

Mekong Bamboo

Sector Feasibility Study



Final Report

1st Edition

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Prepared by:

Enterprise Opportunities Ltd



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- Enterprise Development Consultants, Laos (EDC)
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1st Edition

This Final Report 1st Edition presents the findings of the Study from work completed up to 30 June 2006. At the time of publication, research is ongoing in selected areas of potential relevance to the Study and further Editions of the study may be published in due course to incorporate further findings.

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Contents

1	EXECUTIVE SUMMARY	1
1.1	INTRODUCTION.....	1
1.2	KEY CONCLUSIONS.....	1
1.3	POTENTIAL IMPACT OF THE SECTOR	4
1.4	NEXT STEPS	6
2	INTRODUCTION.....	8
2.1	BACKGROUND.....	8
2.2	OBJECTIVES.....	8
2.3	STRUCTURE OF THE REPORT.....	9
2.4	APPROACH	10
3	RECENT DEVELOPMENTS IN THE BAMBOO INDUSTRY.....	11
3.1	NEW COMMERCIAL USES OF BAMBOO.....	11
3.2	POLICY OPTIONS FOR INDUSTRIAL PROCESSING.....	14
3.3	CONCLUSIONS	16
4	WHAT CAN BAMBOO DO FOR POVERTY REDUCTION AND RURAL DEVELOPMENT?	17
4.1	LESSONS FROM CHINA.....	17
4.2	WHO BENEFITS FROM BAMBOO?.....	18
4.3	HOW TO MAKE IT HAPPEN?.....	21
4.4	WHAT DOES THIS MEAN FOR THE MEKONG COUNTRIES?.....	26
5	THE WORLD BAMBOO MARKET	28
5.1	INTRODUCTION.....	28
5.2	OVERVIEW	28
5.3	CURRENT SIZE OF SELECTED MARKETS.....	29
5.4	FUTURE MARKET SIZES.....	32
5.5	MARKET ATTRACTIVENESS	35
5.6	INDUSTRY OUTLOOK.....	36
5.7	MARKET RECOMMENDATIONS.....	37
5.8	THE ROLE OF DOMESTIC AND REGIONAL MARKETS.....	38
5.9	TRADE CONTEXT	40
5.10	CONCLUSIONS	43
6	MEKONG SECTOR SCENARIOS.....	44
6.1	DEMAND DRIVEN SCENARIOS	44
6.2	SUPPLY DRIVEN SCENARIOS	47
6.3	MEKONG SECTOR SCENARIO SUMMARY	48
7	MEKONG SECTOR POTENTIAL.....	50
7.1	APPROACH	50
7.2	EFFICIENCY OF IMPACT	53
7.3	SCALE OF IMPACT.....	58
7.4	ENVIRONMENTAL IMPACT	61
7.5	SUMMARY OF IMPACT	64

8	VIETNAM.....	66
8.1	CURRENT STATUS	66
8.2	COMPETITIVE ADVANTAGES.....	71
8.3	SECTOR POTENTIAL.....	72
8.4	SWOT – VIETNAM BAMBOO SECTOR	74
8.5	SUMMARY	75
9	LAOS.....	76
9.1	CURRENT STATUS	76
9.2	COMPETITIVE ADVANTAGES.....	83
9.3	SECTOR POTENTIAL.....	84
9.4	SWOT – LAOS BAMBOO SECTOR.....	85
9.5	SUMMARY	86
10	CAMBODIA	87
10.1	CURRENT STATUS	87
10.2	COMPETITIVE ADVANTAGES.....	91
10.3	SECTOR POTENTIAL.....	92
10.4	SWOT - CAMBODIA BAMBOO SECTOR.....	93
10.5	SUMMARY	93
11	RECOMMENDATIONS	94
11.1	GENERAL CONCLUSIONS.....	94
11.2	VIETNAM RECOMMENDATIONS.....	97
11.3	LAOS RECOMMENDATIONS	103
11.4	CAMBODIA RECOMMENDATIONS	107
12	PHASE 2 PROGRAMMING.....	110
12.1	OVERALL STRUCTURE	110
12.2	NEXT STEPS.....	111
	REFERENCES	112
APPENDIX 1	THE ‘GLOBAL MARKETS’ IN WHICH BAMBOO COMPETES.....	I
APPENDIX 2	TRADE PERFORMANCE DATA.....	XII
APPENDIX 3	EXCHANGE RATES.....	XIV

List of Tables

Table 1-1: Summary of Mekong Sector Potential.....	5
Table 3-1: Industry mix in different industrial models.....	14
Table 5-1: Rationale for Current Bamboo Market Estimates.....	31
Table 5-2: World bamboo market scenarios.....	33
Table 5-3: Market Recommendations	37
Table 5-4: ACFTA Tariff Reduction Schedule	41
Table 5-5: US and EU MFN Tariff for selected bamboo goods.....	42
Table 6-1: ‘Demand driven’ Mekong sector scenarios.....	45
Table 6-2: Contributions of each sub-sector under different scenarios.....	46
Table 6-3: Implied Mekong Industry Growth Rates.....	47
Table 6-4: ‘Supply driven’ Mekong Sector Scenarios.....	48
Table 6-5: Mekong Sector Scenarios.....	49
Table 7-1: Rate of impact of bamboo industry supply chains	53
Table 7-2: : Potential scale of impact of the Sector - Scenario 1	58
Table 7-3: Potential scale of impact of the Sector - Scenario 2.....	59
Table 7-4: Scale of impact by sub-sector - Scenario 1	60
Table 7-5: Scale of impact by sub-sector - Scenario 2	60
Table 7-6: Summary of Mekong Sector Potential.....	65
Table 8-1: Scale of impact in Vietnam by sub-sector - Scenario 1	73
Table 8-2: Scale of impact in Vietnam by sub-sector – Scenario 2.....	73

List of Figures

Figure 1-1: Phase 2 Programme Structure.....	7
Figure 3-1: The many uses of bamboo	12
Figure 3-2: Pro-poor impact and material requirement in different industrial supply chains	13
Figure 3-3: Pro-poor impact under different industrial models.....	15
Figure 4-1: Bamboo was the pioneering industry in Anji’s economic transformation.....	17
Figure 4-2: The importance of bamboo for farmers in different income groups in Anji County .	19
Figure 4-3: Ruiz Pérez et al.'s idealised model of the role of bamboo in development.....	20
Figure 4-5: Intensification drives Anji’s bamboo production growth	23
Figure 5-1: Size of selected 'Global Markets' (USD m).....	30
Figure 5-2: Size of selected 'Bamboo Markets' (USD m)	30
Figure 5-3: The growing importance of the new bamboo markets	34
Figure 5-4: Attractiveness of the Markets.....	35
Figure 7-1: Employment creation and Pro-poor financial impact	55
Figure 7-2: Women in the supply chain (% of total FTEs).....	56
Figure 7-3: Distribution of employment in selected bamboo supply chains.....	57
Figure 7-4: Declining yields of annual crops on sloping land in North Vietnam	62
Figure 8-1: Trade flows of 'luong' bamboo in Thanh Hoa, Vietnam	67
Figure 9-1: Laos market size estimate	77

Figure 9-2: Differential role of bamboo in household livelihoods (excluding livestock)..... 81
Figure 9-3: Economic Returns (“land rent”) of livelihoods in Viengxay District, Houaphan 82
Figure 10-1: Cambodia market size estimate..... 88
Figure 12-1: Phase 2 Programme Structure..... 111

Glossary of terms and abbreviations

Acronyms

ACFTA	ASEAN China Free Trade Area
ADB	Asian Development Bank
AFTA	ASEAN Free Trade Area
ASEAN	Association of South East Asian Nations
BJC	Builders' joinery and carpentry
EDC	Enterprise Development Consultants, Laos
EO	Enterprise Opportunities Ltd
FAO	Food and Agriculture Organisation of the United Nations
GRET	Groupe de Recherche et d'Echanges Technologiques
IDE	International Development Enterprises
IFC	International Finance Corporation
INBAR	International Network for Bamboo and Rattan
IPSARD	Institute of Policy and Strategy for Agricultural and Rural Development (MARD), Vietnam
ITC	WTO / UNIDO International Trade Centre
MARD	Ministry of Agriculture and Rural Development, Vietnam
MFN	Most Favoured Nation
MPDF	Mekong Private Sector Development Facility
NUOL	National University of Laos
OHK	Oxfam Hong Kong
PAFO	Provincial Agriculture and Forestry Office, Laos
SFE	State forest enterprise
SOE	State owned enterprise
UNIDO	United Nations Industrial Development Organisation
WTO	World Trade Organisation

Terms

Culm	An individual stem or woody pole-like section of the bamboo plant.
Mat board	Bamboo based board product, with similarities to plywood. Typically made through the lamination of layers of woven bamboo mat.
Mekong	For the purposes of this study refers to the three study countries: Vietnam, Laos and Cambodia.
Nieyou	A system of labelling bamboo used in Anji in which every culm is marked with its year and owner at 1 yr old while it is still growing.

1 Executive Summary

1.1 Introduction

This feasibility study is the first phase of a multi-phase project to facilitate the pro-poor development of the bamboo sector in Vietnam, Laos and Cambodia. This phase aims to assess the potential social and economic impact of the industry and identify immediate priorities for the development of subsequent phases.

Phase 2 will involve initial sector facilitation, pilots and further detailed research and planning. Phase 3 and beyond will implement increasingly active market facilitation strategies before a managed exit.

The study seeks to:

- evaluate the potential of the bamboo sector in Laos, Vietnam and Cambodia;
- identify the scale and scope of the sector and the likely benefits accruing to sections of the value chain, including the various targeted poor groups in each country;
- develop and evaluate sector development scenarios;
- develop plans for subsequent stages of intervention, including priority interventions and their nature and scale, and a proposed scoping and staging of subsequent phases of the bamboo sector development.

The study provides an evaluation of the potential of the sector via analysis of resources, technology processes, product markets, input markets, and institutional contexts. It combines the collection and analysis of primary data from fieldwork in the three countries with international research on technologies and markets for bamboo.

1.2 Key conclusions

The opportunity

- The world market for bamboo products is USD 7bn+ p.a.¹
- Bamboo can be a lead industry for rural industrialisation and large scale poverty reduction in bamboo producing areas.
- Governments at local and national level must provide sustained and consistent leadership if the sector is to develop.
- The outlook for world bamboo markets looks strong, driven by world economic growth and growing demand for sustainable wood-replacement products.

¹ Including: handicrafts, bamboo shoots, chopsticks, blinds, flooring, furniture, panels, builders' joinery & carpentry, charcoal and activated carbon. Excluding paper/pulp and unprocessed bamboo used in construction and household uses.

- The industry can be divided into three distinct sub-sectors:
 - Handicrafts,
 - Bamboo shoots,
 - Industrial processing (such as chopsticks, blinds, flooring, paper).
- The bamboo industry is currently dominated by traditional products such as handicrafts, bamboo shoots, chopsticks and bamboo & rattan furniture accounting for more than 90% of world demand.
- The commercialisation of recent innovations in bamboo processing has created significant new market opportunities in areas such as flooring, laminated furniture, panels and activated carbon.
- Processing innovations are proven in the market place and specialist bamboo processing machine tool industries exist supplying 'off-the-shelf' processing lines to larger businesses and affordable equipment to household processors.
- New, higher added-value processing greatly increases the potential for pro-poor financial impact compared to traditional lower value processing industries. For example, every tonne of bamboo used for producing bamboo flooring has 5 times the pro-poor financial impact than if used for paper.
- There are significant opportunities to exploit linkages between industries in the three countries as well as with producer and end user markets in China.
- Markets in US, EU and Japan present significant opportunities for many of the higher value products.
- The competitiveness of future bamboo industries will be largely driven by the 'value added utilisation' rate, with different parts of the bamboo plant being used in the most profitable way.

Potential in the Mekong countries

- In the region, the sector has the potential to be worth approx. USD 1.2bn annually within ten years, providing approx. 1.2m jobs (full time equivalent) and up to USD 900m p.a. pro-poor financial impact², mostly in rural areas.
- Vietnam has:
 - an increasingly diversified industry worth approx. USD 250m p.a.,
 - sizeable bamboo resources of approximately 1.4m ha.,
 - growing recognition of the sector from government and others,
 - active interest from buyers and investors,
 - improving business environment for rural SMEs,
 - significant market distortions from state enterprises,
 - potential to develop a USD 1bn+ p.a. industry benefiting poor rural communities and the wider economy.

² 'Pro-poor financial impact' is defined as the proportion of total output value captured by poor communities, primarily in the form of waged labour and income to farmers and local enterprises (see main report for further details).

- Laos has:
 - potential to develop a vibrant bamboo industry,
 - a large bamboo resource of 1.4m+ ha. mostly un-exploited,
 - a small bamboo sector worth approximately USD 4m p.a.,
 - growing linkages with neighbouring industries in Vietnam,
 - potential to leverage its proximity to the expanding bamboo sectors and markets in China, Vietnam and Thailand,
 - challenging business environment,
 - limited recognition of the sector in official policy.
- Cambodia has:
 - a small bamboo sector worth around USD 7m p.a., dominated by household production of baskets (70%) which is heavily reliant on Thai export markets,
 - declining bamboo resources,
 - stagnant or declining fishgear and bamboo shoots industries,
 - potential to improve the productivity and impact of its existing industries,
 - a need to diversify its markets,
 - challenging operating conditions for enterprises and farmers,
 - limited current opportunities for developing a diversified bamboo processing industry.

Actions required

Priorities in all three countries include:

- sharing the findings of the study,
- building the network of government agencies, donors, INGOs and private sector participants to drive the development of the industry,
- defining detailed action plans for Phase 2.

Additional priorities include:

In Vietnam, immediate action is required to:

- work with MARD and provincial authorities to inform the development of national and provincial strategies and action plans,
- support the continued development of supply chains in Thanh Hoa, to avert set-backs with prolonged negative effects,
- deepening our understanding of critical issues that have emerged during the Phase 1 study (e.g. paper industry, SFE's).

In Laos:

- fostering linkages with the industry in Vietnam.
- working with provincial authorities to inform the development of local strategies and action plans,

In Cambodia:

- deepening our understanding of critical issues that have emerged during the Phase 1 study e.g. Thai market for basketware.

1.3 Potential impact of the sector

The study has assessed the potential impact of the sector from a number of perspectives:

- Scale of impact
- Efficiency of impact
- Gender bias of impact
- Rural bias of impact
- Environmental impact

Taken together, these measures indicate clear choices about strategic policy options at both national and provincial level.

Each of the sub-sectors, and their associated supply chains, can make an important contribution to rural development and poverty reduction. However, as shown in Table 1-1, there are important differences in the nature of their impact:

- **Handicraft:** is most important for employment creation and has the highest impact efficiencies per ha. of bamboo used although delivers relatively few benefits to farmers.
- **Bamboo shoots:** is a high impact niche that primarily delivers high levels of benefits to a relatively small group of farmers.
- **Industrial processing:** is most important for overall pro-poor financial impact and is the only sub-sector capable of delivering widespread benefits to farmers.
 - **Premium processing (e.g. flooring):** has high rates of financial impact efficiency, comparable to bamboo shoots, but on more than twice the scale. It also creates more employment than all other areas, except handicrafts. The scale of the industry should be maximised to fully exploit available premium grade bamboo.
 - **Medium value processing (e.g. chopsticks):** creates substantial employment and pro-poor financial impact. It has impact rates typical of the industrial processing sub-sector as a whole and should be expanded as part of a diversified industrial processing sector.
 - **Low value and bulk processing (e.g. paper):** has impact rates of only $\frac{1}{5}$ of premium processing industries and a correspondingly low total scale of pro-poor impact. However, the industry has an important role within a diversified industrial processing industry as a value-added user of lower grade bamboo and leftovers and processing waste from other industries.
 - **Raw culm supply:** has the lowest rate of pro-poor impact, but is an inherent part of the sector due to bamboo's great versatility.

The sector in the region is estimated to have the potential to grow to be worth approx. USD 1.2bn p.a. over the next ten years, providing approx. 1.2m jobs (full time equivalent) and approx. USD 900m p.a. of pro-poor financial impact.

Given the current stage of development of the industry in each country, it is estimated that a majority of the potential will be realised in Vietnam (approx. 97%). It is estimated that in Laos there is the potential to develop a sector worth USD 20m p.a. within the next 10 years and in Cambodia a USD 10m p.a. sector.

Table 1-1: Summary of Mekong Sector Potential

(Mekong Sector Scenario 2 - "Greater share of growing world markets")

Sub-sector	Overall impact	Impact scale			Impact efficiency			Gender bias of impact % of FTEs to women	Rural bias of impact % of FTEs to rural communities	Environmental Impact
		Pro-poor financial impact	Financial output	Job creation	Pro-poor financial impact	Financial output	Job creation			
		\$m	\$m	FTE (000's)	\$/ha.	\$/ha.	FTE/ha.			
Handicrafts	*****	***	***	*****	*****	*****	*****	*****	*****	*****
		266	336	920	11,300	14,300	39.2	60%	95%	
Bamboo shoots	**	**	*	*	*****	*****	*	*	*****	****
		111	136	16	3,100	3,800	0.4	30%	100%	
Industrial Processing	*****	*****	*****	****	**	**	***	***	***	***
		532	716	296	1,113	1,498	0.6	45%	62%	
Premium Processing	****	***	***	***	*****	*****	*****	*****	**	***
		263	340	129	2,400	3,100	1.2	49%	35%	
Medium Value Processing	***	**	**	***	***	**	***	*****	*****	***
		163	190	123	1,037	1,333	0.9	46%	72%	
Low value & bulk processing	*	*	*	*	*	**	*	**	*****	***
		46	126	20	455	1,050	0.2	37%	81%	
Raw bamboo	*	*	*	*	*	*	*	*	*****	****
		60	60	24	360	360	0.1	31%	100%	
Total		909	1,185	1,232	1,690	2,203	2.3	56%	87%	

Note: Data shown is for whole supply chains

Source: Study analysis

1.4 Next steps

The long time-scales required to facilitate the development of the sector in the different countries dictate that national and local governments will need to play a central role and provide consistent and sustained leadership in the development of the sector.

One of the primary objectives of any programme will be to develop a widely supported framework for the development of the sector to guide the actions of a range of different participants including government, private sector, farmer and producer groups, donors and the development sector.

