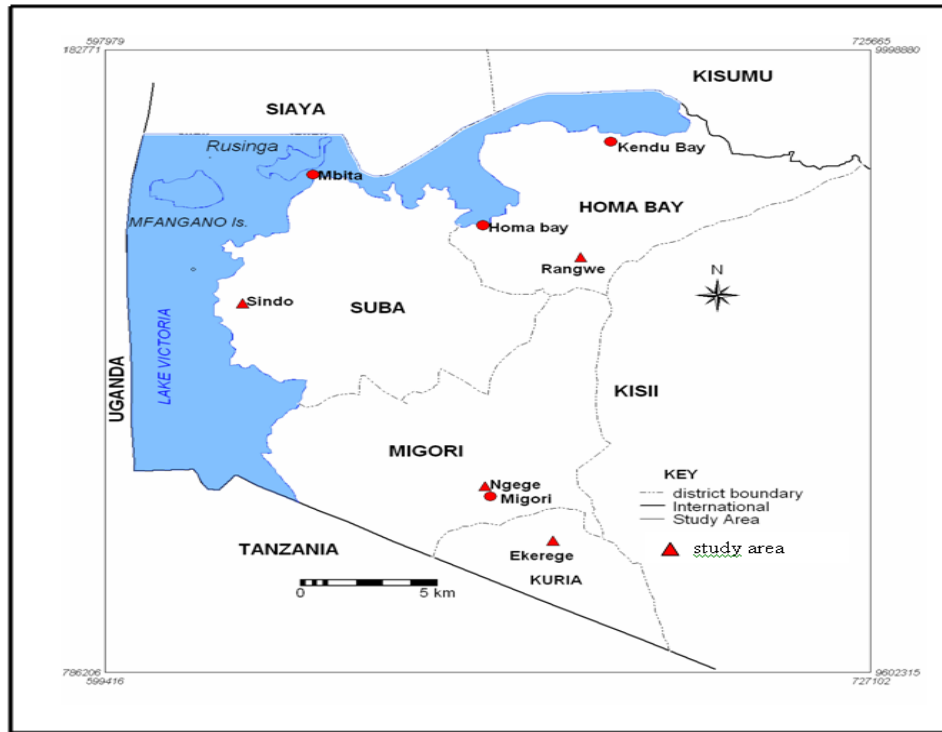


Figure 2: Specific Study Sites

4.2 Household Surveys among tobacco and non-tobacco households

To achieve objective one of the study, two interactive approaches were used in data collection. First, four focused group discussions were carried out, that is, one in each of the study sites (districts) where livelihood mapping was done. Livelihood mapping process entailed identification and ranking of basic life support resources used by the smallholder farming households. In every study site, 30 farmers that is, 15 tobacco and 15 non-tobacco and Kenya government agricultural officers participated in the livelihood mapping exercise. Secondly, a multi-stage and stratified random sampling procedure was used to select 440 smallholder farming households that is, 210 tobacco and 230 non-tobacco households from the 4 study sites (Ikerege, Ngege, Rangwe and Sindo in Kuria, Migori, Homa bay and Suba districts, respectively) (Figure 2). However, there were no tobacco farmers sampled in Suba district as most of them had abandoned the activity. One administrative location with the highest concentration of tobacco farmers was selected from each district through stratification where a proportional sample was randomly selected for the study. The survey was carried out using a standard questionnaire with both structured and non-structured questions relevant to the study. The questionnaires were developed and tested during a pilot survey.

Data were analyzed using statistical package for social scientists (SPSS) and excel with a general framework of contrasting the assets and livelihood strategies for both groups of households studied. The inclusion of non-tobacco growing households means the establishment of a control group which helps to debunk the myth of tobacco crop profitability created (“socially constructed”) by the tobacco industry. The best practices of participation were observed including gender sensitivity where adult men, women and youths were included. The livelihoods approach was meant to give an understanding of

the farmer's strengths (assets or capital) which is crucial in the analysis of how people convert their assets into positive livelihood outcomes.

4.3 Assessment of bamboo growth performance

To undertake objective two of the study, the research team collaborated with the Ministry of Agriculture and identified 120 field experimentation sites (that is, 30 in Kuria, 30 in Migori, 30 in Homa Bay, and 30 in Suba). The criteria used in the selection of farmers included: Whether or not one was a tobacco farmer, gender, age, poverty status; farming scale; access to water and the willingness to provide land for the bamboo experimentation.

The experiment was set and carried out on the 120 farm trial sites where 2,420 bamboo cuttings were planted under the same natural tobacco growing conditions in five different zones (that is, zone A = hillside/steep sloping farmland, B = hillside/gentle sloping farmland, C = flat farmland/not wetland/riverbank, D = flat farmland/wetland and E = homestead) based on each farmer's preference during the short rain season between September and October 2006. The cuttings were sourced and transported from Githumbuini estate in Thika district, near Nairobi, about 460Km from the project area. The experiment comprised of 1210 giant bamboo (*Dendrocalamus giganteus*) and 1210 common (yellow) bamboo (*Bambusa vulgaris*). Each cutting was planted in a cubical hole measuring (0.6 x 0.6 x 0.6 m). Each farmer was given 20 bamboo cuttings (that is, 10 each of giant bamboo and common bamboo).