Furthermore, the management of regional and national sector development work requires a management structure which is able to:

- coordinate the wide interests of donors and those already engaged or interested in supporting a coordinated approach to the sector's development,
- build appropriate partnerships and management mechanisms to manage a large and complex initiative such as this,
- support/advise government engagement in national, provincial and local strategies and plans to create an enabling environment for the development of the sector,
- support the participation of farmers, domestic businesses and multinational companies in the range of initiatives required to develop the sector,
- identify, initiate and coordinate a range of projects and initiatives.

The final structure of the programme will need to evolve over time with the input from governments, key donors or other participants. However, based on the considerations outlined above, the following programme framework is recommended:

Figure 1-1: Phase 2 Programme Structure

	Vietnam	Laos	Cambodia	Regional	Key Focus
Co-ordination & management	<ul style="list-style-type: none"> VN dev. aid coordination and promotion. VN networks Project & policy co-ordination 	<ul style="list-style-type: none"> Laos dev. aid coordination & promotion. Laos networks Project & policy co-ordination 	<ul style="list-style-type: none"> Local dev. aid coordination and promotion. Local networks. Project & policy coordination 	<ul style="list-style-type: none"> Regional dev. aid coordination and promotion. International & regional networks 	<ul style="list-style-type: none"> Pro-active leadership of: Project and policy coordination. Development aid coordination. Network facilitation
Policy, strategy & research	<ul style="list-style-type: none"> National strategy & development plan Provincial dev. plans BEE / farmer policy 	<ul style="list-style-type: none"> Local sector development plans BEE Farmer & forestry policies 	<ul style="list-style-type: none"> BEE Land use / farmer context Integration into local development plans 	<ul style="list-style-type: none"> Regional & int'l trade promotion. Impact monitoring Knowledge sharing 	<ul style="list-style-type: none"> National & local policies & planning to stimulate the parallel growth of: markets & industries farmers & resources
Markets & processing industries	<ul style="list-style-type: none"> Investment promotion Technology & mgt dissemination Value chain pilots Market access 	<ul style="list-style-type: none"> Investment promotion Technology & mgt dissemination Value chain pilots Market access 	<ul style="list-style-type: none"> Small enterprise focus Upgrading handicraft, shoots & fishgear sectors Market research (e.g. Thai baskets) 	<ul style="list-style-type: none"> Market Research Technology adaptation Standards development FDI promotion 	<ul style="list-style-type: none"> Development of 3 distinct industry groups: Handicrafts Industrial processing Bamboo shoots
Resources & farmers	<ul style="list-style-type: none"> Awareness promotion Farmer extension & support Production pilots and trial 	<ul style="list-style-type: none"> Awareness promotion Farmer extension & support Production pilots and trial 	<ul style="list-style-type: none"> Link to community forestry plans Farmer extension & support 	<ul style="list-style-type: none"> Knowledge sharing Resource planning coordination 	<ul style="list-style-type: none"> Intensification and expansion of bamboo production to meet expected future demand for commercial species.
Steering Group	Government, MPDF, Oxfam, Key donors	Government, MPDF, Oxfam, Key donors	Government, MPDF, Oxfam, Key donors	MPDF, Oxfam, Key donors	

The speed of implementation of this framework in each country should reflect the local conditions and priorities.

We believe that there are sufficient immediate opportunities for the establishment of preliminary programmes in Vietnam and at the Regional level in order to establish the full second Phase of the OHK-MPDF Mekong bamboo sector initiative.

In Laos and Cambodia, we recommend that the initial implementation be completed on a more pragmatic, project-by-project basis with a strong provincial focus. Initially, this work should be co-ordinated through the regional programme and local partners with distinct country programmes being established when the scale and momentum warrants it.

To reduce complexity and management bottlenecks, the core programme should not seek to manage the funding and delivery of all the activities needed, but act in a co-ordination and facilitation role between donors, governments and other sector participants. At both a regional and national level, some activities will be managed and funded through the core programme, while others will be implemented by other organisations who are broadly aligned to the overall framework for the development of the sector.

2 Introduction

2.1 Background

This feasibility study is the first phase of a multi-phase project to facilitate the pro-poor development of the bamboo sector in Vietnam, Laos and Cambodia. This phase aims to assess the potential social and economic impact of the industry and identify immediate priorities for the development of subsequent phases.

Phase 2 will involve initial sector facilitation, pilots and further detailed research and planning. Phase 3 and beyond will implement increasingly active market facilitation strategies before a managed exit.

At the outset of this process, the OHK-MPDF framework document stated:

“Bamboo has the potential for transformational economic, environmental and social benefits to poor communities in the region. There is an emerging bamboo production sector in Vietnam serving domestic demand for chopsticks, paper pulp and unprocessed structural materials, as well as an emerging high quality export demand. There is considerable scope to develop unexploited production potential to serve growing existing and new product markets domestically, regionally and in the West. The opportunity exists to shape the emergence of the sector to ensure benefits accrue across the value chain including for poor farming communities and towns close to source.”

This reports presents a range of analysis and evidence which validates these initial opinions.

2.2 Objectives

The study seeks to:

- evaluate the potential of the bamboo sector in Laos, Vietnam and Cambodia;
- identify the scale and scope of the sector and the likely benefits accruing to sections of the value chain, including the various targeted poor groups in each country;
- develop and evaluate sector development scenarios;
- develop plans for subsequent stages of intervention, including priority interventions and their nature and scale, and a proposed scoping and staging of subsequent phases of the bamboo sector development.

2.3 Structure of the Report

The main report begins by reviewing the international context for the bamboo industry:

Section 3: Recent developments in the bamboo industry - outlines recent developments in the industry and the opportunities that these have created.

Section 4: What can bamboo do for poverty reduction and rural development? - reviews evidence of the potential role of bamboo in rural development, with an emphasis on experiences from China.

Section 5: The world bamboo market - provides an overview of selected world bamboo markets, presenting estimates of their current size and developing scenarios for their future growth.

Having considered the wider context, the report then looks in more detail at the Mekong sector and assesses its potential scale and impact:

Section 6: Mekong sector scenarios - develops scenarios for the sector from both a demand and supply driven perspective.

Section 7: Mekong sector potential - assesses the potential socio-economic and environmental impacts of the sector under the different scenarios in terms of both efficiency and scale of impact.

The next sections of the report present summaries of the current status and specific issues for the sector in each country.

Section 8: Vietnam - presents national level information and details of key findings from the study in Thanh Hoa and Nghe An provinces.

Section 9: Laos - presents national level information and details of key findings from the study in Houaphan and Xieng Khouang provinces.

Section 10: Cambodia - presents national level information and details of key findings from the study of several bamboo supply chains spanning several provinces.

The report concludes with:

Section 11: Recommendations - presenting detailed conclusions and recommendations to support the development of the sector in the region and in each country.

Section 12: Phase 2 programming – recommends a management structure and next steps for follow-on activities.

2.4 Approach

The study provides an evaluation of the potential of the sector via analysis of resources, technology processes, product markets, input markets, and institutional contexts. It combines the collection and analysis of primary data from fieldwork in the three countries and China with international research on technologies and markets for bamboo.

To achieve the highest quality analysis across a comprehensive range of issues, the study has drawn on the expertise of a series of international and local experts from 13 different organisations.

The research was conducted in a series of distinct component studies, each with a particular thematic and geographical focus. This report presents a synthesis of these, highlighting the main findings and conclusions from each. For further details readers are encouraged to refer to the research reports from the component studies which are available on request. Reports available include:

No.	Report Title	Author	Focus
1	International Review of Current & Emerging Technologies	INBAR	International bamboo processing technologies
2	International Bamboo Markets Research	Enterprise Opportunities Ltd	International bamboo markets
3	Bamboo Trade Context Overview	OHK	Trade condition affecting bamboo in the Mekong
4	Laos Business Environment Overview	MPDF	Laos Business Environment
5	Laos Resource Mapping and Farmer Input Markets	National University of Laos	Laos Farmers & Resources
6	Analysis of Sample Value Chains and Bamboo Processing Enterprises in Laos	EDC, Laos	Laos Value Chains
7	Vietnam Business Environment Overview	MPDF	Vietnam Business Environment
8	Development of bamboo value chain: Analysis on economic context and practices in Vietnam	GRET	Vietnam Farmers & Resources
9	Insights Of Input Markets And Technological Development For Producers Of Bamboo Products	IDE	Vietnam Value Chain Inputs and Technologies
10	Vietnam Domestic Value Chains	Marije Boomsma	Vietnam Value Chains
11	Vietnam National Bamboo Resources, Trade and Policy Overview	IPSARD	Vietnam National Sector and Context
12	Cambodia Bamboo Sector Feasibility Study	McNaughton, Setephal, Maredi et al.	Cambodia Bamboo Sector

3 Recent developments in the bamboo industry

3.1 New commercial uses of bamboo

Until very recently, most people's experience of bamboo was limited to sitting on bamboo and rattan furniture, using bamboo baskets or using bamboo chopsticks to eat some bamboo shoots.

The last 15 years has seen a mushrooming of the variety of commercially available bamboo products. As well as traditional products, there is now successful commercial production of bamboo flooring, laminated furniture, building panels (similar to timber based plywood, chipboard or MDF), high quality yarn and fabrics, activated carbon, bamboo extracts and so forth. These are no longer novelty items but are successfully competing in the marketplace and gaining market share.

The emergence of bamboo as a timber substitute has coincided with a growing demand for timber at a time of declining supplies, particularly of certified wood. Bamboo's appearance, strength and hardness (comparable to oak) combined with its rapid growth cycle and sustainable harvesting make it an increasingly attractive wood substitute. The market outlook for bamboo is strong. (See Section 5 below)

These recent developments have created new opportunities for leveraging bamboo as a basis for rural industrialisation and poverty reduction. In particular, the emergence of new higher added-value processing increases the sector's potential economic impact, especially in poor rural communities, compared to traditional lower value processing industries. For example, evidence gathered directly from businesses during this study shows that in Vietnam today, every tonne of bamboo that gets used for producing bamboo flooring has almost 5 times the pro-poor financial impact than if it were used to make paper. (See Section 7)

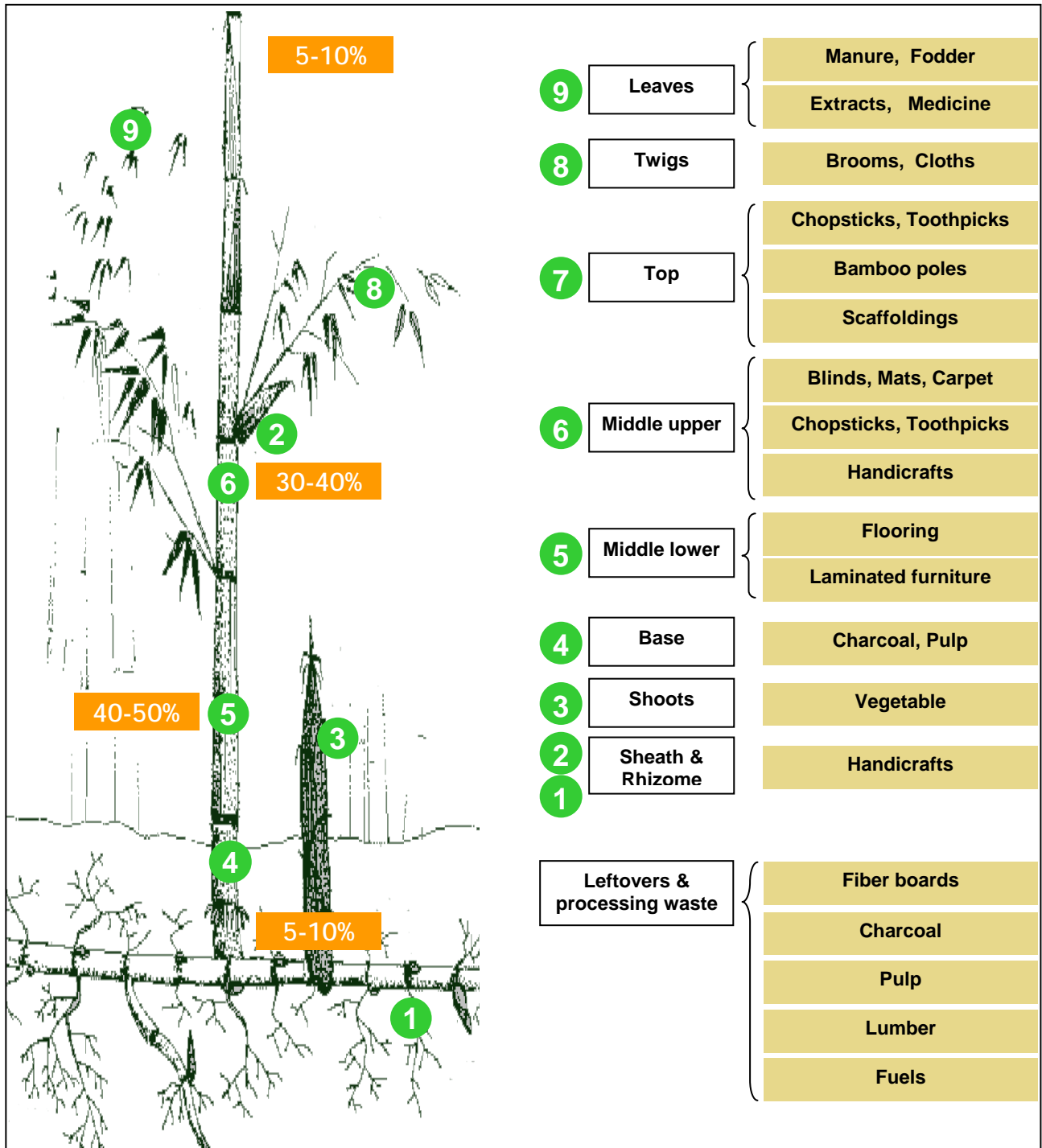
Every tonne of bamboo used for producing bamboo flooring has almost 5 times the pro-poor economic impact than if it were used to make paper.

Source: Study analysis and survey data

Unfortunately not all of the bamboo plant can be used to such effect. Premium processing needs premium parts of the bamboo (typically the middle lower part of large culms). So modern bamboo industries need a mix of different businesses producing a variety of products, with premium bamboo parts going to premium uses (e.g. flooring, laminated furniture), mid quality parts (e.g. upper mid section) going to medium value added processing (e.g. blinds, mats, chopsticks) and the leftovers, sawdust and other processing 'waste' being used in the bulk processing industries such as paper, charcoal or chipboard.

Figure 3-1 illustrates some of the main uses of the different parts of the plant.

Figure 3-1: The many uses of bamboo



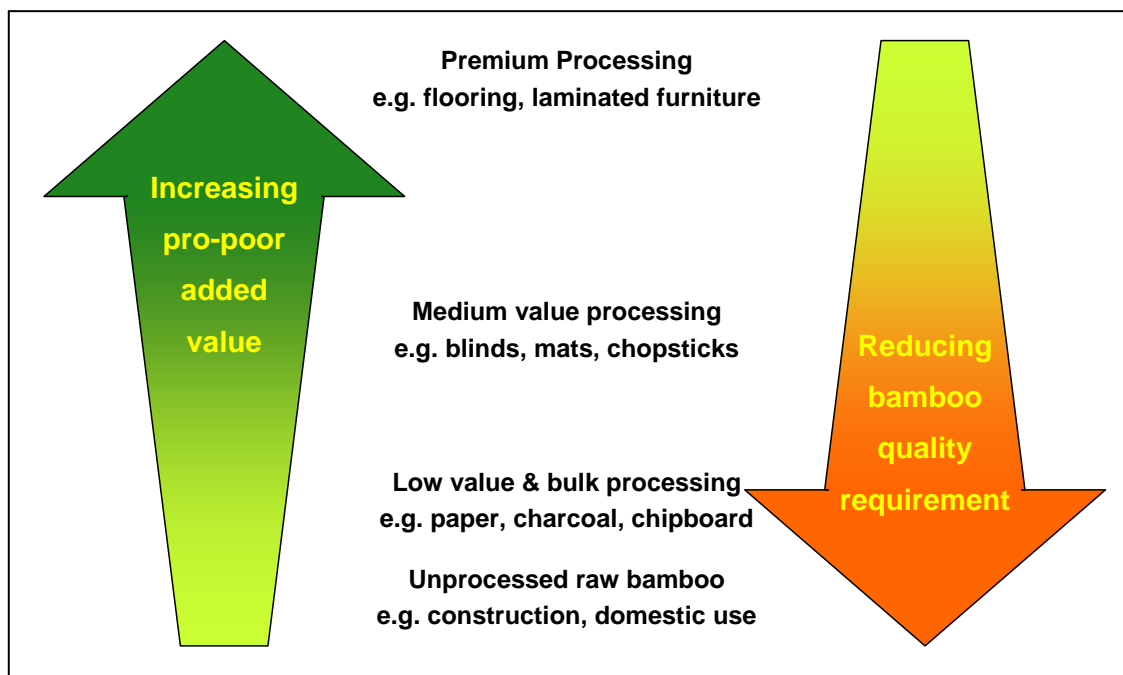
Source: Study presentation by Prof. Zhu , INBAR (2006)

From a production perspective, it is possible to divide the sector into distinct sub-sectors, each of which can exist on a standalone basis or in combination with the others:

1. **Handicrafts:** characterised by high levels of semi-skilled and skilled manual processing of relatively small volumes of bamboo culms.
2. **Bamboo shoots:** essentially a high value agricultural crop that can either be grown primarily for shoots or in parallel with the production of culms.
3. **Industrial processing:** semi-mechanised and mechanised processing of comparatively large volumes of bamboo culms. Industrial processing industries can be further divided according to the value of the processing and grade of material used:
 - i. **Premium processing** (e.g. flooring, laminated furniture)
 - ii. **Medium value processing** (e.g. chopsticks, mat boards)
 - iii. **Low value and bulk processing** (e.g. charcoal, paper & pulp)
4. **Unprocessed culms:** supplied to the local construction industry or used for domestic household applications.

As we will demonstrate in Section 7 below, the new premium processing industries generate the highest rates of pro-poor impact of all the industrial processing industries. However, they cannot exist in isolation, but must operate within a diversified industry where all the bamboo can be used to its greatest effect. The relationship between the pro-poor impact and grade of material required for different industries is illustrated below.

Figure 3-2: Pro-poor impact and material requirement in different industrial supply chains



Source: Study analysis

3.2 Policy options for industrial processing

30 years ago, industrial processing of bamboo was largely limited to bulk processing such as paper and pulp production and a limited range of medium value processing, e.g. chopsticks, fans. In some bamboo producing regions this is still the dominant industrial model, while in others the industry has developed primarily as a raw material producer with little added value processing. However, the greater range of bamboo processing industries now available creates opportunities for new industrial models for high impact pro-poor rural industrialisation.

To illustrate the difference between the older and newer industrial models we can consider the impact that can be achieved by using a sample area of 50,000 ha. of bamboo. We shall consider four different industrial models:

1. Raw material producer
2. Bulk processing led industry
3. Medium value and bulk processing industry
4. New industrial model with a balance of premium, medium and low value and bulk processing

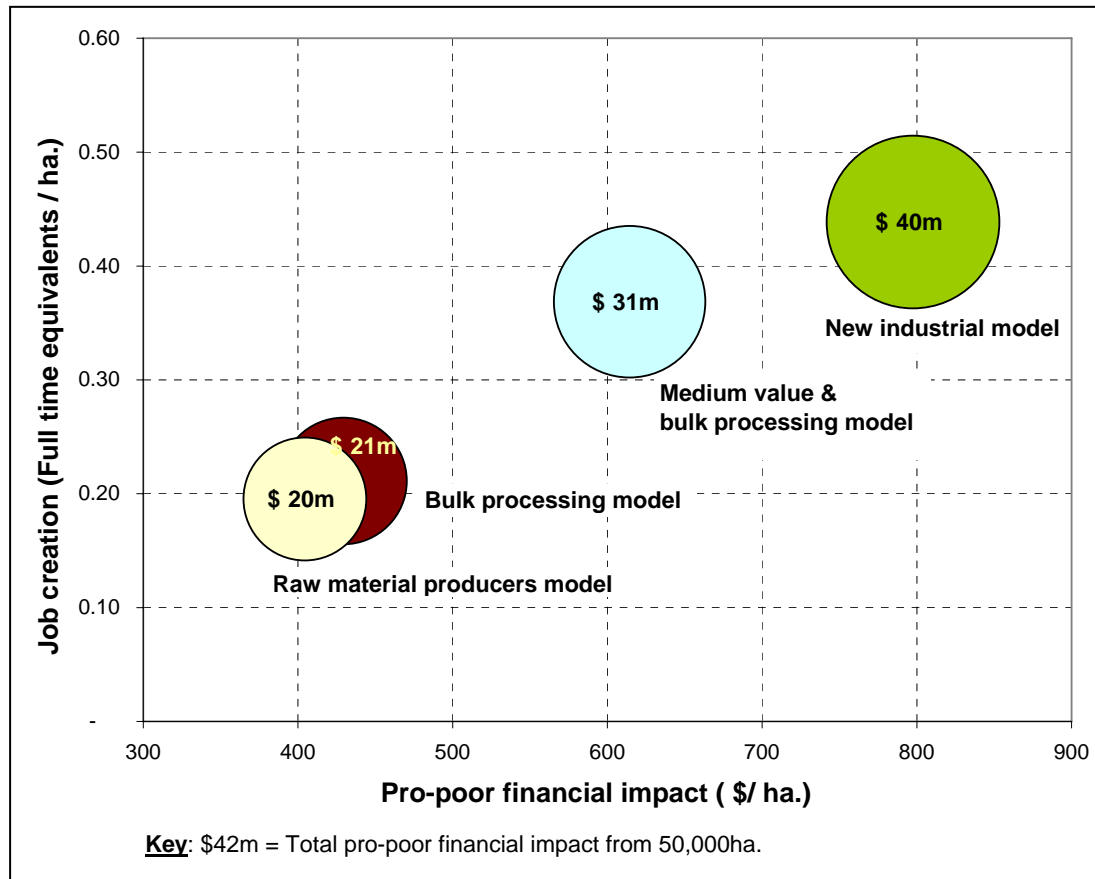
In reality, in all bamboo sectors a large proportion of the bamboo harvested gets used in unprocessed form in construction and other household uses. Similarly, while one type of industry may dominate there will always be other types of processors operating on a smaller scale. So, all the industrial models above include a variety of different industry types but in varying proportions (see Table 3-1 below).

Table 3-1: Industry mix in different industrial models

Industry model (% of bamboo consumed by each industry type)	Industry type				Total
	Raw bamboo supply	Low value & bulk processing	Medium value processing	Premium processing	
Raw material producer	80%	15%	5%	-	100%
Bulk processing led industry	55%	40%	5%	-	100%
Medium value & bulk processing industry	55%	20%	20%	5%	100%
New industrial model	40%	30%	15%	15%	100%

Source: Study analysis

Figure 3-3: Pro-poor impact under different industrial models



Source: Study analysis and survey data

Using actual data on yields, costs and output from farmers and businesses in Vietnam, Laos, Cambodia and China gathered during this study, we can calculate the impact of the different industrial models from the sample 50,000 h.a of bamboo. This is illustrated in Figure 3-3 above.

The 'New industrial model' creates twice the pro-poor impact of either the raw material producer or bulk processing industrial models, as illustrated in Figure 3-3. This creates attractive options for policy makers in bamboo producing areas.

Industries at a cross-roads?

In the last 10 years the industry in the study provinces in Vietnam has emerged from a 'Bulk processing industrial model' to a 'Medium value & bulk processing industrial model'.

This is thanks to growth of private sector SME's in medium and higher value processing industries. Current plans for the large scale expansion of the bamboo paper industry mean that policy makers are now at a crossroads.

Should the industry continue its development towards a high impact 'new industrial model' or should the industry revert to a 'bulk processing model' and recent developments be reversed?

3.3 Conclusions

Recent developments in the bamboo industry have created new policy options for supporting the development of new industrial models for the bamboo sector for high impact pro-poor rural industrialisation.

These developments are already proven in practice, as we will see in the following Sections. Furthermore, these high impact industrial development models for the bamboo sector are already within the reach of policy makers in the more advanced bamboo producing regions in the Mekong countries (see Section 8 below).

4 What can bamboo do for poverty reduction and rural development?

Acknowledgement

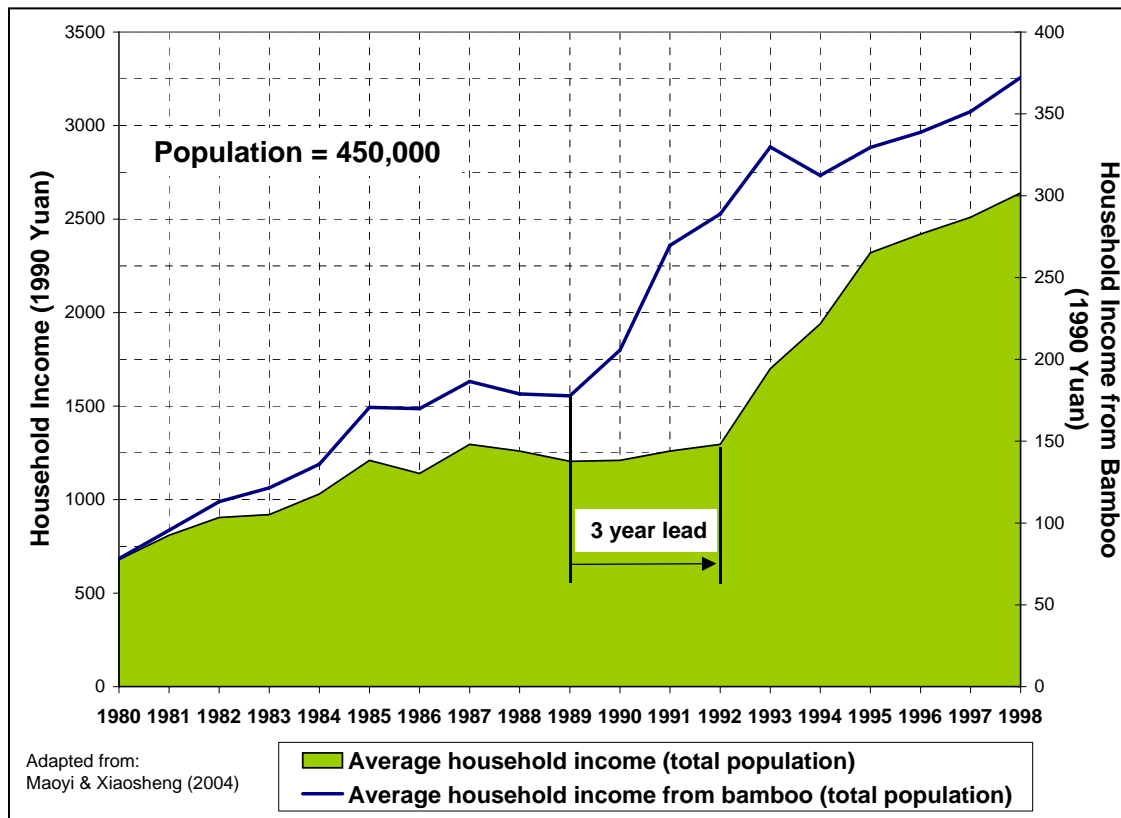
The evidence presented in this chapter draws heavily on the work of others. Of particular note is the work of Manuel Ruiz Pérez, Fu Maoyi, Brian Belcher, Prof Zhu Zhaohua and others over the last ten years. It has only been possible to present a small part of the insights from their work within this report. For fuller insights, readers are encouraged to refer to the numerous original papers by these researchers (see References for full details).

4.1 Lessons from China

There is clear evidence from China that, under the right conditions, bamboo can be a lead sector for rural industrialisation and large scale poverty reduction.

Anji County, Zhejiang Province, is one of the 'Ten Bamboo Homelands' in China. The county is situated 230 km from Shanghai and 70km from Hangzhou in the Yangtze Delta Region with a population of 450,000 people.

Figure 4-1: Bamboo was the pioneering industry in Anji's economic transformation



Household income in the county grew at more than 12% p.a.³ in the first half of 1980's following the policy reforms and introduction of the Household Responsibility System in 1983. However, by the mid 1980's the local economy had stagnated, with household income growth of just 1.3% p.a.³ between 1985 and 1992. But between 1992 and 1998 average household incomes grew by more than 15% p.a.³. (Maoyi & Xiaosheng, 2004)

Bamboo can be a pioneer sector for rural industrialisation and large scale poverty reduction, benefiting all income groups.

This dramatic recovery in household income growth was preceded by an almost identical growth in the bamboo sector. Tellingly, the boom in the bamboo sector began a full three years before the recovery of the general economy. (See Figure 4-1)

At the beginning of the bamboo boom, the sector accounted for just 9% of the county's 'exports' (outside of the County) and grew to be 64% of 'exports' within 10 years (Ibid).

Bamboo was clearly the key driving force of the rural industrialisation and widespread poverty reduction in Anji. The benefit was not only gained by bamboo farmers, but by the whole population, with average household incomes for the whole population increasing by 220% in the first ten years of the bamboo boom, enabling farmers to share in China's rapid economic growth.

While the direct benefits from bamboo were considerable, some researchers have suggested that the greatest impact was the catalysing effect that bamboo had on the diversification of income opportunities (Ruiz Pérez & Belcher (2001)). Income from bamboo itself accounted for only 14% of average household incomes for all farmers and 25% for bamboo farmers. In contrast, the positive impact between the growth of agricultural production and processing industries created additional capital in the economy and provided greater opportunities for farmers to invest their labour and increasing financial resources. This broadening and deepening of household economies enabled the benefits of growth in the bamboo sector to drive the transformation of the economy of the whole county.

4.2 Who benefits from bamboo?

The most important point of note is that in a successful bamboo economy, all income groups benefit substantially. For example in Anji, the average household income for the county had risen to five times the national average by the end of the 1990's.

While a successful bamboo sector benefits the whole community, there are differences in the role that bamboo plays in the livelihoods of different income groups *within* a community depending on local economic conditions and availability of alternative livelihoods.

³ in constant currency terms

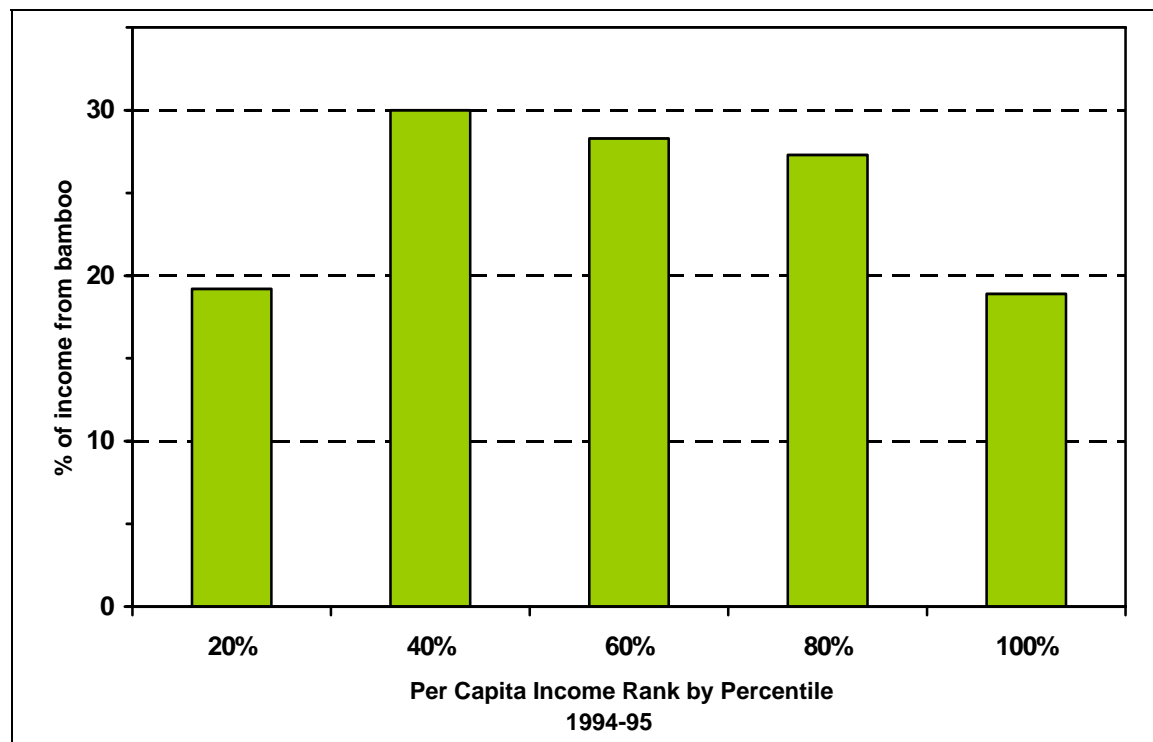
Various pieces of research have investigated the impact that bamboo development in China has had on poor farmers. The most authoritative of these studies are based on comparative, cross-sectional studies of farmers in six counties in China. (see Ruiz Pérez & Belcher (2001), Ruiz Pérez et al (1996, 1999, 2004). This research lead to the following conclusions:

In a stagnant bamboo sector, where bamboo does not offer an attractive livelihood compared to other opportunities, it is the poorest households that gain the greatest proportion of benefit from bamboo as they have insufficient resources to exploit more attractive alternatives.

In a rapidly expanding bamboo sector, where bamboo plays a growing role in farmers' incomes, it is the richer households that gain the most proportional benefit. This is because in such situations bamboo is more financially attractive compared to other opportunities. The households with most resources are more able to capitalize on this opportunity.

In a mature, or maturing, bamboo sector with ample opportunities elsewhere in the local economy it is the lower-middle and middle income groups that gain the greatest proportional benefit from bamboo. These middle income groups have been described as falling between the "Need-nots" and the "Cannots" (Ibid). Higher income groups have opportunities for gaining higher returns on their labour and capital and so 'Need-not' focus on the bamboo sector. The poorest groups do not have sufficient resources and so 'Cannot' fully exploit the opportunities from bamboo. (See Figure 4-2 below)

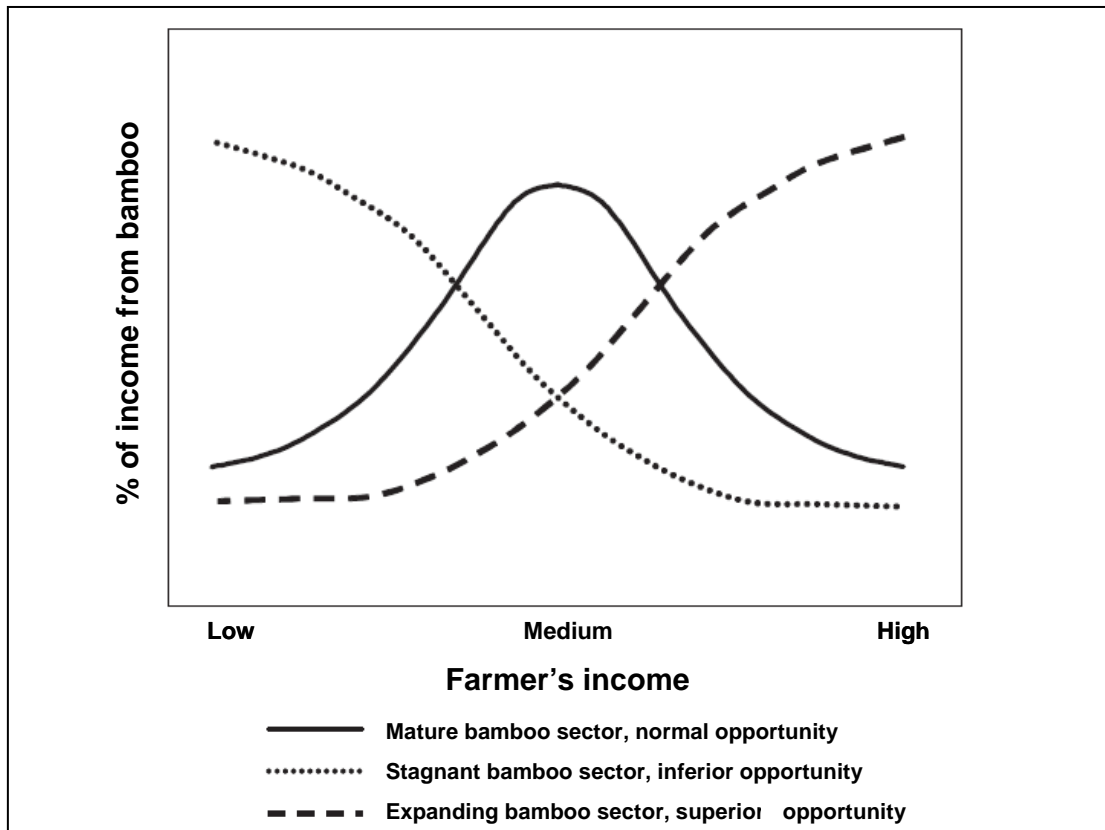
Figure 4-2: The importance of bamboo for farmers in different income groups in Anji County



Source: Adapted from Ruiz Pérez et al (2004)

The overall conclusion to draw is that all income groups benefit from a mature sector, but while the sector is expanding it is the middle and higher income groups that initially benefit the most. Ruiz Pérez et al. present an idealised model for the role of bamboo under different stages of bamboo sector development.