To reduce sampling errors thereby enhancing sampling precision, 50% of bamboo clumps were randomly selected. The selected clumps were tagged with codes indicating the district (site), farmer's number, species and the number of clump selected for easy identification and monitoring of survival rates, culm numbers, heights and diameters, among other modeling parameters (Plates 1 & 2). Assessments of the bamboo performance parameters were carried out at an interval of 3 months from the time of planting for the first 2 years and later after every 6 months.



Plate 1: Giant bamboo tagged



Plate 2: Common bamboo tagged

Stakeholders consultations were conducted in 2006 to build bamboo research partnerships and participation by farmers interested in tobacco production control. Moreover, consultations helped to identify research and action points of entry. Field trips and trainings were also conducted to equip farmers with basic skills on bamboo cultivation, land preparation, bamboo farm inputs and general care of cuttings through field demonstrations as well as improving participatory project monitoring.

4.4 Bamboo Market Surveys

To understand bamboo market dynamics in the formal sector, a stratified simple random sample of 20 supermarket branches selling bamboo products in the country was conducted in three major cities (Nairobi, Mombasa and Kisumu). Managers were interviewed from each of the supermarket branches and their head offices. Customers' views about existence of bamboo products in the market, quality, affordability and preference in relation to competing non-bamboo products were recorded. The survey was carried out in the months of April and December, 2006. To detect product differentiation in the market, various bamboo products sold by the supermarkets were identified, recorded and examined. Barriers to entry into the bamboo market were determined by establishing the possible factors hindering investment in the bamboo industry. Such included government licensing, capital requirements, customer loyalty and supply of desired quantities of the products. Market concentration was assessed by determining the major source of supply of the bamboo products and the number and size (percentage of sales) distribution of the supermarkets. Market performance was examined by establishing demand differences among the market segments and ranking the bamboo products based on the branch managers' views about the rate at which their stock got emptied. Analysis of Variance (ANOVA) was conducted at 0.05 level of significance to confirm the hypothesis that there was significant difference in the means of bamboo products sold in the three cities. Gini coefficient was also computed to confirm the hypothesis that conditions of imperfect competition with oligopolistic tendencies characterize formal retail market of bamboo products in Kenya.

For the informal (*jua-kali*) bamboo market survey, 78 persons involved in bamboo micro-enterprises including proprietors, employees, traders, customers, policy makers and experts in Nairobi were interviewed in March-April 2009. Snowball sampling was used in primary data collection using questionnaires and interview schedules. A total of 14 key informants were interviewed and 64 questionnaires were administered. Six microenterprises were sampled for detailed examination, where the main bamboo activities included: bamboo nurseries, bamboo handicraft processing workshops and bamboo curio shops.

4.5 Community Action Planning

Four farmers' groups were formed in the year 2006 (i.e. Homa Bay bamboo (Modi) Farmers Group, Migori Bamboo (Modi) Farmers Group, Kuria Bamboo (Imiere) Farmers Group and Suba Bamboo (Modi) Farmers group) and formally registered by the Kenyan Government Ministry of Gender, Sports, Culture and Social Services. Each group has 30 tobacco and non-tobacco farmers and officials elected as per their constitution/ by-laws. The groups are mainly engaged in bamboo farming/ production as an alternative crop to

tobacco and as a long-term strategy of livelihood diversification, poverty alleviation and environmental conservation in the region. Due to the positive results obtained from the bamboo growth and market surveys, there was need to develop a plan for up-scaling the experimental farms to averagely one acre each and expand the group membership in order to realize more impact from the project.

Community Action Plans (CAPs) were developed through a consultative process, which involved meetings and discussions with members of each of the groups and some key stakeholders (i.e. Ministry of Agriculture, Maseno University Tobacco to Bamboo Research Team, Office of the President-Provincial Administration representatives and local NGOs during workshops for each farmers' group. The farmers and the stakeholders identified key issues which the groups need to address in future. The CAPs process also identified who to undertake the tasks identified and when the implementation should start. Supplementary information was also collected from the existing bamboo monitoring reports, household interviews data bank and Focused Group Discussions. Maseno University Research Team collated all the information and produced a draft of CAP for each group. An action plan for each group was subsequently discussed by the farmers' group members. Finally, the research team harmonized all the comments and produced a final document (see Appendix) which was discussed and adopted by the four farmers' groups.

4.6 Research capacity building

This was mainly targeting small-holder tobacco farmers and Maseno University project staff. The emphasis was in bamboo production and processing and tobacco control strategies through livelihood diversification. This was undertaken through field demonstrations, in-house and field basic trainings on bamboo production and processing, field tours, farmer-to-farmer field visits, participation in bamboo growth monitoring, workshops and conferences.

The farmers were trained in the first and second years of the project on how to establish and maintain bamboo farms. The training specifically was in farm preparation, weeding, mulching and general maintenance of the bamboo plots. This was conducted through consultancy and collaboration by bamboo production and utilization experts, i.e. Mr. David Nyantika- Ministry of Agriculture in Kenya and Dr. Jinhe Fu of The International Network for Bamboo and Rattan (INBAR) from China. We also collaborated with Kenya Forestry Research Institute (KEFRI) in the trainings. KEFRI provided back-up staff during trainings and bamboo materials/ culms for product making.