Figure 4-3: Ruiz Pérez et al.'s idealised model of the role of bamboo in development



Source: Adapted from Ruiz Pérez et al (2004)

4.3 How to make it happen?

4.3.1 Key features of Anji's success

Several features were crucial to the dynamic growth of the sector in Anji:

- **Strong demand and favourable market conditions:**
 - Booming demand on its doorstep - Located in the heart of the Yangtze Delta region, close to the major Yangtze Metropolis around Shanghai and Hangzhou. The region has a population of >200m people and an economy bigger than Thailand with sustained growth approaching +10%p.a. In 1993 the Yangtze Delta had approximately 16% of China's population but almost 40% of its industrial output. Industrial output in the Yangtze Delta tripled between 1990 – 1993. This economic boom included the rapid growth of key bamboo consuming industries such as furniture and construction with 17% of the world's cranes reputedly working in Shanghai at the time.
 - China's logging ban in the 1990's created additional demand for timber substitutes and led to a 10% -15% jump in bamboo prices in 1 year.
- **Consistent and sustained leadership from Government** - Provincial and County level leadership specifically targeted the development of the bamboo sector as part of economic development planning. This led to a systematic and coordinated strategy of policy measures and initiatives over the last 20 years that has been central to the growth of the sector.
- **Parallel development of processing industries and bamboo resources** created a virtuous circle of demand for farmers products, increased value added and capital in the local economy, reinvestment and diversification of income opportunities.
- **Local development of specialist processing technologies and equipment** ensured appropriate, affordable equipment was available.
- **Minimum scale of production suited to resources** of farmers, SME's and town and village enterprises (e.g. typical area of bamboo in Anji was 0.6 Ha per household (Ruiz Pérez et al, 2004)).
- **Lower perceived market risks due to diversity of uses** of culms and shoots and so greater attractiveness of bamboo for farmers and processors.
- **A readily available existing bamboo resource and a tradition of growing bamboo**, meant the County was well placed to exploit the emerging market opportunities.

In addition, there were three pre-requisite policy reforms that paved the way for the rapid development of the bamboo sector in China which will also be important for the Mekong countries:

- **Land tenure system:** clear land ownership and usage rights, with 30-50 year leases, allowing the transfer of rights to family and others.
- **Supportive business environment:** creating the conditions for a vibrant private (and collective) sector, especially small and medium enterprises.
- **Opening up of the economy** to allow access to international markets and investors.

At a local level several further points are worth noting:

- Heavy public investment in the development and dissemination of local processing technologies greatly increased their affordability and accessibility to local enterprises.
- Intensification of raw material production was as important in driving output growth as the expansion of planted area with ave. yields rising to 8.9 T/ha from 4.9T/ha between 1978 and 1998 and the area of bamboo increased by 16% while production of culms increased by 98% (Figure 4-5, Zhu, 2005)
- Bamboo shoots production generated sufficient value for farmers to be a standalone industry driving poverty reduction, as happened in Li'nan County, but it also provided opportunities for diversification for culm farmers.

4.3.2 Recent developments and emerging lessons

More recent developments that have contributed to the continued growth of the industry include:

- **Emergence of a pre-processing industry**, which greatly assists in achieving very high 'added value' utilisation rates for the bamboo harvested.
- **"Nieyou"**: a traceability system in Anji, in which every culm is marked with indelible ink at 1 year old to show its age, owner and village. The system allows easy identification of the age and source of culms and is linked to harvest quotas and regulated by the Forestry Bureau. It has the potential to form the basis of an effective 'Certification' or 'Chain of Custody' system.

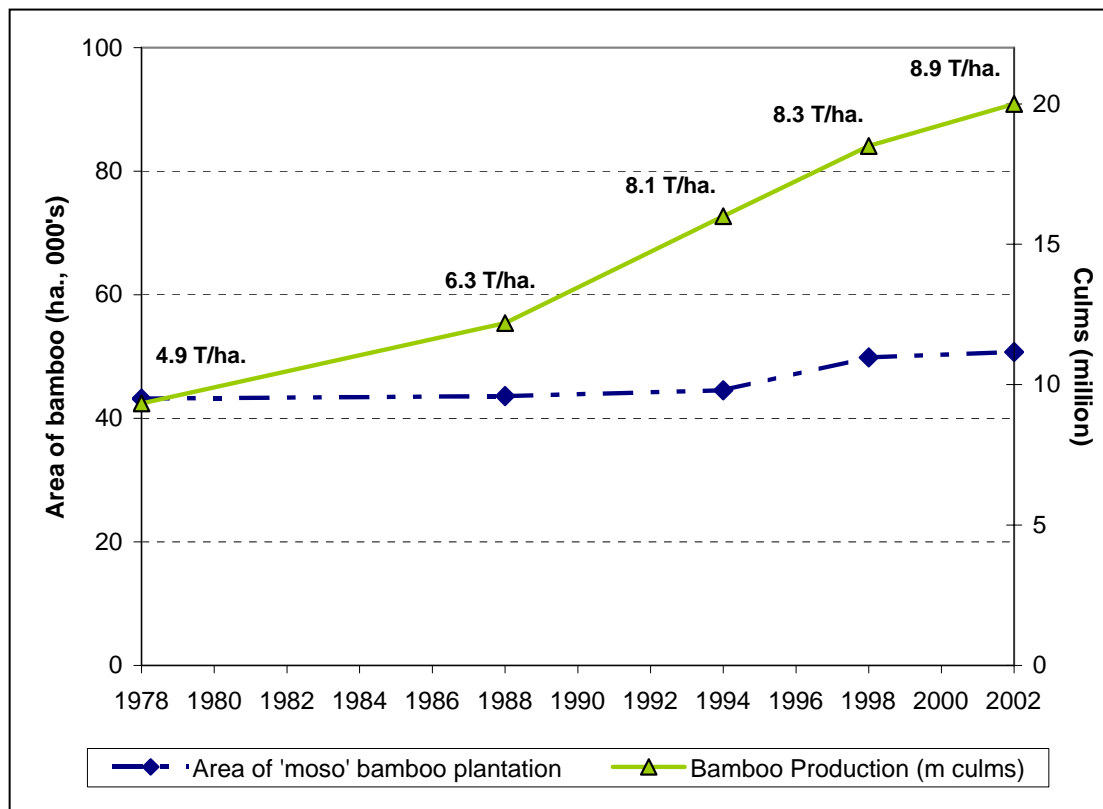


Figure 4-4:
"Nieyou" traceability system, Anji

Emerging issues for the industry in Anji include:

- **Quality** is becoming an increasingly important issue in the market. Anji, and China as a whole, have not yet established a good reputation for this.
- **Raw material shortages** and rising bamboo prices (USD 85/tonne 'moso' culms in early 2006) are squeezing margins and, at times, limiting output of individual businesses that are unable to secure enough raw material.
- **Decreasing margins** and excessive competition in several markets have driven increasing commoditisation of some products.
- **Challenge of biodiversity protection:** Due to the planned and natural extension of bamboo planted areas, and the predominance of the main commercial species, there is an increasing risk from mono-culture development.

Figure 4-5: Intensification drives Anji's bamboo production growth



Source: Zhu, 2005

4.3.3 Evolution of the industry structure

The development of the industry in Anji happened gradually over the past 20 years. In terms of the way the industry is organised, it is possible to identify three distinct stages in the evolution of the industry structure, with each stage increasing the efficiency and the overall competitiveness of the sector:

Stage 1: Individual Farmers operating independently, with some trying to enter into processing;

Stage 2: Company-farmer supply chains – with more structured linkages between individual companies and groups of farmers;

Stage 3: Integrated sector built around pre-processing hubs, with farmers supplying raw material to pre-processors who then supply semi processed pieces to a range of different secondary processors according to their requirements.

It is interesting to note that in the Mekong industries, most are at either the first or second stage of this evolution. Only in the most vibrant parts of the Vietnamese industry are there early signs of a progression to the 3rd stage.

4.3.4 Specific policy lessons

Local policy lessons can be drawn in key areas:

Effective technology extension system

A well-organized technology extension system is one of the most important factors of China's fast growing bamboo industry. Technology extension stations are set up at national, provincial, county and township levels. Their main responsibilities are to introduce new technologies and provide technical services to farmers and processors. The main experiences are as follows:

- **Multi-participation:** local governments, scientists, enterprises and farmers jointly participate in technology extension. Local governmental officials participate in the establishment and development of demonstration sites.
- **Technology service contracts:** technologists sign contracts with enterprises and local farmers for technical services. These contain clauses that compensate the household if the results are poor. On the other hand, if results are positive, gains are shared with the support resources.
- **Training workshops for farmers:** to share best practice and build networks
- **Success stories and model farmers/enterprises:** demonstration plantations, model rural farmer households and enterprises are identified to demonstrate the effects of technologies and motivate people to participate in the development of a modern bamboo sector.
- **Evaluation policy for scientists and technicians:** the contribution of technologies in industry production practices is acknowledge in the performance assessment of researchers.

Policies identified to promote bamboo development:

At the beginning of the sector development programme, local Government set out to provide:

- **Financial support:**
 - local government extends credit with low/zero interest to farmers and enterprises in support of bamboo plantations and processing;
 - provides subsidies for the improvement of low-yielding plantation and newly established plantations;
 - finances research, technical services, demonstration sites and development of demand and markets.
- **Awards for excellence** were provided in the form of cash, fertilizer, reduced taxes or tax exemptions for;
 - successful 'demonstration households',
 - entrepreneurs,
 - scientists and technicians.
- **Identification of medium and long term bamboo development plans** including:
 - feasibility studies,
 - suitable government policy,
 - financial support.

Development of appropriate market structures and organisations;

- **Promotion of 'pre-processing' industry model** to improve efficiency and quality.
- **Establishment of national and local trade associations** and coordination structures to facilitate linkages between government, enterprises, farmers and technical resources.
- **Establishment of the 'nieyou' system** of bamboo labelling and traceability for farmers. (See 4.3.2)

4.4 What does this mean for the Mekong countries?

It is useful to consider which of the key factors in Anji's success are replicable in the Mekong and elsewhere.

In theory, most if not all of the key factors are replicable within the Mekong. However, in practice, Government interest and commitment will be the biggest determinant of whether these essential factors are replicated, particularly in relation to the requirement for consistent leadership and the creation of a favourable operating environment for businesses and farmers.

Each of the main factors is considered in turn below:

- **Strong demand and favourable market conditions:** The substantial local demand created by the boom in the Yangtze delta in the 1990's is unlikely to be recreated to the same degree in the Mekong region, but Vietnam's continued strong growth will create growing domestic demand. However, the Chinese bamboo industry has established a growing world market for both traditional and new bamboo products, not least within China itself. A key to the future success of the Mekong industries will be to access these markets and deliver products that compete both in terms of prices and quality.
- **Consistent and sustained support from government:** Given the current capacities and resources of Governments in the three countries it is arguable that Vietnam is best placed to achieve this, with Laos and Cambodia facing greater challenges.
- **Parallel development of processing industries and bamboo resources** is possible with the right policies and measures but will require a medium term strategy to achieve harmonised growth.
- **Development of local specialist processing technologies and equipment** is not necessary for the Mekong countries. There is now an established bamboo machine tools industry in China able to supply specialised bamboo processing equipment for household, SME and larger processors. The critical issue is to improve awareness and access.
- **Minimum scale of production suited to resources of farmers and SMEs:** Similarities between the Mekong and China exist in this respect.
- **Lower perceived market risks due to diversity of uses** if several industries are able to develop in parallel within the domestic sector, the overall risk of aiding the bamboo sector is reduced as there is no over-reliance on one key industry. This should reduce the risk to bamboo farmers of price and demand volatility.
- **A readily available existing bamboo resource and a tradition of growing bamboo** exists in some provinces in the region but not all. This suggests a phased approach to the development of the sector, with an initial focus on the development of industries in areas with existing resources. However, it is also possible to develop sectors in other Provinces starting with efforts to increase the resource base.

Policy and Context Conditions

For the pre-requisite policy/context conditions, if suitable conditions do not already exist then the need for reforms will likely slow the development of the sector.

- **Land tenure system:** similar reforms to China's Household Responsibility System were introduced in Laos and Vietnam. These reforms have been most effectively implemented in relation to agricultural land. For forestry land, the implementation of reforms has been less consistently applied between provinces. For example, in areas of shifting cultivation, the land is often seen as communal, and so a move to static plantation of bamboo would require substantial shifts in the cultural perception of the ownership and/or usage rights of the land. Also, especially in Vietnam, many of the State Forest Enterprises retain ownership of large areas of forest land and usage and management rights remain unclear in practice.

In Cambodia, while usage rights for village agricultural land are reasonably clear, exploitation of bamboo from natural stands is less transparent. While nominally able to exploit resources with a tax charged on items sold outside the village, in practice there are numerous incidents of villagers being prevented from accessing useful resources where large areas of land are claimed by private interests and businesses.

- **Supportive business environment:** reforms in Vietnam and, to a lesser extent, in Laos are creating an increasingly favourable business environment. There are still some important challenges in both countries, ranging from market distortions from current and former state enterprises to poor rural infrastructure and limited availability of finance for enterprises. Greater challenges exist in the business environment in Cambodia.
- **Opening up of the economy** to allow access to international markets has happened in all three Mekong countries. However the extent to which this has been sufficient in practice to create attractive conditions for investors and competitive conditions for producers varies across the region.

5 The World Bamboo Market

5.1 Introduction

This review provides a overview of international markets of greatest potential interest to the current study⁴. The objective is to inform the strategic decision making process on the market potential for the selected markets.

Consistent with this objective, all data presented are estimates based on secondary information sources. These have been checked for consistency between different sources wherever possible. The information has been supplemented with industry interviews.

Ten product markets are covered.

- | | |
|------------------------|--|
| 1. Handicrafts | 6. Panels/Boards |
| 2. Blinds ⁵ | 7. Flooring |
| 3. Bamboo Shoots | 8. Builders' Joinery and Carpentry (BJC) |
| 4. Chopsticks | 9. Charcoal |
| 5. Furniture | 10. Activated Carbon |

This review does not cover the markets for bamboo in paper/pulp production nor for unprocessed bamboo supplied to domestic construction industries and other users. While these are known to be large consumers of bamboo in many countries, consideration of these markets was beyond the scope of the current phase of this study.

5.2 Overview

It is estimated that the bamboo markets analysed in this study have a combined value of approximately USD 7bn p.a.. Traditional products account for almost 95% of this by value. Newer industries offer interesting growth potential and may begin to rival traditional bamboo-related markets over the medium term.

Markets for bamboo can be grouped into traditional or emerging markets. Demand remains strong in traditional markets such as handicrafts, blinds and bamboo shoots with profitable opportunities despite moderate growth. Other traditional markets, such as chopsticks, are highly commoditised with low growth and low margins.

Emerging bamboo markets, particularly wood substitutes, have been pioneered by Asian producers and include flooring, panels and furniture (non-traditional).

⁴ For details of the sources, calculations and assumptions behind the data presented in this section please refer to the study report "Bamboo International Market Research" and its associated source list spreadsheet prepared by Enterprise Opportunities.

⁵ 'Blinds' market is only covered in term of market size estimates. Deeper research on this market has not yet been completed.

These represent the largest growth opportunities for bamboo. Strong world (& Chinese) demand and China's productive capacity and exports have produced a structural change in the wood industries. Increased restrictions of certified timber supply create a positive market outlook for bamboo.

Additional niche market opportunities exist for processed bamboo charcoal (driven by growing demand for bio-fuels) and bamboo activated carbon which has the potential to develop strongly in the growing activated carbon market.

Overall prospects for a diversified bamboo sector look strong.

Market Recommendations

From a demand perspective, the following markets offer potential for Mekong producers of bamboo: Furniture, Handicrafts, Blinds, Bamboo shoots, Wood Flooring, Charcoal and Activated Carbon. Markets for wood panels and chopsticks have some attractive characteristics but need further investigation. Wood panels in particular should be oriented initially towards furniture and then Asian construction markets.

There is a risk in the lack of diversification prevalent in wood industries. Most industries are heavily correlated towards the residential property sector. In formulating a strategy, it would be advisable to seek non-correlated or sufficiently diversified industries to minimise the concentration of risk.

A key risk to the developing bamboo industries is poor quality product entering the new, higher value product markets (as seen in the US flooring markets). This could restrict growth and the ability to command higher margins.

5.3 Current size of selected markets

No authoritative estimates have yet been published as to the size of the various markets for bamboo products. This study attempts to address some of these gaps in a manner consistent with the study's primary purpose: evaluating the potential of the sector for the Mekong countries.