For a successful process of switching from tobacco to bamboo production, farmers had to embrace the economic potential of the new initiative as they wait for their young bamboo plants under trials to mature by September / October 2009. It was for this reason that bamboo utilization training was conducted in the region (i.e. Suba, Migori, Homa bay and Kuria districts) to equip the farmers with skills through a *Basic Training on Bamboo Treatment, Handcraft Weaving & Furniture Processing Technologies between August – October 2008*. The number of trainees were selected by taking into consideration gender factors. Averagely, there were 30% women, 20% youths and 50% men. This training was

conducted by the Kenya Forestry Products Research Centre (which is part of Kenya Forestry Research Institute) staff courtesy of INBAR. The Trainers were formerly trained under the on-going East Africa Bamboo Project (EABP) being funded by Common Fund for Commodities through United Nations Industrial Development Organization (UNIDO). The two weeks training workshop per site was organized in strategic points in market centres where many local people could make observations on the potential of bamboo in changing rural livelihoods. The trainees were wearing green dustcoats with an advocacy message “*Stop tobacco! Start bamboo!*”, which proved very effective (see Plate 3).



Plate 3: Project beneficiaries who were formally small-holder tobacco farmers

The farmers were also sensitized on the negative environmental and human implications of tobacco production through the project period by collaborating officials of key NGOs like Social Needs Network, Community Livelihood Development Forum (COLIDEF), Kenya Anti-Tobacco Growers Association (KATOGA). Advocacy programmes of these three organisations were integrated into project research activities to increase the impact of project in the region.

To build research capacity at Maseno University, the following activities were undertaken. First, a research office was established at Maseno University, School of Environment and Earth Sciences. The office is equipped with two computers, a digital camera, a laptop and office furniture during the first year of the project, i.e. 2006. The office acts as the databank for all project data. There was also continuous acquisition of relevant literature on bamboo and tobacco production throughout the project period. Most of the materials were downloaded or obtained from the internet and various organisations

like INBAR, IDRC, WHO, and other international research institutions dealing with tobacco control or bamboo production promotion. Secondary data were obtained from published and unpublished theses, conferences/ workshops, proceedings reports, scientific journals, periodical reports and textbooks. Maseno University kindly contributed in office space, security, and also paid all electricity bills incurred by the project office.

4.7 Dissemination of project outputs

Dissemination of project outputs activity was through reports, publications, policy briefs, conferences, meetings/events/workshops, posters, films and internet. These activities were carried throughout the project period. The specific outputs disseminated listed below are appended to this report in a separate DVD. A summary of dissemination activities supported by the project directly or indirectly are as outlined below. The set targets will all be achieved by the end of 2009 when all data results on bamboo monitoring for this phase of the project is complete.

Table 1: Summary of dissemination activities

Type of Dissemination Activity	Number achieved	Number being processed/ prepared
Interim Project Technical Reports	04	00
Final Project Technical Report	01	00
¹ Papers in International refereed Journals	04	10
Book Chapters	01	00
International Conference/ workshop Papers	04	10
Local Conference/ workshops	04	02
Policy Briefs (Drafts)	02	02
Public/ community meetings/ events	18	00
Websites established	01	00
Posters	05	00
Video on Bamboo as Alternative Livelihood to Tobacco	01	00
Daily Newspaper articles	02	00

¹ Note: For titles of the papers under preparation, see the section of project outputs below

The key project staff have participated in the following national and international meetings and disseminated the results of the study. The project staff attended the following meetings/ events and gave a talk on: *The potential of adopting bamboo production as an alternative livelihood strategy to tobacco farming in South Nyanza region, Kenya.*

1. The *International Workshop on Bamboo for the Environment, Development and Trade* held in Wuyishan City, Fujian, China on 21-25 October 2006.

2. *International Training Workshop on Research for Action on the FCTC*, held at IDRC, Ottawa, Canada, May 7-9, 2007.
3. The *WHO-FCTC Second Meeting of the Study Group on Economically Sustainable Alternatives to Tobacco Growing* Mexico City, 17-19 June 2008.
4. *Training Workshop on Technology Options for Communities in Western Kenya* under the World Bank sponsored Western Kenya Community Driven Development and Flood Mitigation Project (WKCDD/FMP) on October 1-3, 2008, at Sunset Hotel, Kisumu City, Kenya.
5. The *14th World Conference on Tobacco or Health (WCTOH)*, held in March 8th - 12th 2009, Mumbai, India.
6. UNIDO/ KEFRI *National workshop on Sustainability and Growth in the Bamboo Sector in Eastern Africa Region: Opportunities and Constraints*, held in Nairobi on 24-25 February 2009.
7. *Annual Bamboo International Study Tour* of 10 days in Zhejiang and Sichuan provinces, China from 19th – 29th April 2009, Organized by INBAR.
8. Project posters and farmers products were displayed during the Kenya National Universities Annual Exhibition through the support of Maseno University in Nakuru town in March 2009.

Maseno Research Project Team and other participating ministry of Agriculture officials gave talks on the pros and cons of Tobacco and the benefits of bamboo production during the following 4 forums:-

- Community Action Planning workshop for Homa bay Bamboo (*Modi*) Farmers Group held on 25th July 2008 at Rangwe Market Centre
- Community Action Planning workshop for Suba Bamboo (*Modi*) Farmers Group held on 15th August 2008 at Sindo Market Centre.
- Community Action Planning workshop for Kuria Bamboo (*Imiere*) Farmers Group held on 25th September 2008 at Ikerege Market Centre
- Community Action Planning workshop for Migori Bamboo (*Modi*) Farmers Group held on 16th October 2008 at Ngege Market Centre.

4.8 Research Methodology changes in Orientation

The major modification in the study methodology was the introduction of a second bamboo species, i.e. *Bambusa Vulgaris*. This was due to inadequacy of Giant bamboo plantlings and need for diversification of small-holder farmers' livelihoods at this earlier stage of the project. *Bambusa Vulgaris*, whose diameter is about 3-4 inches, is good for furniture, poles required in the construction industry, fuelwood, etc. Farmers are set to benefit more from this change in methodology. Hence, farmers received an average of 10 plantlings of each species, giving a total of 20 as previously planned.

For easier administration of the project, four (4) community-based Bamboo Farmers Groups, i.e. one per site were established. The four farmers groups are: *Migori Bamboo (Modi) Farmers Group*, *Kuria Bamboo (Imiere) Farmers Group*, *Homa Bay Bamboo (Modi) Farmers Group*, *Suba Bamboo (Modi) Farmers Group*. The Kenyan Government registered these 4 community-based organisations (CBOs) by the end the first year of the project. Though this was a new initiative by farmers in collaboration with the Project Research Team after the First Basic Bamboo cultivation training, it proved useful in

project administration, for example in supervision of holes preparation, land preparation/clearance, discipline of farmers, distribution of planting materials, farmers mobilization, capacity building and general project monitoring.

Another minor change in the project was that the seedlings were given to farmers at a small cost of Ksh. 5 each, i.e. Ksh. 100 (CAD \$ 1.6) for the 20 seedlings. This was arrived at after consultations with government agricultural field extension officers, farmers and other key stakeholders. This was basically aimed at creating ownership of the project by the farmers for its success. The proceeds from the sale (i.e. Ksh. 3,000 = CAD 50 per site) were used to facilitate the registration and organisation of local Bamboo Community-based groups. The initial setting of farm experimental sites was also shifted from the April/May long rains period to September-November 2006 short rains season due to institutional delays in processing the funding. However, the short rains were preferable because of the short time range attributed to long rains. This implies that the last envisaged field bamboo growth monitoring in September/ October 2009 as planned is yet to be done, hence need for extension of the project to Phase II. Otherwise other project field methodologies remained the same.

In terms of the project administration, all the research team and collaborators remained intact and active in relevant scheduled activities. The poor nature of the rural access roads in the study area even during the dry season, posed major challenges to the project performance, especially during the heavy rains in March-May every year. However, hiring of 4WD vehicles and re-scheduling of project activities solved this problem.

5.0 Key Project Results

Below is a summarized narrative of key results obtained after the research methodology outlined earlier and after undertaking of the above project activities. The results are arranged as per the objectives of the study. Scientific details of the results can be found in the journal papers, book chapters or conference proceedings outlined in the section of outputs.

Objective 1: To examine the current and historical changes in household livelihood strategies used by tobacco and non-tobacco farming households.

This study assessed household assets and livelihood strategies among tobacco-growing households in comparison to non-tobacco-growing household in the region. The study established that an annual net income of a non-tobacco farmer is higher than that of a tobacco farmer with an average annual difference of USD 198. This is a significant difference in living standards at the local level. Moreover, a tobacco farmer spends more income (\$ 35) per year on medical/ health care services than a non-tobacco farmer, an indication that tobacco farming households are prone to illnesses. In terms of social status, the two groups displayed the fact that both categories of farmers' households like keeping and maintaining a slightly high household size of an average of 9 persons to ensure labour availability for agricultural activities. Tobacco farming is labour intensive and partly encourages polygamy, though to a large extent, it is also a cultural practice in the region. It was also noted that majority of the non-tobacco farmers' households had better educational levels than those of tobacco-growing households. Absence of marked

difference in the ownership of livestock and household assets by the two groups was noted.

In conclusion, although households engage in tobacco farming to improve their standards of living in the region, tobacco farming seems to have added little or no difference in the livelihood of tobacco households in the region. Hence, the need to provide other alternative sources of livelihood to tobacco-growing households in the South Nyanza region, Kenya.

Objective 2: To experiment on the potential and people's attitudes of adopting bamboo as an alternative crop to tobacco or source of livelihood to small-holder tobacco farmers in the region.

The study findings indicated that bamboo does well in soil, topographical and agro-climatic conditions similar to those of tobacco and will fetch 4-5 times more in terms of incomes. Survival rates of 70-90% were recorded. Besides numerous economic advantages of bamboo, social and environmental problems associated with tobacco farming can be reduced through bamboo production (see Table 2 below). Existing curing skills and structures used by tobacco farmers can also effectively be utilized in bamboo processing. The study concluded that the shifting from tobacco to bamboo is possible because the majority of farmers are willing. However, they must be well trained on bamboo processing at the community level and the market should be well structured with more bamboo species introduced in the region because of their diversified uses.

It is further recommended that the bamboo growth performance monitoring should continue to maturity around September/ October 2009 for final conclusions to be made on its economic potential in the area. To replace tobacco with bamboo in the long run, this experiment needs to be replicated in the other 3 remaining tobacco-growing regions in the country. Capacity building will be very important through training and farmers empowerment in bamboo farming and processing.