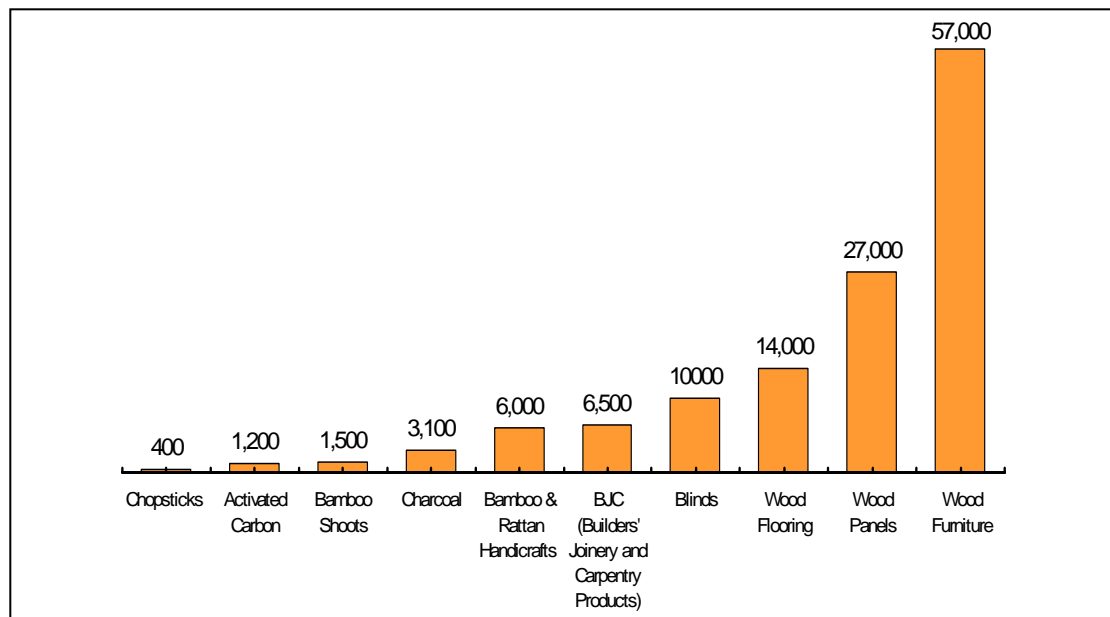
In developing market size estimates, a key consideration has been that a large proportion of potential growth for the bamboo industry relies on increasing substitution of bamboo-based products into more general markets. To reflect this the study has examined markets for bamboo at two levels:

- Firstly, estimates have been made of the 'Global markets' in which bamboo competes against other products and has the potential to be a substitute for alternative products in these markets, for example 'wood and laminate flooring'.
- Secondly, estimates have then been developed for the size of the current bamboo markets in particular. This second stage is based on either direct estimates of market size, e.g. bamboo shoots, or on estimates of the share of bamboo products in the 'global market', e.g. 'bamboo flooring'.

The conclusions from the market sizing analysis are illustrated below. Figure 5-1 shows the estimated current size of the 10 selected 'Global Markets'. Figure 5-2

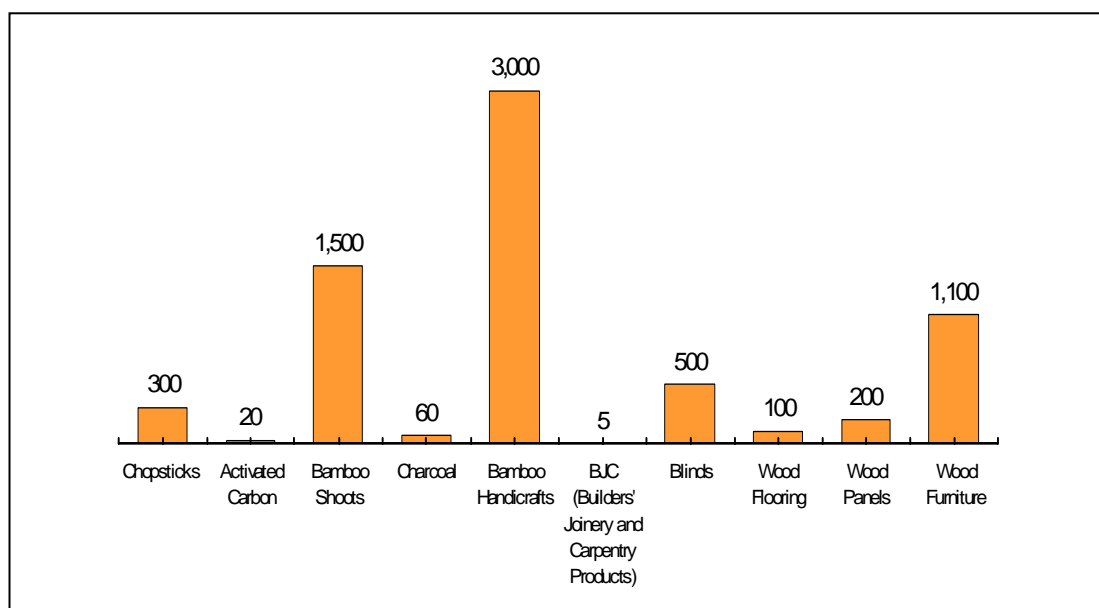
shows the estimated current size of the corresponding 'Bamboo Markets'. From Figure 5-1, the largest 'Global Markets' are wooden furniture, wooden panels and wood and laminate flooring. In contrast, Figure 5-2 shows that the main current markets for bamboo are dominated by the traditional bamboo products of handicrafts, shoots, bamboo & rattan furniture, bamboo blinds and chopsticks. These traditional products represent almost 95% of the current world bamboo market (excluding paper and construction). The basis for the estimates of the current bamboo market are summarized in the Table 5-1 below.

Figure 5-1: Size of selected 'Global Markets' (USD m)



Source: Enterprise Opportunities research

Figure 5-2: Size of selected 'Bamboo Markets' (USD m)



Source: Enterprise Opportunities research

Table 5-1: Rationale for Current Bamboo Market Estimates

Market	'Global' Market		Bamboo Market		Rationale
	\$m	Definition	%	\$m	
Handicrafts	6,000	Bamboo & Rattan	50%	3,000	US is largest market for handicrafts, data shows 5% of imports are bamboo & rattan. Given domestic role of bamboo and rattan in developing countries (e.g. baskets), share is likely to be higher than 5% as in US market. So, share for bamboo and rattan is at least 6% of \$100bn = \$6bn. Bamboo may be 50% of this.
Bamboo shoots	1,500	Bamboo shoots	100%	1,500	100% (unless the counterfeiters have a new target)
Blinds	10,000	Handicrafts and decoratives	5%	500	Blinds represent 10% of US imports in decoratives and handicrafts, so for world 10% x \$100bn = \$10bn. 'Blinds' also includes metal, plastic, fabric and other blinds. Given prominence of bamboo blinds in developing countries a conservative estimate of market share is 5%. Speculative as not studied in detail.
Chopsticks (disposable)	400	Chopsticks (disposable)	80%	300	Bamboo is the dominant source for disposable chopsticks, but no firm data is available on relative share., hence assume estimate of 80%
Furniture	57,000	Wood furniture	2%	1,100	ITTO data indicates cane and bamboo furniture was 4.3% of world wood furniture export market in 2002. Cane/rattan is arguably likely to be a larger part of this than bamboo => bamboo = c.2%, rattan =2.3%.
Flooring	14,000	Wood flooring	0.75%	100	Even in China, bamboo flooring was only 5 M m ² from a total 290 M m ² wood flooring (1.85%) but up to 3% in value. Value of China bamboo flooring estimated as \$60m, assume China is c.60% of world output gives estimated world bamboo flooring market size of \$100m = c. 0.75% of wood flooring
Panel	27,000	Wood panels	0.75%	200	Bamboo panel production in China is >.1.4M m ³ (Inbar) from 45M m ³ total panel production. China has c.20% of world panel production of 225M cubic, but arguably will dominate bamboo panels. Assuming China is 80% of world bamboo panel production, gives bamboo world panel mkt share of 0.75%
BJC (Builders' Joinery and Carpentry Products)	6,500	BJC	0.1%	<5	The technology exists but has only really been applied in China and on a small scale. Given estimated market share in flooring, bamboo BJC is not comparable in scale or market penetration. Hence, maximum estimate of 0.1% but may in fact be almost zero.
Charcoal (fuel)	3,100	Charcoal	2%	60	Bamboo fuel charcoal is not a preferred charcoal in unprocessed form if alternatives are available due to low density and burning temperature. Overall use is likely to be very small, but there is a growing export trade in processed bamboo charcoal (e.g. briquettes), so estimated market share may be, say, 2%.
Activated Carbon	1,200	Activated carbon	2%	20	Recent CCM survey of AC market in China noted that bamboo AC was available but actual production volumes 'ignorable'. Hence assume upper estimate of market share = 2%

Source: Enterprise Opportunities research

5.4 Future market sizes

Whilst current demand is heavily concentrated in the traditional markets for bamboo, growth rates for bamboo products are highest in the emerging wood-substitute based markets (e.g. flooring, panels, furniture). How these factors will combine to determine the shape of the future market is an important question.

The scale of future demand for bamboo products will be driven by:

- a) **'Global market' growth rate:** Growth in global markets in which bamboo products compete, linked to global GDP growth etc.
- b) **Penetration rates of bamboo into these 'global markets':** Driven by the attitudes of buyers and the price/performance competitiveness of bamboo products compared to existing and new alternatives.

There is significant uncertainty about both of these factors. To better judge the potential importance of different bamboo markets in the future, a number of bamboo market scenarios have been analysed that show the combined impact of these two key market drivers.

The research into each individual 'global market' has generated information on prevailing forecasts for industry growth for the relevant industries (see Table 5-2). These forecast growth rates have then been extrapolated out to estimate the size of the future 'global market'.

Against these future 'global market' estimates, we have developed 3 different scenarios for the penetration of bamboo into the 'global markets'⁶ (see Table 5-2). These are based on estimates of current bamboo penetration and informed by the review of international markets and bamboo product price/performance competitiveness.

5.4.1 Scenario analysis

Two of the above bamboo market scenarios will be used for further analysis of the potential impact of the sector (See Section 7 below). Given the high degree of uncertainty over bamboo market growth, especially in new markets, the two bamboo market scenarios chosen will be:

World Bamboo Market Scenario 1: Existing market – zero growth scenario (Worst case), based on current market size only assuming zero growth in global markets or bamboo penetration (highlighted on the left below).

World Bamboo Market Scenario 2: Mid-level future scenario, based on the prevailing forecasts for 'global market' growth and the mid-level scenario for bamboo penetration growth (highlighted on the right below).


⁶ It is also possible to generate scenarios for the 'global market' growth rates. However, the range of market sizes from the market penetration scenarios is large and means that applying different 'global market' growth scenarios would not yield any further insights.

While it is useful to consider a worst case scenario, the current dynamic expansion of the sector and global economic outlook means that a 'zero growth' scenario is unlikely to occur.

Table 5-2: World bamboo market scenarios

Industry ⁷	Current Bamboo Market	Global Market Growth	Bamboo Product Penetration %				Future Bamboo Market (\$m)		
	US\$m	% p.a. (x 7yrs)	Current	Future lower	Future mid level	Future upper	Lower	Mid	Upper
Handicrafts (Bamboo/rattan)	3000	5%	50%	40%	50%	80%	3,400	4,200	5,100
Bamboo Shoots	1500	1.5%	100%	100%	100%	100%	1,700	1,700	1,700
Blinds	500	8%	5%	5%	7%	10%	900	1,200	1,700
Chopsticks (Disposable)	300	3.5%	80%	80%	90%	95%	400	400	500
Wood Furniture	1100	10%	2%	2%	5%	10%	2,200	5,600	11,100
Wood Flooring	100	8%	0.75%	2%	5%	10%	500	1,200	2,400
Wood Panels	200	7%	0.75%	2%	5%	10%	900	2,200	4,300
BJC	5	7.5%	0.1%	0.0%	0.3%	0.5%	-	30	50
Charcoal	100	5%	2%	2%	3%	4%	90	130	170
Activated Carbon	20	5.5%	2%	5%	10%	20%	90	170	350
Total ⁷	6,800						10,200	16,800	27,400


World bamboo market scenario 1

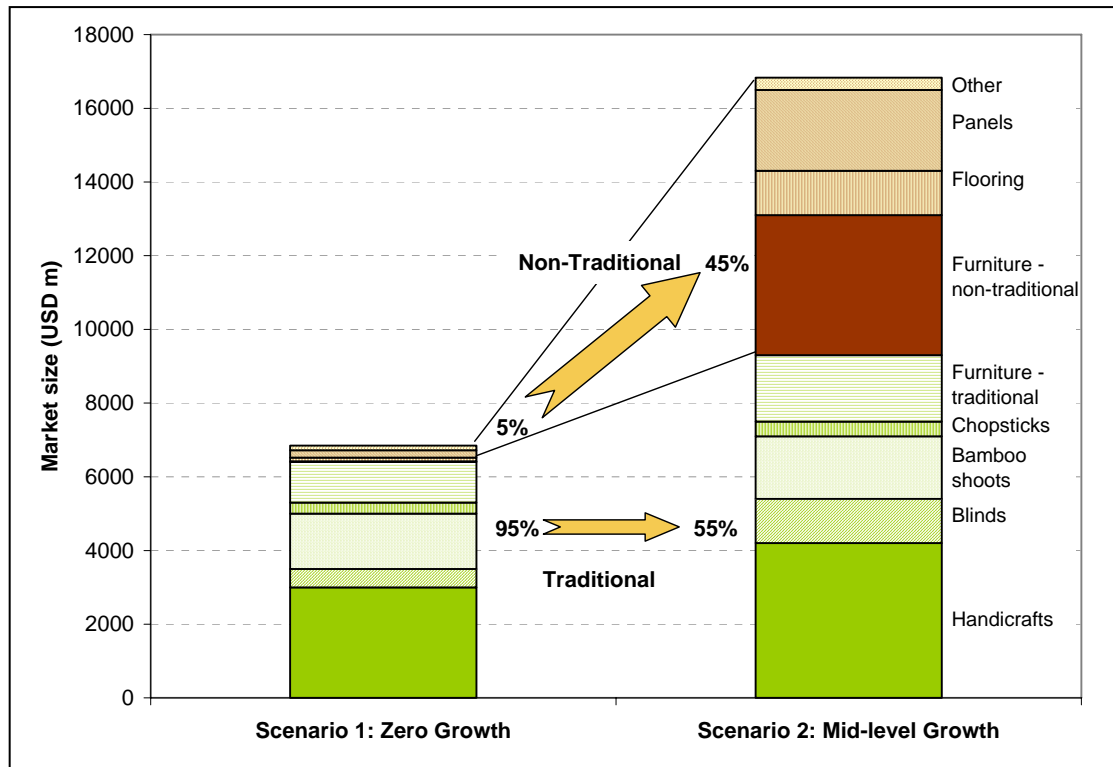

World bamboo market scenario 2
 Source: Study analysis

Under these two scenarios, there is a significant change in the relative importance of different industries, as illustrated in Figure 5-3 below:

- Under zero world market growth (Scenario 1), traditional markets such as handicrafts, blinds, shoots, chopsticks and traditional bamboo furniture account for 95% of the market as they do today.
- Under mid-level world market growth (Scenario 2), new markets for bamboo including modern/laminated furniture, flooring and panels, emerge to account for approx. 45% of the world market from only approx. 5% today.

⁷ The list of industries is not intended to be exhaustive and hence the 'Total' is only for the markets covered and not the entire 'bamboo' sector. Notable exceptions include paper/pulp, domestic construction and others

Figure 5-3: The growing importance of the new bamboo markets⁸



⁸ Furniture is split between 'traditional' bamboo furniture that accounts for almost all of the current bamboo furniture market and 'non-traditional' bamboo furniture such as laminated bamboo furniture where there is likely to be the majority of growth for bamboo within the 'global' wooden furniture market.

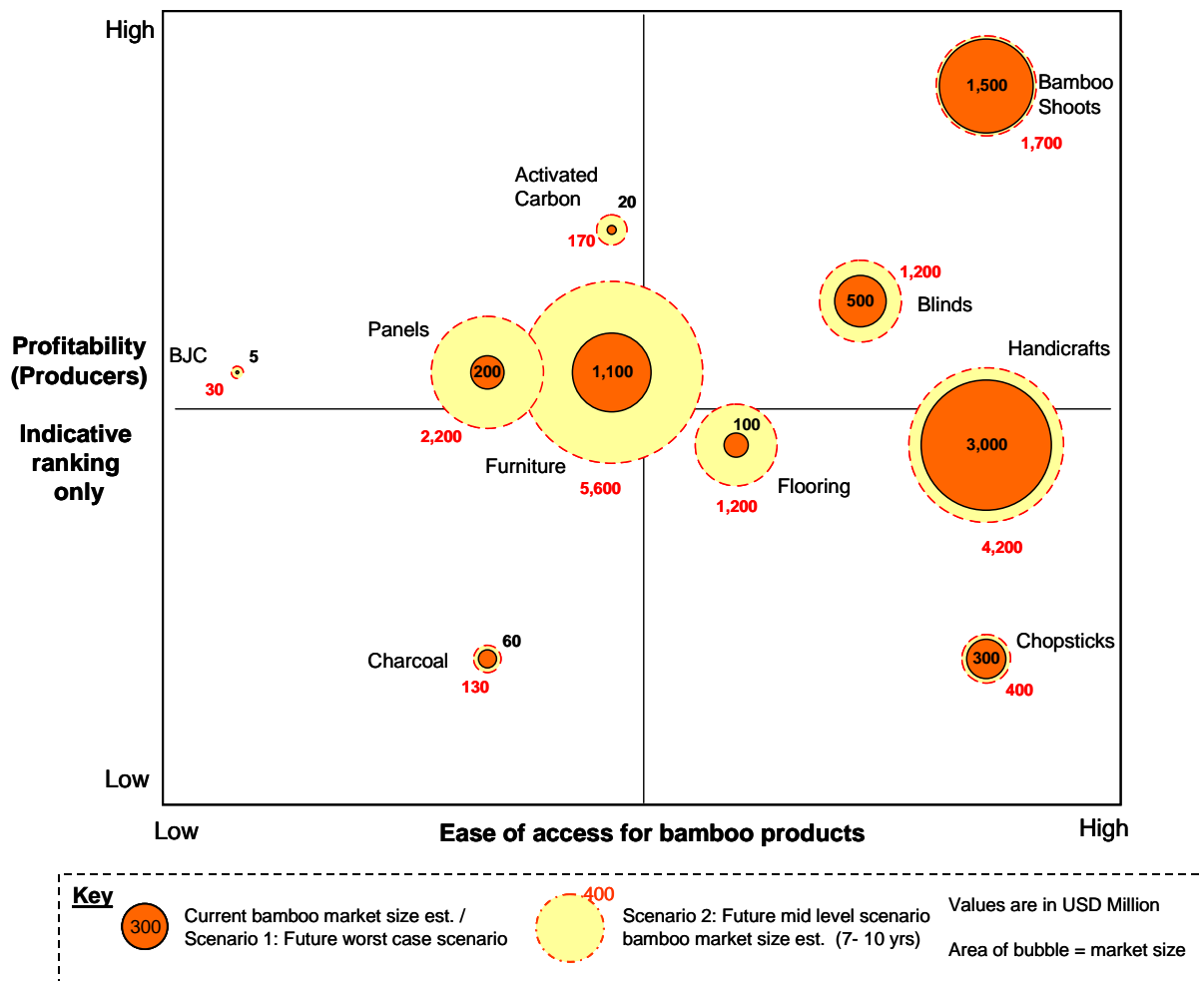
5.5 Market attractiveness

The market attractiveness of each industry is not only dependent on the size of the market, but also how accessible the market is and how profitable it may be for producers.

For the current purposes, accessibility is a measure of how easily bamboo products can penetrate into their 'global markets'. Accessibility is the result of a combination of factors including: price/performance competitiveness, trade conditions, standards and regulations and buyer attitudes. For each of the selected markets, we have used qualitative information and industry feedback to assess the 'ease of access' and indicative 'profitability'. In combination with estimates of market size, this provides an initial assessment of the demand side attractiveness of the different markets, as illustrated below.

As already discussed, current demand (darker circles) is concentrated in the traditional markets (to the right in the chart) but future growth (lighter, dashed circles) prospects are dominated by the emerging wood-substitute based markets (furniture, flooring, panels, activated carbon). However, these growth markets are less easy to access and so there is inherently greater uncertainty about their future potential.

Figure 5-4: Attractiveness of the Markets



Indications are that current profitability varies greatly across the industry (high in bamboo shoots, very low in chopsticks) but that within this there are profitable niches within most markets.

5.6 Industry outlook

There are significant macro-economic changes driving the wood-based markets at present:

- Strong worldwide demand for materials alongside an established and growing environmental awareness are forcing changes in the way wood-based products are produced and marketed.
- Production and exports in China are changing the business context for US and European suppliers who are forced to either build their own factories in lower-cost countries or go out of business.
- A global shortage of certified renewable wood and shortage of all wood kinds in Asia is opening up opportunities for substitute products i.e. bamboo.
- Growth in interest in sources of environmentally friendly energy such as biomass will have an effect on wood-based industries and potentially bamboo.

Key issues expressed in interviews with industry participants from a range of bamboo / wood related industries included:

Macro-level issues

- Rise in demand for certified timber products and chain of custody documentation
- Shortage of certified timber products and chain of custody documentation
- Biggest issue apart from sourcing wood remains quality assurance

Perceptions of bamboo

- General positive disposition towards bamboo as a material, if some reservations about "the hype"
- Perception of bamboo as a suitable product for use in furniture and flooring but not construction based products in export markets
- Perception of bamboo as uncompetitive for use in wood panels, especially in high income economies

Buying from Vietnam

- General improvement in production quality in last 5 years, e.g. in furniture
- Forecast growth of expenditure on Vietnamese products, some buyers expect growth of +20% p.a. for short to medium term

5.7 Market recommendations

The table below provides a summary of the overall assessment and recommendations for each market, based on the detailed market analysis presented in the study report “Bamboo International Market Research”.

Table 5-3: Market Recommendations

Market	Demand Drivers	Observations	Proceed
Handicrafts	Construction (home starts) ; World GDP growth; Tourism	Relatively high levels of skill in Mekong countries. Markets that are already developed and operational.	Yes
Bamboo Shoots	Availability of produce / Seasonality	Mainly Asian market with strong seasonality. Potential for good profitability at producer level	Yes
Furniture	Construction; World GDP; Substitution	Large growing market. A lot of expertise in Vietnam. Growth of bamboo will rely on growth of laminated bamboo furniture and panels used for furniture.	Yes
Flooring	Construction; World GDP; Substitution	Large growing market with bamboo as one of fastest growing segments. Bamboo penetration still small. Quality and cost of product are major drivers of likely growth.	Yes
Wood Panels	Construction; World GDP; furniture; Substitution	Large, growing market. Export opportunities rely on ability to meet construction codes and gain acceptance by tradespeople which vary according to each market. Easiest in short-medium term in Asia, including panels for furniture. Doubts about its performance and cost-benefit compared to established materials such as MDF for construction.	Investigate further
BJC	Construction; World GDP; Substitution	Large market, but performance issues related to bamboo look set to hinder industry uptake.	No
Blinds	Construction; World GDP Growth	Large industry – bamboo an established material. Relatively low capital investment.	Yes
Chopsticks	Asian GDP Growth	Asian market. High volume, low margin business. Opportunities for growth are difficult to identify.	Investigate further

Market	Demand Drivers	Observations	Proceed
Charcoal	High Energy Prices; Environmental Issues;	Globally a 98% domestic market. Low value - high volume business. Possible niches for briquettes and processed charcoal. Demand set to increase due to rising costs of alternative fuel-types.	Investigate further
Activated carbon	Environmental considerations; World GDP	Growing market. Bamboo a new entrant and yet to establish its place as a material. Apparent strong technical performance of bamboo may make it a player in this market. Significant potential to develop industries in linked sectors (i.e. water filters, exhaust canisters and other).	Investigate further

5.8 The role of domestic and regional markets

The sections above have outlined selected world markets for bamboo, providing the macro level context against which to judge the potential demand for different bamboo products.

However, in terms of the specific development of the bamboo sector in the Mekong countries, demand from domestic and neighbouring regional markets is likely to play an equally prominent role, especially during the initial stages of development and for particular products.

Vietnam represents the greatest opportunity of the three Mekong countries as a market for producers, with a population of 82m people and average annual GDP growth expected to increase to around 7.5% - 8.0% p.a. in coming years from 7.0% p.a. between 1994 and 2004 (World Bank (2006)). Over the same period there has been a ten fold increase in manufacturing exports from USD 1.4 bn to USD 14.8 bn, with similar growth rates expected to continue in coming years. (World Bank (2005) 3).

While Gross National Income (GNI) per capita of USD 540 p.a. is still low compared to the average for the East Asia & Pacific region (USD 1240), the strong growth of the economy and manufacturing sector means that Vietnam is likely to become an increasingly important market for bamboo products both from end-consumers and manufacturing industries.

Laos and Cambodia, with smaller populations and weaker economies are unlikely to have sufficient domestic demand to drive growth for domestic producers.

While Cambodia and Laos may lack domestic markets on which to build their bamboo sectors, the proximity of larger and growing economies in the region are likely to create important growth opportunities for the bamboo sectors all three countries.

Thailand is already the most important market for the Cambodian and Laos bamboo sectors. Its importance as a key market in the region is likely to remain with a population of 64m people, GNI per capita almost 5 times higher than Vietnam (USD 2550 (2004)) and recent GDP growth in excess of 5% p.a. expected to be sustained in the coming years (World Bank (2005) 2, World Bank (2006)).

China's continued rapid economic growth, with GDP growth forecast to continue in excess of 8% p.a., its large population and GNI per capita of USD 1290 p.a. means that it is rapidly becoming one of the most important markets in the region and the world as a whole (World Bank (2005) 1, World Bank (2006)). It is also the global bamboo superpower, with an estimated industry production output of USD 5.5 bn in 2004, almost 85% of which is consumed in the domestic market (INBAR study report).

These key domestic and regional emerging markets will continue to be the dominant markets for several traditional bamboo products such as bamboo shoots and chopstick. They are also likely to provide useful opportunities for the emerging sector in the Mekong region in newer products such as panels, flooring and furniture to both end-user markets (e.g. for bamboo flooring) or manufacturers and other industries (e.g. bamboo panels to the furniture or construction industries).

Quality and price requirements in domestic and regional markets are substantially different from those of developed country markets and can therefore provide alternative pathways for the development of the Mekong sector. An example of this is the use of bamboo panels in construction, such as mat board (broadly similar to plywood). While use of these products in the construction industry in China is growing rapidly, in developed countries the more stringent building standards and attitudes of the construction industry have limited the penetration of these products. In this case Mekong producers may be best to initially target markets in China and other emerging Asian economies and progress to targeting developed country markets as they gain more experience and understanding of the production processes, quality control and market requirements.

5.9 Trade context

The trade context between the Mekong countries and potential market countries will be an important determinant of the potential for Mekong producers to compete in export markets.

While other non-tariff barriers may exist, trade tariffs are a key component of the trade context. For Vietnam, Laos and Cambodia trade tariffs with key potential bamboo markets are determined by four main trade frameworks:

- ASEAN Free Trade Area (AFTA)
- ASEAN China Free Trade Area (ACFTA)
- US Most Favoured Nation (MFN) status
- EU MFN status

By end 2006, Laos will be the only one of the three countries that is not a member of the WTO, but MFN tariff still apply between Laos, Vietnam and Cambodia and the EU and US. The impact of each of the above frameworks on bamboo goods is summarised below.

AFTA

ASEAN members have agreed to eliminate all import duties (tariffs) by 2010 for the six original members and by 2015 for the new members (including Laos, Cambodia and Vietnam). The Free Trade Area covers all manufactured and agricultural products. However, 734 tariff lines (1.09%) in the General Exception List are permanently excluded from the Free Trade Area

No bamboo products are included in this General Exception List and hence all bamboo products should move to a zero tariff status within ASEAN over the coming years, and between all ASEAN countries within a maximum of 10 years.

At present, of 15 bamboo-related product lines covering the main potential bamboo markets, intra-ASEAN tariffs range between 0% - 35%. Vietnam, Laos and Thailand are the most liberal economies for bamboo, with imports tariffs on bamboo products of 0%-5% from 2008. Cambodia is the only country with exclusions on some bamboo products where they apply regular MFN rates.

The low tariffs between Laos and Vietnam could be of particular relevance to the development of cross border supply chains, while low tariff to Thailand will facilitate penetration of this key market for Laos and Cambodia producers.

ACFTA

Tariff rates in this agreement are similar to those between ASEAN members under the AFTA. However, unlike the AFTA, the ACFTA has a *Highly Sensitive*, *Sensitive* and *Normal Track* listing of goods - the difference being the length of time over which the tariffs are eliminated. Where a good is in none of these lists it means that the good has not been included in the agreement and MFN rates apply. The tariff reduction schedule under ACFTA is summarised below.

Table 5-4: ACFTA Tariff Reduction Schedule

Goods category	Maximum length of time for tariff reduction
Early Harvest Programme (including Bamboo shoots)	2007 for China and original ASEAN members 2010 for new members (incl. Vietnam, Laos and Cambodia)
Normal Track	2010 for China and original members 2015 for new members
Sensitive / Highly Sensitive	2018 for all members

For bamboo goods this means the following:

Bamboo shoots are covered by the Early Harvest Programme and so tariffs must be removed by 2010 at the latest for Vietnam, Laos and Cambodia, until then MFN rates apply (10% for vegetables).

For all other bamboo goods tariffs will be eliminated starting 2005 with elimination completed by 2015 for China and Vietnam, Laos and Cambodia and by 2010 for original ASEAN members (except the two goods listed as Sensitive / Highly Sensitive by China and Cambodia – see below). Until then the following MFN rates apply:

- Handicrafts 10%
- Vegetables (edible and plaiting) 10%
- Blinds 16%
- Wood and Charcoal 10.5%-12.4%

Only China and Cambodia have listed bamboo goods as sensitive or highly sensitive. For these goods, import tariffs will be eliminated by 2018:

- Cambodia: blinds (current tariff = 35%)
- China: furniture (current tariff = 12%)

In addition to the above, a supplementary agreement was signed between China and Cambodia under the Early Harvest Programme that included several bamboo products to which zero tariffs would be applied from 1 January 2004. Bamboo products included in this list were:

- Bamboo shoots (fresh and chilled)
- Raw bamboo
- Bamboo furniture
- Plaited bamboo products (e.g. baskets)

US and EU MFN Tariffs

In general, the MFN rates that apply to the main potential bamboo products from Vietnam, Laos and Cambodia into the US and EU are relatively low. Current MFN tariffs for selected products are shown below.

Table 5-5: US and EU MFN Tariff for selected bamboo goods

Bamboo products	MFN rates (%)	
	US	EU
Bamboo Handicrafts	0-6.6	3.7
Vegetables	0	0-14.4
Furniture / Furniture Parts	0	5.6
Laminated Wood	0	0
Parquet Floors	0	0
Panels, Boards	0	6
Fiber Boards	4.8	1.7
Blinds	3.3	0
Charcoal	0	0

Tariff Summary

Tariff barriers for bamboo products are not high for the key potential markets and there are no extremely high tariff rates for any country:

- For ASEAN and China, most tariffs affecting bamboo goods from Vietnam, Laos and Cambodia are scheduled to be eliminated by 2015 under the AFTA and ACFTA. No bamboo products fall under the General Exception List.
- For the US and EU, MFN rates apply which are mostly in the range of 0 - 7%.

While non-tariff barriers have not been assessed, this brief review of trade tariffs suggests that they should not be a major barrier to the export-led development of the bamboo sectors in Vietnam, Laos and Cambodia.

5.10 Conclusions

In summary, from a demand side perspective, there are three industry groupings that should be looked at in more detail, these are:

1. Handicrafts – household and enterprise level production and marketing of very wide variety of different products.
2. Shoots – agricultural, standalone market
3. Industrial Processing (furniture, flooring, panels, chopsticks, blindmaking) – Many producers are small-end, still large manual processing however most of these industries present opportunities for more intensive production.

In terms of formulating a strategy for market intervention, this combination appears to offer:

- Size and growth
- Ability for Mekong countries to compete effectively
- Diversification (i.e. no over-reliance on one market for example the Western housing markets)

Other markets require further investigation particularly those that would allow the development of a more high-tech application of bamboo such as activated carbon. This market has significant market linkage potential, in particular the development of higher value-add businesses based around end-products that use activated carbon.

Macro-economic developments suggest that products that can replace wood-based products will be in demand due to shortages of certified (and non-certified) timber.

Overall prospects for the world bamboo industry look strong.

6 Mekong Sector Scenarios

Potential 'World bamboo markets scenarios' are outlined in Section 5 above. These provide the context for the sector's development in the Mekong. Here we consider scenarios specifically for the development of Mekong bamboo sector. The objective is to develop an appropriate basis for assessing its potential impact.

Two approaches have been used to develop scenarios for the Mekong sector:

1. **Demand Driven:** using analysis of the potential share of the world bamboo markets that could be captured by the Mekong sector.
2. **Supply Driven:** using analysis of the development of the sector under different industrial models.

6.1 Demand driven scenarios

Demand driven scenarios combine the 'world bamboo market scenarios' with an assessment of the potential share of the world market that could be captured by the Mekong sector.

The assessment of the potential market share is informed by analysis of current production levels in the Mekong bamboo industries as well as national export performance in other light manufacturing and agricultural sectors. Based on this assessment, three different world market share scenarios have been calculated for each industry: 2%, 5% and 8%. The feasibility of different bamboo market shares is discussed in detail later.

Is past performance a guide to future potential?

Mekong countries already capture a good share of some world markets: 3% of wooden furniture (growing at >40% p.a.), 7% of coffee exports and in c.7% of world exports of basketwork & wickerwork.

In reality, industries will develop at different rates. We have therefore highlighted our opinion of the level of 'world market share' that is perhaps the realistic limit of what could be captured within the next 10 years. Our opinion is based on consideration of the current state of development of each of the domestic bamboo industries and the past performance in other similar industries.

Table 6-1 summarises the size of each industry under the different 'Demand driven' Mekong sector scenarios. The analysis of 'Demand driven' scenarios suggests that within 10 years, and under favourable domestic conditions, the Mekong sector could be worth around:

- **USD 0.6 bn p.a. by capturing a greater share of the existing world bamboo markets (World Bamboo Market Scenario 1)**
- **USD 1.2 bn p.a. by capturing a greater share of a growing world bamboo market (World Bamboo Market Scenario 2)**

Table 6-1: 'Demand driven' Mekong sector scenarios

Industry	World Bamboo Market Scenario 1 (Existing market - zero world growth)					World Bamboo Market Scenario 2 (Future mid level world growth)				
	World market	Mekong Market Share			Author's Opinion	World market	Mekong Market Share			Author's Opinion
	\$m	2%	5%	8%	\$m	\$m	2%	5%	8%	\$m
Handicrafts (Bamboo & rattan)	3,000	60	150	<u>240</u>	240	4,200	84	210	<u>336</u>	336
Bamboo shoots	1,500	30	75	<u>120</u>	120	1,700	34	85	<u>136</u>	136
Wood furniture	1,100	22	<u>55</u>	88	55	5,600	112	<u>280</u>	448	280
Wood flooring	100	2	5	<u>8</u>	8	1,200	24	<u>60</u>	96	60
Wood panels⁹	200	4	10	<u>22</u>	22	2,200	44	<u>110</u>	176	110
Blinds (incl. fish gear)	500	10	<u>25</u>	40	25	1,200	24	<u>60</u>	96	60
Chopsticks	300	6	<u>15</u>	24	15	400	8	<u>20</u>	32	20
Charcoal	100	2	<u>5</u>	8	5	130	3	<u>7</u>	10	7
Activated carbon	20	0	<u>1</u>	2	1	170	3	<u>9</u>	14	9
Paper/pulp¹⁰	n/a	n/a	n/a	n/a	80	n/a	n/a	n/a	n/a	110
Raw bamboo¹⁰ / construction	n/a	n/a	n/a	n/a	60	n/a	n/a	n/a	n/a	60
Total	6,825	137	341	552	630	16,830	337	842	1,346	1,185

Source: Study analysis

The 'Author's Opinion' of the achievable market share under each of the two 'World bamboo market scenarios' will be used as the basis for the two 'Demand Driven Mekong Sector Scenarios' for further analysis.

These scenarios show that within the existing world bamboo markets (Scenario 1) handicrafts, bamboo shoots and paper would continue to be the main industries of scale in the Mekong. However, in a growing world market (Scenario 2), furniture would become increasingly important and begin to rival handicrafts as the leading Mekong bamboo industry. Flooring, panels and blinds would also become industries of scale.

⁹ VN production of pressed woven mat boards is estimated at \$22m, hence current market share may be c. 11%

¹⁰ Paper/pulp and raw bamboo world market size data is not presented as it was not reviewed during this study. However, estimates of future Vietnamese bamboo paper/pulp production and raw bamboo consumption for domestic demand are included here to better illustrate the overall potential scale of the sector.

When grouped by sub-sector, the growing importance of industrial processing becomes apparent.

Table 6-2: Contributions of each sub-sector under different scenarios

Sub sector	Mekong Demand Scenario 1 (Existing market– zero world growth)		Mekong Demand Scenario 2 (Future mid level world growth)	
	Overall financial output (\$m)	%	Overall financial output (\$m)	%
	Handicrafts	240	38%	336
Bamboo Shoots	120	19%	138	12%
Industrial Processing (incl. Raw culms)	270	43%	710	60%
Total	630	100%	1185	100%

Source: Study analysis

Scenario Feasibility

It is reasonable to ask if these scenarios are realistic. This is best answered by reference to past performance.