Objective 3: To undertake an assessment of marketing dynamics as a feedback to investment in the bamboo industry in the region and Kenya.

The survey indicated that in Kenya, bamboo is mostly found in Central, Rift Valley, Western and Coastal provinces. It is mainly traditionally used in residential fencing, horticultural flower farming, handcrafts and processing of minor cottage industrial products. Kenya has so far recorded up to 48 local bamboo uses, but in limited scales. Most bamboo products in local supermarkets are mainly imported from China (72%), India (26%) and Thailand (2%), in that order, a scenario that results high product prices and low demand among the majority of Kenyans who are in the low and middle-income brackets. Toothpicks, mats and baskets are the products in high demand, thus, the need to encourage domestic production of the products. Conditions of imperfect competition with oligopolistic tendencies characterize the formal retail market, hence the need to strengthen its competition through consumer enlightenment and information

dissemination. While the demand for bamboo products is high, there exists no bamboo management policy and marketing network in the country.

Table 2: Comparison between tobacco and bamboo	
Disadvantages of tobacco	Advantages of bamboo
<ul style="list-style-type: none"> • Has very minimal uses most of which are hazardous to human health e.g. smoking and chewing 	<ul style="list-style-type: none"> • Has over 2,000 uses so far recorded in Asia e.g. fencing, shoots for food, making toothpicks, handicrafts
<ul style="list-style-type: none"> • Low annual yields associated with insufficient returns of Ksh 20,000/acre/annum 	<ul style="list-style-type: none"> • High annual yields of about 17 tons per acre in a well managed plantation, approximately Ksh 83,910 per annum
<ul style="list-style-type: none"> • High demand for wood fuel e.g 25 tons per annum per acre during the curing process 	<ul style="list-style-type: none"> • Less demand for wood fuel during the treatment process. Bamboo residues alone are sufficient in treatment/ curing.
<ul style="list-style-type: none"> • Environmental pollution due to increased use of fertilizers and other chemicals that pollute soil and water bodies. 	<ul style="list-style-type: none"> • Environmental conservation e.g purification of air and polluted water bodies. No farm application of fertilizers and chemicals.
<ul style="list-style-type: none"> • Enhances soil infertility as it extracts several nutrients from the soil, leaving it almost barren. 	<ul style="list-style-type: none"> • Ensures bio-remediation and improves soil fertility due to the decomposing leaves and sheaths.
<ul style="list-style-type: none"> • High risks associated with natural calamities like hailstones, diseases and fire out breaks. 	<ul style="list-style-type: none"> • Fewer risks associated with natural calamities like hailstones, diseases and fire out breaks in well maintained farms.
<ul style="list-style-type: none"> • High labour intensive and promotes child labour especially during harvesting and curing periods to avoid damages and losses ascribed to climatic changes when it matures. 	<ul style="list-style-type: none"> • Less labour intensive and no child labor requirement during harvesting.
<ul style="list-style-type: none"> • Matures in about 6-7 months and requires a lot of capital and labour investments every season. 	<ul style="list-style-type: none"> • Matures in about 3-4 years and can be harvested for up to 80-120 years with very little capital investments.
<ul style="list-style-type: none"> • Leads to deforestation hence soil erosion. 	<ul style="list-style-type: none"> • Good in soil stabilization and river bank protection.
<ul style="list-style-type: none"> • Minimal local processing activities with limited employment opportunities. 	<ul style="list-style-type: none"> • Promotes community based processing and creates employment opportunities.

Objective 4: To develop community action plans to ensure a reduction of tobacco production in the region through livelihood diversification/poverty alleviation strategies.

Major new research problems/ challenges that emerged during the Community Action Planning process that require further investigation or action include the following:-

- Group dynamics and leadership competition in the 4 bamboo farmers groups
- Lack of physical office infrastructure/ facilities for community groups
- Establishment of a marketing system (cooperative or private companies or new bamboo processing groups) for bamboo products
- Provision of protective equipment for all bamboo farmers
- Water scarcity / climate vulnerability
- Destruction of bamboo plants by domestic and wild animals
- Local cultural/ traditional misconceptions and stigma on bamboo as a crop associated with witchcraft.
- Limited knowledge on bamboo growth patterns/ trends and utilization
- General management and care of bamboo farms by individual farmers
- Limited bamboo varieties availability
- Lack of local means of transport for bamboo monitoring and evaluation by farmers' group officials

The farmers indicated that most of the above issues were urgent and a partnership approach is required in dealing with them by the farmers themselves with the support of the Ministry of Cooperatives, Ministry of Agriculture, Ministry of Environment, Ministry of Forestry, Media houses, Donors, local and international NGOs, Constituency Development Fund (CDF) committees, private sector, Maseno University, World Health Organizations (WHO) and other possible project supporters.

Objective 5: To build the capacity of tobacco small-holder farmers in bamboo production and processing to ensure improved livelihoods.

In reference to the last four interim technical reports, several trainings in relation to bamboo cultivation and processing were conducted to build the capacity of both farmers and the project staff. The Basic Trainings on Bamboo Farming and Processing Technologies conducted throughout the project period were a major impetus to the acceptance of bamboo as a new crop and livelihood strategy in the region. This is because the trainings acted as an eye opener on the multiple and wide market potential of bamboo at local, regional and international markets in the long run. The trainings changed peoples' negative attitude towards bamboo (i.e. a plant previously perceived as having no economic returns and associated with witchcraft especially among the Luo community).

It was also evident that some participating trainees had some important traditionally acquired skills and talents relevant to the processing of bamboo items. Such skills were in the area of traditional basketry, carpentry, artwork and making of fishing gear. If such skills were harnessed and diverted to bamboo utilization, it would be a major boost to bamboo industry in the region. Hence, such people should be targeted in future bamboo processing trainings.

The bamboo utilization training implied that there is a large market potential for bamboo products in the region. This was shown by the sale of most bamboo products (toothpicks, furniture, animal yokes, musical instruments, fishing gear, arrow boxes, etc) made during the training workshops.

One other lesson learned from training was that farmers in the various sites (communities) had varied interests on bamboo utilization. In Kuria District, the farmers' interest was in socio- cultural uses e.g. making arrow boxes and flutes due to the long-term insecurity in the area. In Suba District, the interest was in fishing related items/ gear e.g. fishing lump holders and baskets due to its proximity to Lake Victoria fish landing beaches. Interest in modern household items such as tables and chairs and farm implements like yokes was common in Migori District, due to their extensive crop farming practices by using animal labour. Finally, Homa bay District participants were keen on using bamboo in socio-cultural uses/ entertainment e.g. traditional musical instruments (Orutu), sport trophies and household items. Hence, the study showed that the economic and socio-cultural values attached to different bamboo products differ from one community/ locality to another.

6.0 Project outputs

The project had several outputs categorised into three: research, capacity and policy/ practice outputs. These are as listed below and accessible to the appended DVD to this report. They can also be accessed directly without prior permission from the project website: <<http://www.tobaccotobamboo.com>>.

6.1 Research outputs (reports, journal papers, book chapters)

1. Kibwage, J. K.,(2007). *Diversification of Household Livelihood Strategies for Tobacco Small-holder Farmers: A Case Study of Introducing Bamboo in the South Nyanza Region, Kenya*. A chapter in the book: *The Principle of Sustainability: An Interdisciplinary View*, ISBN No. 9966-932-41-1, pp 91-104 DAAD/Goethe-institut, Nairobi.
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8. Kibwage J. K, Netondo GW, Odondo A, Momanyi GM, Kapiyo RA, Nyantika D (2007a). *Second Technical Project Progress Report on Diversification of Household Livelihood Strategies for Tobacco Smallholder Farmers: A Case Study of Introducing Bamboo in South Nyanza Region, Kenya*. Maseno University/ IDRC, Canada. Available at <http://www.tobaccotobamboo.com/index.php?PID=5>.
9. Kibwage J. K, Netondo G. W.; Odondo A, Momanyi G. M.; Kapiyo R. A.; Nyantika D. (2008a). *Third Technical Project Progress Report on Diversification of Household Livelihood Strategies for Tobacco Smallholder Farmers: A Case Study of Introducing Bamboo in South Nyanza Region, Kenya*. Maseno University/ IDRC, Canada. Available at <http://www.tobaccotobamboo.com/index.php?PID=5>.
10. Kibwage J. K, Netondo G, W.; Odondo A, Momanyi G. M.; Magati P. O.; Awadh AH, Kapiyo RA, Nyantika D (2008b). *Fourth Technical Project Progress Report on Diversification of Household Livelihood Strategies for Tobacco Smallholder Farmers: A Case Study of Introducing Bamboo in South Nyanza Region, Kenya*. Maseno University/ IDRC, Canada. Available at <http://www.tobaccotobamboo.com/index.php?PID=5>.

Other journal papers under preparation and are expected to be published before December 2009 include the following:-

1. *The Impact of Tobacco Farming on Food Security in South Nyanza Region, Kenya*
2. *Effectiveness of Religion as an Instrument of Tobacco Production Control in South Nyanza Region, Kenya*
3. *Tobacco Farming and Gender Issues in South Nyanza Region, Kenya*

4. *Bamboo Growth Trends and Estimated Economic Productivity in South Nyanza, Kenya*
5. *Cost-benefit Analysis of Tobacco and Bamboo Small-holder farming in South Nyanza, Kenya.*
6. *Modelling Appropriate Bamboo Plant Spacing in South Nyanza, Kenya.*
7. *Situational Analysis of Child Labour in Tobacco Growing areas of Southern Nyanza, Kenya*
8. *Traditional and Socio-cultural Issues of Bamboo Farming in South Nyanza, Kenya*
9. *Forecasting Bamboo Culm Density and Crown Cover in Relation to Intercropping Systems in South Nyanza, Kenya*
10. *Bamboo Micro-Enterprises and their Capacity in Urban and Rural Poverty Alleviation in Kenya*