Trade performance in other sectors

A first test is whether the 'market share' assumptions of 2%, 5%, and 8% are realistic. The evidence from the recent trade performance of the Mekong countries suggests that these market shares are indeed achievable. (See Appendix: Trade performance data). Other commodities in which the Mekong countries have achieved similar world export market shares include:

- ~8%: Footwear, basketwork, ornamental ceramics, pepper, coffee
- ~5%: Rice, Men's & Women's overcoats, Natural rubber, bicycles
- ~2%: Wooden furniture, various garments and agricultural products

Required Industry Growth Rate

A second test is the extent to which supply could grow at the required rate to achieve the implied scale. Again, the required growth rates appear to be feasible, if bullish, as they are within the range of annual growth rates achieved by Vietnam in several similar sectors since 1999. (See Appendix: Trade performance data). Of particular relevance may be the emergence of the wood furniture sector which has grown from \$12m in 1999 to \$1.1 bn by 2004, a sustained average annual growth rate >40% p.a. (ITTO, 2004 & 2005).

The table below summaries the implied growth rate over a ten year horizon for each industry under the two 'Demand driven' Mekong sector scenarios.

Table 6-3: Implied Mekong Industry Growth Rates

Industry	Current Production	Implied annual growth rate	
	\$m (indicative estimate only)	Scenario 1 (Author's opinion)	Scenario 2 (Author's opinion)
Handicrafts	138	6%	9%
Bamboo shoots	10	28%	30%
Wood furniture	5	27%	50%
Wood flooring	7.5	1%	23%
Wood panels	22	0%	18%
Blinds	4	20%	31%
Chopsticks	7	9%	12%
Charcoal	2	10%	13%
Activated carbon	-	N/a	N/a
Paper/pulp	55	5%	10%
Raw culms	55	N/a	N/a
Total	250	10%	19%

Source: Study analysis

6.2 Supply driven scenarios

Supply driven scenarios for the Mekong sector can be developed based on the available resource base combined with different models for industrial development of each of the sub-sectors.

In the case of the handicrafts and bamboo shoots sub-sectors, availability of bamboo resources is unlikely to be a limiting factor as under the higher of the two Demand driven scenarios above, they require only 24,000 ha. and 36,000 ha of bamboo respectively (see Section 7.2.1 below). As market demand and market share are more likely to be limiting factors, the Demand driven scenarios will therefore be used to determine the size of these two sub-sectors,.

In the case of the industrial processing sub-sector, availability of suitable bamboo resources may be a limiting factor over the medium term. We will therefore consider the potential scale of the industry that could be supported under different resource base scenarios.

A key variable in the resource scenario is the yield per ha. of bamboo. This was found to be around 9.5 Tonnes/ha. p.a. ('luong' bamboo) in the active bamboo processing areas of the Mekong countries covered by the study. In Anji in 2003, the maximum yields achieved by farmers were around 14 Tonnes/ha. p.a. of

equivalent quality and types of bamboo ('Moso' bamboo - although the average yield across the County was around 9 Tonnes/ha)

Reliable estimates are not currently available for the total area of bamboo exploited in the Mekong countries at present. We will therefore assume a total area of 500,000 ha. will be available for bamboo production, equivalent to approximately 1/3 of the bamboo resource in either Laos or Vietnam.

The 'New industrial model' outlined in Section 3.2 above is used to illustrate the potential scale of the sector. The 'New industrial model' has a balance of premium, medium and low value and bulk processing.

Table 6-4: 'Supply driven' Mekong Sector Scenarios

Sub sector	Mekong Supply Scenario 1 500,000 ha., 9.5 Tonnes/ha		Mekong Supply Scenario 2 500,000 ha. 14 Tonnes/ha.	
	Area of bamboo (ha.)	Overall financial output (\$m)	Area of bamboo (ha.)	Overall financial output (\$m)
Handicrafts	24,000	336	16,000	336
Bamboo Shoots	36,000	138	36,000	138
Industrial Processing (New industrial model)	440,000	495	448,000	729
Total	500,000	970	500,000	1,200

Source: Study analysis

Table 6-4 summarises the likely scale of industry that could be supported under different supply scenarios. The supply scenarios indicate that under current raw material production practice and yields, an area of 500,000 ha. of bamboo could support an industry worth USD 970m p.a.. With improved production practice and increased yields the same area of 500,000 ha. could support an industry worth USD 1,200m p.a.

6.3 Mekong Sector Scenario Summary

Scenarios for the development of the Mekong sector have been developed from both a 'Demand driven' and 'Supply driven' perspective.

The higher level 'Demand' and 'Supply' scenarios are broadly consistent. Both suggest a potential Mekong sector worth around USD 1,200m p.a. Of the lower scenarios, the Demand scenario based on zero world market growth suggests the lowest sector potential worth around USD 630m p.a..

Given that the higher level scenarios are broadly consistent and the lower level 'Demand' scenario is more conservative, the two 'Demand' scenarios will be used as the 'Mekong Sector Scenarios' for further analysis of the potential impact.

Table 6-5: Mekong Sector Scenarios

Sub sector	Mekong Scenario 1 (Existing market – zero world growth)		Mekong Scenario 2 (Future mid level world growth)	
	Overall financial output (\$m)	%	Overall financial output (\$m)	%
Handicrafts	240	38%	336	28%
Bamboo Shoots	120	19%	138	12%
Industrial Processing (New industrial model)	270	43%	710	60%
Total	630	100%	1185	100%

Source: Study analysis

7 Mekong Sector Potential

The purpose of this section is to:

- evaluate the potential scale and scope of the sector in the Mekong countries under different scenarios,
- provide an indicative impact assessment oriented towards poor farmers and workers which identifies likely impacts in socio-economic and environmental terms.

7.1 Approach

The potential socio-economic and environmental impact of the sector under the Mekong Sector Scenarios above has been assessed using a combination of measures:

Socio-Economic Impact

1. **Overall financial impact:** the total value of the output of the sector or supply chain.
2. **Pro-poor financial impact:** the component of the overall financial impact captured by waged income, and income to farmers and small businesses close to source (i.e. 'local costs' – see box below). The study suggests that this typically amounts to around 75% for the sector (except for products like pulp/paper). (See Table 7-1 below)
3. **Employment creation:** the total number of Full Time Equivalent (FTE) jobs created in farming, pre-processing, secondary processing and in associated activities such as transport and loading, trading and wholesale.
4. **Total direct beneficiaries:** the total number of workers and farmers gaining direct benefit from the sector. The number of direct beneficiaries will be higher than the FTE Employment creation as most farmers only spend part of their time growing bamboo.
5. **Distribution of benefits between men and women:** the percentage distribution of benefits between men and women is also carried out for each supply chain, based on the share of employment creation.
6. **Geographical distribution of benefits:** the distribution of employment creation along each supply chain, between farmers, traders, primary and secondary processing workers, is used as a proxy measure for the potential geographical distribution of benefits and hence the potential for benefits to be captured by more remote poor communities. The summary indicator used is the percentage of jobs with potential to go to rural communities which is assumed to equal employment creation among farmers, traders and primary processing workers.

Each of these measures are expressed in two forms:

- a) **Efficiency of impact:** measured as the rate of employment creation or financial impact (pro-poor and total) in the sector per hectare of land committed to bamboo production. This measure permits very clear policy and strategic decision making and permits the comparison of benefits with competing options for land-use.
- b) **Scale of impact:** measures the overall scale of benefit which may potentially accrue with given market opportunities and resource base.

Environmental Impact

There are two main environmental considerations from the supply side:

1. **Raw material production:** Does the cultivation and harvesting of bamboo have discernable positive or negative environmental impacts?
2. **Processing:** What are the main environmental impacts of the different processing industries?

Taken together, these measures indicate clear choices about strategic policy options at both national and provincial levels.

What is ‘pro-poor financial impact’ ?

In assessing the potential of the sector we want to understand not only its total size in terms of output value and revenue but also how much of this is captured by poor communities compared to being taken as profits of larger businesses, interest payments, or other expenditures that remove the value from the local rural economy.

We have used the term **‘pro-poor financial impact’** to describe this local component of total revenue that is captured by poor communities. To examine this we asked enterprises to estimate the proportion of their total costs that were spent on the main ‘local’ costs such as labour and bamboo and provide estimates of their profit margins and other main costs.

Bamboo and labour together typically represented approx. 80% of total cost of production for most bamboo processing industries with profit margins of approx. 7% (but ranging typically from 0% to 12%). So at the processor level, approx. **75% of revenue is captured by local costs compared to approx. 7% taken as profits.** (The notable exception is paper where only approx. 33% of revenue is captured locally.)

These estimates reflect the ‘factory gate’ price paid for bamboo. As such they include the total local value-added and profit captured by farmers, traders and transporters along the local value chain. They include local costs such as raw material, labour, local fees and profits of farmers and local traders but also transport costs. When bamboo businesses are sourcing bamboo from poor rural communities, as is most often the case, this is a useful approximation of the value captured by poor communities.

However, it is only a proxy measure. The main limitations are that it:

- under estimates the total pro-poor impact as it does not reflect the wider impact of reinvestment of profits and surplus capital by farmers and local traders back into the local economy.
- over estimates the direct ‘pro-poor’ impact as they also include transportation fuel costs and do not differentiate between the benefit captured by non-poor farmers and traders and the genuine poor. For example, the study found that when transported up to 20km fuel costs may represent around 10% of the factory gate price.

7.2 Efficiency of impact

The efficiency of impact is assessed for the supply chains associated with each individual industry in terms of the five socio-economic measures outlined above. For each industry, the rates of impact per hectare of bamboo include the full impact along the domestic supply chain¹¹. The analysis is based on data obtained by the study from farmers, traders and businesses operating in each industry.

Table 7-1: Rate of impact of bamboo industry supply chains

Data shown are for the whole supply chain for each industry.

Industry	Overall financial output (wholesale) (\$/ha.)	Pro-poor financial impact (\$/ha.)	Employment creation (FTE/ha.)	Total beneficiaries (farmers & workers/ha.)	Local Costs (% of total costs)	% women in supply chain (% FTEs)	% jobs in rural communities (% FTEs)
Handicrafts (VN)	14,3000	11,300	39	40	85%	60%	95%
Bamboo Shoots (China)	3,800	3,100	0.4	1.1	90%	31%	100%
Flooring (VN)	3,100	2,400	1.2	1.9	85%	49%	35%
Chopsticks (VN)	1,600	1,300	1.1	1.8	85%	49%	46%
Woven mat (VN)	1,100	1,000	0.9	1.5	100%	42%	100%
Mat board (VN, panels)	1,300	810	0.8	1.5	70%	46%	98%
Charcoal (briquets, China)	600	420	0.2	0.9	75%	37%	95%
Charcoal (briquets, Laos)	320	180	0.3	1.0	60%	38%	79%
Paper + pulp (VN)	1,500	490	0.3	1.0	35%	38%	66%
Raw culms (VN) (luong for construction)	360	360	0.1	0.8	100%	31%	100%

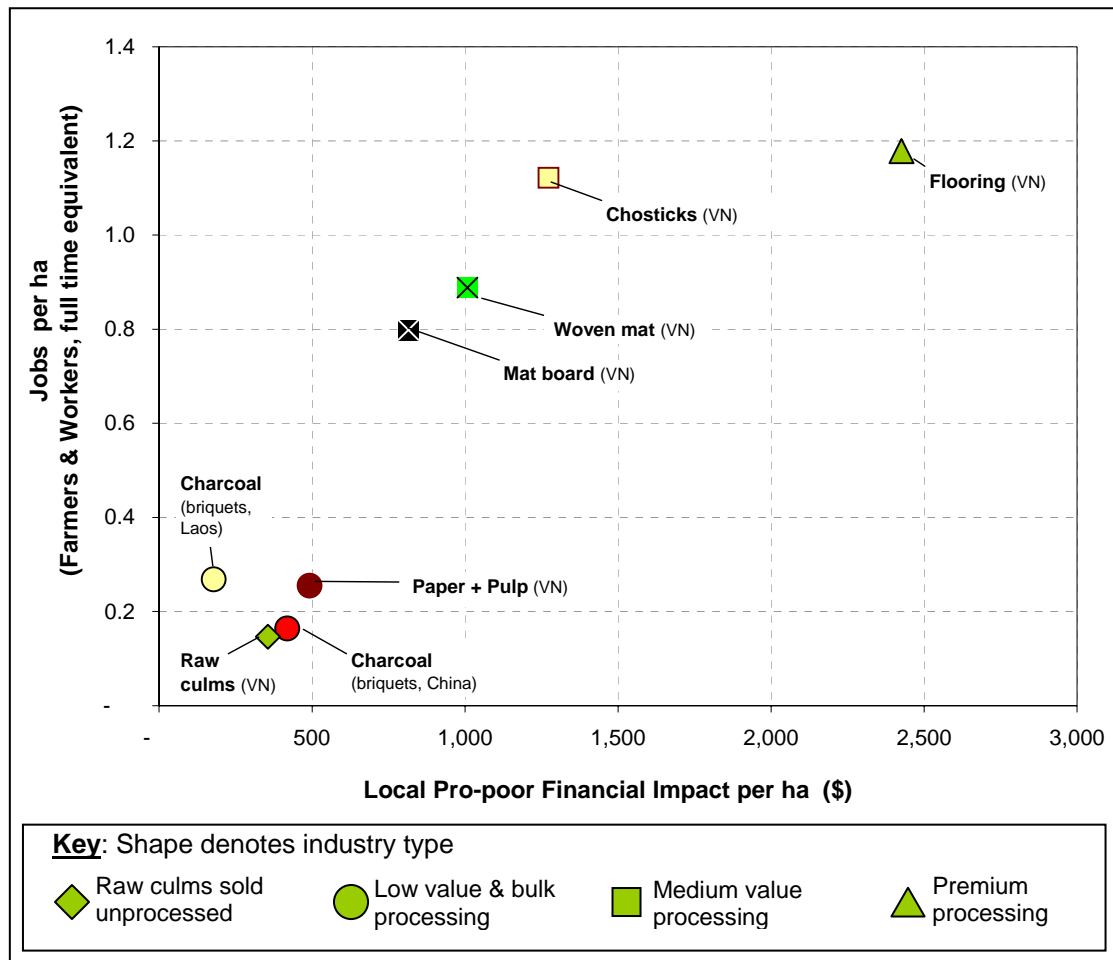
Source: Study analysis & survey data

Arguably the most critical measures from a pro-poor perspective are the rates of 'pro-poor financial impact' and 'employment creation'. Against these two measures, the analysis in Table 7-1 confirms important differences between and within the different sub-sectors.

¹¹ In line with experience from China, the analysis allows for a further 10% employment creation in related activities such as handling, transportation, trading and wholesaling.

- **Handicrafts:** Very high rates of pro-poor financial impact and employment creation per hectare of bamboo. This is due to the highly manual processing of relatively small volumes of bamboo, with most benefit gained by small scale processors and factory workers. This supports the argument that handicrafts are a distinct sub-sector, based on the sale of skilled craft labour rather than of large volumes of bamboo material.
- **Bamboo shoots:** Deliver high levels of pro-poor financial impact per ha. due to the higher prices and yields of shoots compared to culms. In this sense, shoots are a high value agricultural crop. However, shoot farming creates relatively little employment. Most of the financial benefits are retained by farmers themselves and not distributed along the supply chain.
- **Industrial processing:** From a pro-poor perspective, 3 distinct industry groups emerge within the industrial processing sub-sector. These are illustrated in Figure 7-1 below.
 - **Premium processing industries,** such as flooring, have the highest rates of pro-poor financial impact and employment creation of the industrial processing industries, but require premium quality bamboo. Their rate of economic impact is twice the level of the Medium value processors and five times the level of the Low value and bulk processors. Similar results would also be expected for modern furniture industries.
 - **Medium value processing industries,** such as chopsticks and mat boards (panels) create similar levels of employment to the Premium processing industries but only half the pro-poor financial impact per ha. of bamboo. However, they are able to use lower grades of bamboo than Premium processors.
 - **Low value and bulk processing industries,** such as charcoal, paper & pulp, have low rates of both pro-poor financial impact and employment creation. They achieve only marginally higher levels than selling unprocessed bamboo to the construction industry. This lower impact is partially offset by the fact that the industry can utilise low quality bamboo, leftovers and processing waste from other industries and various species (e.g. "nua").

Figure 7-1: Employment creation and Pro-poor financial impact



Source: Study analysis & survey data

Gender impact

The study has found that there are distinct differences in the relative level of involvement between men and women in different areas of the bamboo industry:

Harvesting, collection and cultivation is predominantly a male activity, with an estimated men:women activity ratio of approx. 2:1. This is likely to apply for both culm production as well as shoots. This may be explained by a number of factors including cultural norms of men focussing on perennial crops but also the arduous physical nature of harvesting culms which was highlighted as a key reason by villagers:

- In Laos, villagers reported that men were primarily engaged in collection of natural bamboo (and other forest products).
- In Vietnam, cultivation of bamboo is a male dominated activity – consistent with the generally male dominated cultivation of perennial crops. However, women also contribute labour for harvesting, especially for natural bamboo.
- In Cambodia men are primarily engaged in collection of natural bamboo.