6.2 Capacity outputs

1. The project led to establishment of four (4) community-based organisations whose majority members were former tobacco farmers. Each group owns a small-scale bamboo processing workshop for furniture, handcraft and other household products. The groups are envisaged to develop to bamboo cooperatives in the future in order to provide the institutional capacity and support required by farmers shifting from bamboo to tobacco. These 4 groups are:-
 - a) Migori Bamboo (*Modi*) Farmers Group, based at Ngege Market Centre, Migori district.
 - b) Kuria Bamboo (*Imiere*) Farmers Group, based Ikerege Market Centre, Kuria District.
 - c) Homa bay Bamboo (*Modi*) Farmers Group, based Rangwe Market Centre, Homabay district.
 - d) Bamboo (*Modi*) Farmers Group, based at Sindo Market Centre, Suba District.
2. Establishment of a small research office at Maseno university soon changing to Tobacco-Bamboo Research Centre (TOBAREC). The office has basic equipment for research in the area of tobacco control.
3. Trained four (4) project staff in global tobacco control policies and strategies through the attendance of local and international meetings/ conferences. Through the publications from the project, the key project staff have been promoted at Maseno University. Furthermore, the two Master of Arts students that were trained through the project resources have been employed to lecture at local universities.
4. Trained 120 small holder farmers (tobacco and non-tobacco) on bamboo cultivation, bamboo farm management, utilization (treatment, handcraft weaving & furniture processing technologies) and livelihood diversification.
5. Trained 2 masters' students who accomplished their studies in 2007 and 2008, respectively and 2 more are on-going. The current students undertaking the

masters' programmes through partial support from the project are also expected to graduate by December, 2009.

6. Sensitization of 120 farmers and an estimated 20 key stakeholders (especially Government District Agricultural and Environmental Officers) on the negative environmental and human implications of tobacco production.
7. Establishment of a small library of hard and soft copies of relevant literature on tobacco control and bamboo production industry.
8. Establishment of 120 bamboo field experimentation sites (farms). This will enable long term monitoring of bamboo growth performance in the region.
9. Formulation of standard questionnaires for comparing livelihoods of tobacco and non-tobacco farmers in any rural setting with regional modifications.
10. Development of a general Community Action Plan to enable the shifting of farmers from tobacco to bamboo production industry.
11. The project staff have the capacity to empower other communities in bamboo production and processing in the country through trainings.

6.3 Policy and Practice outputs

1. Two Policy Briefs were drafted and submitted to stakeholders (especially the Ministries of Health, Agriculture, Forestry and Environment) for review before publication and launching expected in July/ August 2009. These are:-
 - a) First Policy Brief on the *“Need for Alternative Crops to Tobacco Farming in Kenya”*
 - b) Second Policy Brief on *“Bamboo Production as an Alternative Livelihood to Tobacco Farming”*
2. Establishment of a project website, ***www.tobaccotobamboo.com***. The site has information on the project vision, objectives, research methods, outputs, partners/ collaborators/ stakeholders, progress reports, publications and other resources. The website has now been linked to other websites like IDRC (RITC) and Maseno University. It will also soon be linked to the websites of Ministries of Health, Forestry, Environment and Agriculture in Kenya, WHO, DIFD, etc. This website has proved useful in influencing policy on tobacco control in Kenya.
3. Establishment of a network and partnership with key staff in Government Ministries of Health, Agriculture, Forestry, Environment and that of Gender, Sports, Culture and Social Services, Kenya Forestry Research Institute (KEFRI), local leaders, 4 Constituency Development Funds Committees (CDFs), Non-Governmental Organisations (NGOs) like Social Needs Network, Community Livelihood Development Forum (COLIDEF)-Africa Bamboo Centre, Kenya Anti-Tobacco Growers Association (KATOGA).

4. Empowerment of vulnerable groups engaged in tobacco farming activities. Such groups included youths, women and in particular widows. The project currently has benefited about 30% adult women 20% youths and 50% adult men. The integration of women and youths has improved the project outcomes and community acceptability. These two groups have especially been active in bamboo farm management and basic processing. Bamboo farms owned by women are always leading in terms of growth performance, an indication of better care than that from men.
5. Kibwage, J. K. et al, (2008): *South Nyanza Regional Community Action Plan for Shifting from Tobacco small holder farming to Bamboo Production* (Draft). Maseno University, Kenya.
6. Publication of posters demonstrating the shifting process from tobacco farming to bamboo industry.
7. Development of a video (DVD) demonstrating the shifting process from tobacco farming to bamboo industry in South Nyanza.
8. Project Brief in PowerPoint

7.0 Project Outcomes

The project has a high positive and tangible impact to the participating and even non-participating tobacco and non-tobacco farmers and Government agricultural officers in the South Nyanza Region. The 4 community-based bamboo farming groups formed are growing strong and operating independently with technical assistance offered by the Project Research Team. The number of tobacco and non-tobacco farmers interested in joining the groups and start bamboo cultivation as an alternative to tobacco is excessively high and continues to swell in the 4 study sites. During the initiation of this project, the number of tobacco and non-tobacco farmers was 85 and 53, respectively. However, the portion of tobacco farmers has now reduced by about 50% due to the influence of this project. On the other hand, two more masters' students have been recruited to the project for capacity building purposes. More students are keen at the University level to undertake studies related to tobacco control both at masters and doctorate levels.

The 120 farmers who undertook the trainings graduated with certificates that motivated them. Members of Parliament from each of the districts, several Government officers and the Public who attended the closing ceremonies, appreciated the importance of bamboo and the trainings. From their speeches, it could be deduced that the project has changed local leaders and people's perception that bamboo was just like any other plant growing in the region. They observed that bamboo is an important crop that should be given a special attention and be adopted as a crop in large scale for the betterment of rural livelihoods in south Nyanza region. The Members of Parliament totally changed their previous support of tobacco farming because they strongly castigated it during local project forums/ field days. The Ministry of Agriculture has also started involving the Groups in regional development events because they are the most active in the region.

The Ministry of Information and Communication has also visited and filmed and aired the activities of the four groups in local TV channels. Furthermore, local newsmen have occasionally reported on the process of farmers shifting from tobacco to bamboo due to the health and socio-cultural problems associated with the crop. In brief, the policy of changing to alternative crops is quickly taking root in the region since the inception of this project.

The study area is mainly dominated by the Luo community who traditionally believe that bamboo is associated with witchcraft and snakes. However, through the project, the community has positively changed this perception after trainings and exposure on the potential of bamboo in improving their livelihoods and local environment. However, more sensitisation programmes should continue on this aspect for sustainability and full adoption of this new bamboo industry initiative by the local farmers.

The Community Action Planning participatory process re-energized project farmers because they were able to list all their challenges and identify sources of funding. The bamboo utilization training also served as an eye opener on how to start a simple bamboo workshop for making household bamboo products that were readily demanded in the region. The CAPs process and training changed farmers' perception that bamboo was a mere crop that could not generate tangible financial returns as compared to tobacco. A number of farmers have decided to reduce their acreage on tobacco and instead grow more bamboo if provided with training, relevant inputs and support required. Even non bamboo farmers and school children who attended and witnessed the various capacity building activities were willing to join the existing farmers' groups to be able to enjoy the same benefits expected from bamboo farming.

In terms of tangible benefits, farmers have already realised that bamboo has the capacity to alleviate a multiple of problems associated with tobacco farming, i.e. food insecurity, social-cultural conflicts, poverty and environmental degradation. Some farmers have already gone a step further by expanding their bamboo farms from the initial 20 experimental seedlings. In one significant case, a former tobacco farmer in Kuria District currently has over 300 bamboo clumps.

8.0 Overall Assessment and Recommendations

The study has indicated that though most households engage in tobacco farming to improve their standards of living in the region, tobacco farming seems to have added little or no difference to their livelihood when compared to non-tobacco households in the region. Field experiments have shown that bamboo can do well in soil, agro-climatic and topographical conditions similar to those of tobacco and will fetch 4-5 times more in terms of income. The market potential for bamboo products is huge because most of those sold in the formal retail market in Kenya are imported entirely from China, India and Thailand. Besides numerous economic advantages of bamboo, social and environmental problems associated with tobacco farming can be reduced through bamboo production.

The Basic Training on Bamboo Treatment, Handcraft Weaving & Furniture Processing Technologies was a major impetus to the acceptance of bamboo in the region. This is

because it acted as an eye opener on the multiple and wide market potential of bamboo at local, regional and international markets in the long run. It is recommended that the next bamboo utilization should focus more on value addition or quality aspects of bamboo products and development of a sustainable marketing structure.

As documented in the last four technical progress reports, emerging research, development and logistical issues that require further investigation, financial and technical support in future include the following:-

- To study and rank the household livelihood strategies used by tobacco and non-tobacco farmers in the other three (3) tobacco farming clusters in Kenya as compared to the South Nyanza region results obtained in Phase I.
- The assessment of agricultural products marketing systems in the Lake Victoria Region and identify best practices that should be replicated in the upcoming bamboo industry for former tobacco farmers.
- To undertake a range of feasibility studies and provide effective business plans for smallholder tobacco farmers and related local enterprises interested in bamboo production and processing of the prioritized marketable product-chains in the country.
- Establishment and monitoring of bamboo propagation for seedling production and enterprise diversity in the south Nyanza Region. It is also recommended that the current bamboo growth performance monitoring should continue to maturity in around September/ October 2009 for final conclusions to be made on the economic potential of bamboo in the area, despite the preliminarily positive and good results.
- Environmental auditing of tobacco farming activities in South Nyanza Region by using various National Environment Management Authority (NEMA) guidelines and regulations.
- Detailed evaluation of the project to determine its impact on tobacco control activities.
- Capacity Building of staff and farmers should be a continuous process.
- Development and implementation of a communication strategy for the project

In brief, the shifting from tobacco to bamboo is possible because the majority of tobacco farmers are willing and about 50% have already shifted to the new industry during the first 3 years of experiment. Hence, there is need to provide other alternative sources of livelihood to tobacco-growing households in the South Nyanza region. This calls for more research on emerging issues from Phase one of the project activities as outlined above.

Despite the few challenges and emerging issues mentioned in this report, the project was able to meet its targets to a large extent. However, to realize fully the vision of this study, the above research needs/ recommendations should be addressed in Phase II (2009-2012) of the project. The IDRC should consider funding other research/ development areas considered fundamental to the final success of the vision of this project. For emphasis purposes, a tier approach should always be used by studying further the potential of bamboo while at the same time investigating the key issues and trends in tobacco industry. If most of the recommendations listed herein are positively considered for funding in Phase II of the project, the goal of replacing the tobacco industry with bamboo

industry will be achieved in the short to medium term. This is evidenced by the large numbers of farmers willing to abandon tobacco and start bamboo cultivation.

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