Handicraft production is mostly done by women:

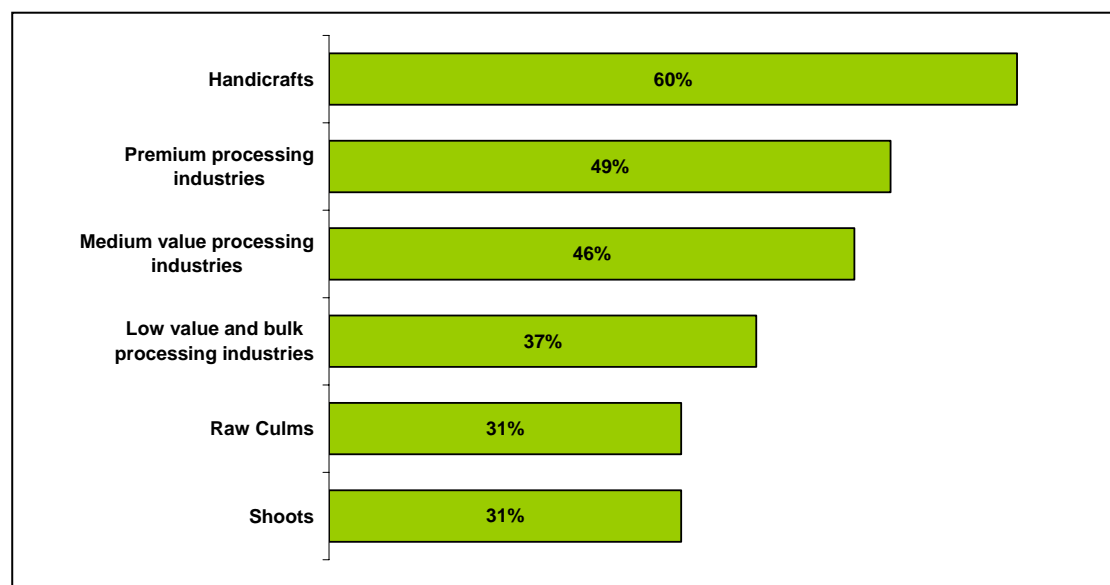
- In Vietnam, women represent 60% of bamboo and rattan craft workers (206,000 from a total of 340,000 workers in 2004, (JICA-MARD 2004))
- In Laos, while women, men, young and old were engaged in handicraft production. Women, the young and the elderly focus on processing and craft work while harvesting and collection of culms tends to be done by men.
- In Cambodia, basket production is an activity engaged in by women and men, young and old particularly in the off-farm season.
- In all of the countries, handicrafts was found to be an important activity for additional off season work and for the elderly and young to contribute to household incomes.

Processing workshops and factories:

- The balance of employment in primary and secondary processing appears to be evenly split between women and men.
- Some enterprises have a predominance of women in clerical roles (c. 60% women) offset by more men in other areas (e.g. 'buyers').
- Of the enterprises surveyed, the vast majority are male owned and managed. For example, the only female-owned businesses found were a chopsticks workshop in Thanh Hoa and a high-end furniture business in Laos.
- Local bamboo trading is the exception to this general ownership pattern. Despite anecdotal evidence to the contrary, both women and men were found to be active as bamboo traders, with the most common trading unit being one woman and one man working together (husband and wife).

The overall gender distribution of the impact within the different parts of the bamboo sector is summarised in Figure 7-2 below.

Figure 7-2: Women in the supply chain (% of total FTEs)



Source: Study analysis & survey data

7.2.1 Geographical distribution of impact

The potential for rural communities to capture benefits is largely determined by the distribution of employment creation and profit along the supply chain.

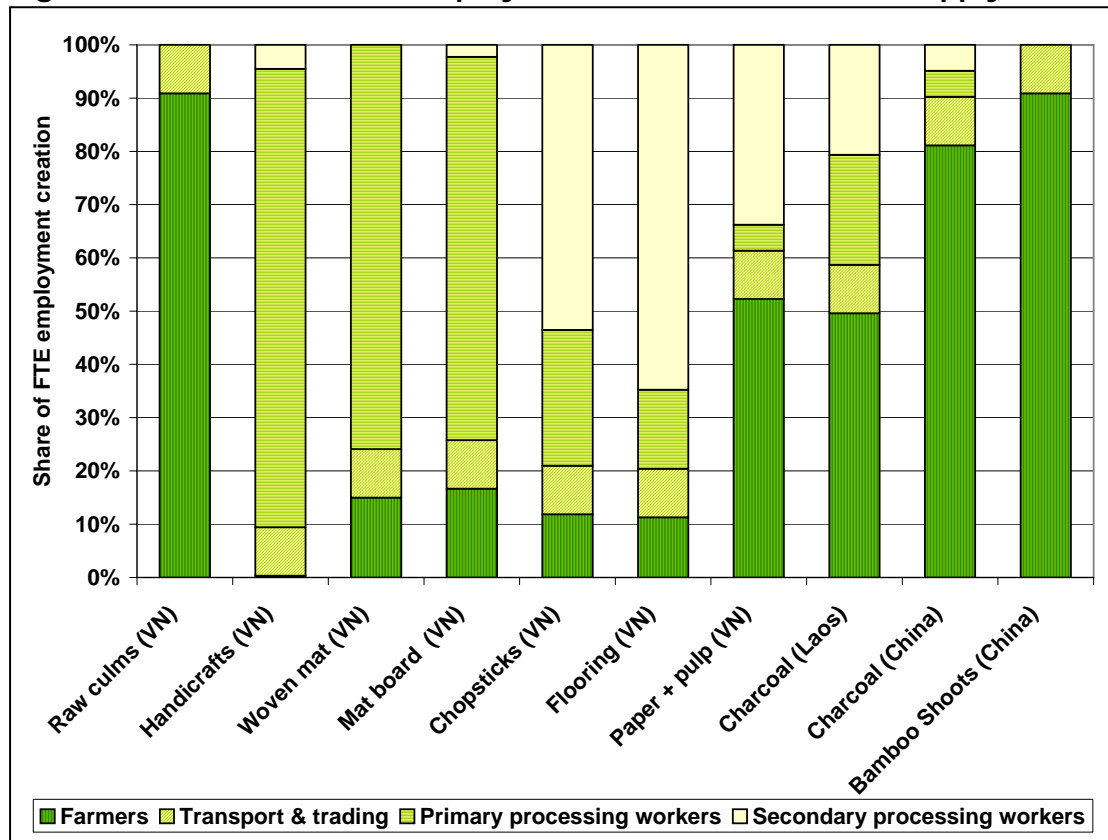
Farmers, traders and transporters operate primarily in rural areas. Primary processing can also be situated in rural areas, as this typically reduces transport costs and has the potential to increase the efficiency of allocation and utilisation of resources. Employment creation in these groups therefore has the greatest potential to benefit more remote and marginalized communities.

The potential for secondary processing enterprises to be located in more rural areas is limited by their greater infrastructure requirements and the current under-development of rural infrastructure in most areas in the region. Consequently, employment creation in secondary processing is likely to create most benefit for communities in less remote areas.

The distribution of employment creation along the supply chain for different industries is illustrated in Figure 7-3.

In some of the provinces covered by this study, there also appears to be a strong representation of ethnic minorities amongst bamboo farmers. For example in Thanh Hoa and Nghe An provinces in Vietnam, of the bamboo farmers surveyed more than 75% were from the Thai, Muong and Kho Mu ethnic groups and a further 13% from other ethnic minority groups. Less than 12% were from the dominant Kinh group, which accounts for 84% of the general population of Vietnam (Baulch et al, 2001).

Figure 7-3: Distribution of employment in selected bamboo supply chains



Source: Study analysis & survey data

7.3 Scale of impact

Scenarios for the potential development of the sector were described in Section 6 above. This section combines these scenarios with the impact efficiency analysis in the previous section to assess the total scale of the impact of the different parts of the sector¹². The assessment is made according to the measures outlined in Section 7.1:

1. Overall financial impact
2. Pro-poor financial impact
3. Employment creation
4. Total direct beneficiaries

Table 7-2: : Potential scale of impact of the Sector - Scenario 1

Industry	Mekong Sector Scenario 1 (Greater share of existing markets - zero world market growth)					
	Pro-poor financial impact	Financial output	Employment creation	Total direct beneficiaries	Area of bamboo	World bamboo market
	\$m	\$m	FTE	People	Ha.	\$m
Handicrafts	190	240	657,000	669,000	17,000	3,000
Bamboo shoots	98	120	14,000	36,000	32,000	1,500
Wood furniture	43	55	21,000	33,000	18,000	1,100
Wood flooring	6	8	3,000	5,000	3,000	100
Wood panels	20	22	14,000	25,000	17,000	200
Blinds (incl. fish gear)	20	25	17,000	18,000	2,000	500
Chopsticks	12	15	11,000	17,000	9,000	300
Charcoal	4	5	1,000	2,000	8,000	100
Activated carbon	1	1	100	400	2,000	20
Paper/pulp	25	80	13,000	50,000	52,000	n/a
Raw bamboo / construction	60	60	24,000	141,000	167,000	n/a
Total	478	630	775,000	996,000	327,000	6,825

¹² It should be noted that unprocessed bamboo and paper/pulp primarily serve the domestic markets. Estimates of the scale of the domestic markets are based on extrapolation of data from only a few provinces and therefore should be treated as indicative only. The size and requirements of these parts of the domestic bamboo markets are currently poorly understood and need further investigation.

Table 7-3: Potential scale of impact of the Sector - Scenario 2

Industry	Mekong Sector Scenario 2 (Greater share of growing world markets)					
	Pro-poor financial impact	Financial output	Employment creation	Total direct beneficiaries	Area of bamboo	World bamboo market
	\$m	\$m	FTE	People	Ha.	\$m
Handicrafts	266	336	920,000	936,000	24,000	4,200
Bamboo shoots	111	136	16,000	41,000	36,000	1,700
Wood furniture	217	280	106,000	170,000	90,000	5,600
Wood flooring	46	60	23,000	36,000	19,000	1,200
Wood panels	100	110	68,000	127,000	85,000	2,200
Blinds	47	60	41,000	44,000	4,000	1,200
Chopsticks	16	20	14,000	23,000	12,000	400
Charcoal	5	7	1,000	2,000	11,000	130
Activated carbon	6	9	1,000	3,100	18,000	170
Paper/pulp	35	110	18,000	69,000	72,000	n/a
Raw bamboo	60	60	24,000	141,000	167,000	n/a
Total	909	1,185	1,232,000	1,592,000	538,000	16,830

Source: Study analysis & survey data

At a sub-sector level, the analysis leads to the following conclusions:

- **Handicrafts:** are the most important source of employment creation, accounting for more than 75% of all employment in the sector under both scenarios. Their pro-poor financial impact is substantial though they deliver relatively little benefit to farmers.
- **Bamboo Shoots:** is the smallest of the three sub-sectors, but its high financial impact rate means that it provides 10%-20% of the pro-poor financial impact from just 1% - 2% of the employment.
- **Industrial Processing:** emerges to become the largest sub-sector in terms of pro-poor financial impact, accounting for up to 60% of the total pro-poor financial impact of the sector. The sub-sector also consumes by far the largest share of bamboo (>85%) and so is the most important sector for delivering large scale benefits to poor farmers.

The tables below summarise the scale of impact by sub-sector under the two scenarios.

Table 7-4: Scale of impact by sub-sector - Scenario 1

Sub-sector	Mekong Sector Scenario 1 (Greater share of existing markets - zero world market growth)					
	Pro-poor financial impact	Financial output	Employment creation	Total direct beneficiaries	Area of bamboo	World bamboo market
	\$m	\$m	FTE	People	Ha.	\$m
Total	478	630	775,000	996,000	327,000	6,800
Handicrafts	190	240	657,000	669,000	17,000	3,000
Bamboo shoots	98	120	14,000	36,000	32,000	1,500
Industrial Processing	191	271	104,100	291,400	278,000	2,300
Premium Processing	49	63	24,000	38,000	21,000	1,200
Medium Value Processing	52	62	42,000	60,000	28,000	1000
Low value & bulk processing	30	86	14,100	52,400	62,000	120
Raw bamboo	60	60	24,000	141,000	167,000	n/a

Source: Study analysis and survey data

Table 7-5: Scale of impact by sub-sector - Scenario 2

Sub-sector	Mekong Sector Scenario 2 (Greater share of growing world markets)					
	Pro-poor financial impact	Financial output	Employment creation	Total direct beneficiaries	Area of bamboo	World bamboo market
	\$m	\$m	FTE	People	Ha.	\$m
Total	909	1,185	1,232,000	1,592,000	538,000	16,830
Handicrafts	266	336	920,000	936,000	24,000	4,200
Bamboo shoots	111	136	16,000	41,000	36,000	1,700
Industrial Processing	532	716	296,000	615,000	478,000	10,900
Premium Processing	263	340	129,000	206,000	109,000	6,800
Medium Value Processing	163	190	123,000	194,000	101,000	3,800
Low value & bulk processing	46	126	20,000	74,100	101,000	300
Raw bamboo	60	60	24,000	141,000	167,000	n/a

Source: Study analysis and survey data

7.4 Environmental impact

There are two main environmental considerations from the supply side:

1. Does the cultivation and harvesting of bamboo have discernable positive or negative environmental impacts?
2. What are the main environmental impacts of the different processing industries?

7.4.1 Cultivation and harvesting

Bamboo is widely regarded as an attractive crop from an environmental perspective. The main environmental benefits of bamboo include:

- Bamboo is a sustainable cropping system for sloping lands, reducing soil erosion, and delivering sustainable yields over the longer term (see below).
- Bamboo is a suitable crop as part of the recovery of degraded lands and is the fastest growing canopy in such situations.
- Through a combination of root structure, canopy and dense litter, bamboo reduces rain run-off and keeps up to twice as much water in the watershed (Environmental Bamboo Foundation). As well as reducing erosion, the reduction in peak run-off rates and extended period over which run-off occurs reduces the risk of flash floods in downstream areas.
- Bamboo's rapid growth rate and selective harvesting means that it can sequester up to 12 tonnes of CO₂ per ha. depending on species, density and harvesting patterns. Its stands release 35% more oxygen than equivalent stands of trees (Ibid).
- Extensive systems of production have comparatively low uses of fertiliser and pesticides, so reduce pollution compared to many other annual crops. (However, more intensive production methods are likely to bring greater use of fertiliser and agro-chemicals.)

When compared to natural forests, the main environmental risk from bamboo is through the development of mono-cultures if large areas of land are converted to single species bamboo plantations. This can reduce biodiversity in the local area compared to mixed forest cover.

Sustainable yields and erosion on sloping lands

One of the main benefits from bamboo cultivation is as a sustainable crop system on sloping lands. If selectively harvested at a rate of around 33% of available culms per year, bamboo yields can be sustained over the long term (>40 years).

In contrast many current cultivation practices for annual crops on sloping land are 'profoundly unsustainable' (Bui Dung The (2001)). One study of soil erosion on sloping lands in upland areas of Central Vietnam found that for upland rice and cassava grown under a four year fallow cycles, the soil depth was estimated to

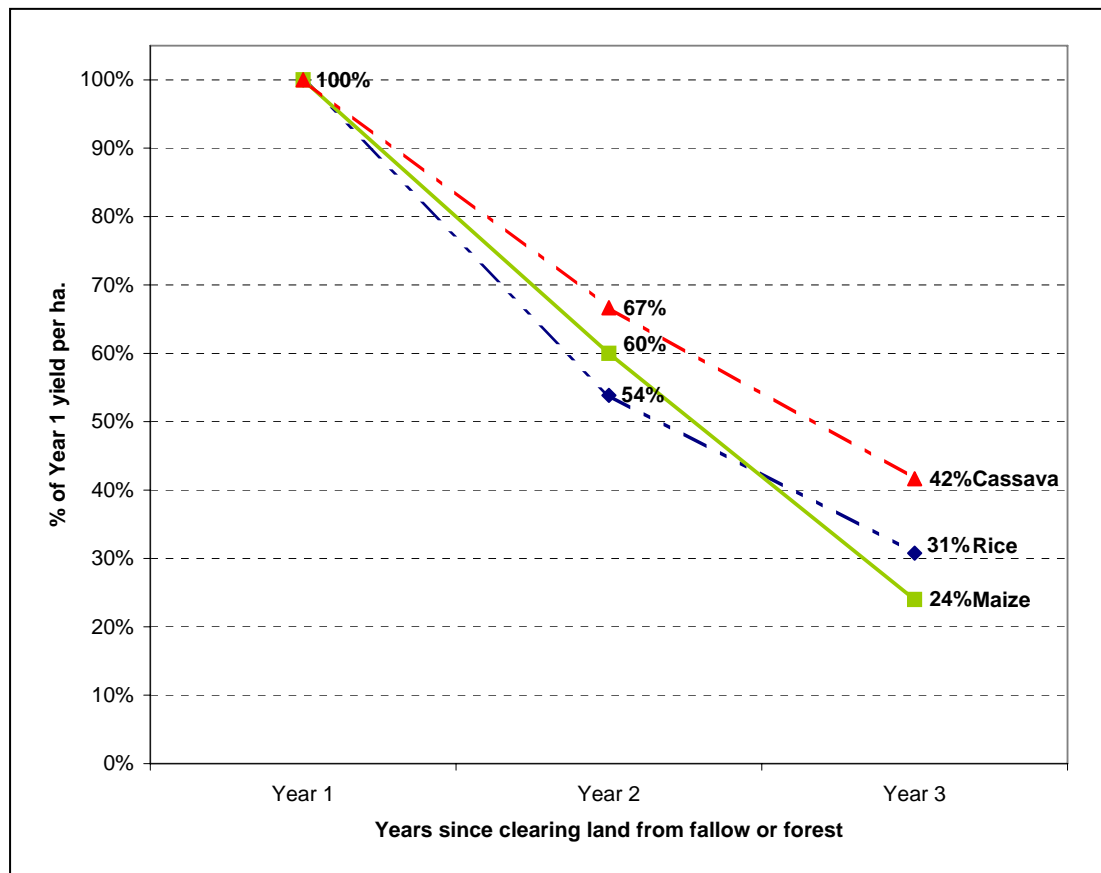
decline at an average rate of about 0.6 cm per year, with the complete loss of topsoil within 33 years. For sugarcane the reduction in soil depth is only marginally less at about 0.56 cm per year, with the complete loss of topsoil by year 45.

Data from a 1998 study (FAO 2001) of crop systems on sloping lands in North Vietnam further illustrates the practical impact of this on the yields of several of the major annual crops grown on sloping lands in the Mekong. By the third year after the land is cleared from fallow or forest, yields have dropped compared to the first year of cultivation to 44% for Cassava, 32% for upland rice and 24% for Maize. (see Figure 7-4)

Similar results have been seen in many areas of Laos where shorter fallow periods have led to land degradation and a halving of average crop yields in some areas over the last twenty years (UNEP (2001)).

Increased areas allocated to bamboo production rather than annual crops will therefore have important environmental benefits in the local area.

Figure 7-4: Declining yields of annual crops on sloping land in North



Vietnam

Source: FAO (2001)

Wider Environmental Impact

The wider environmental impact is primarily driven by the extent to which bamboo products are used as a substitute for hardwood and slow growing timber. Greater use of bamboo as an alternative to hardwoods should contribute to a slowing in the depletion of tropical forests, with corresponding benefits to biodiversity, conservations and carbon sequestration.

7.4.2 Processing industries

The main industries of concern from an environmental perspective include paper/pulp and fibreboard production. The use of large quantities of chemicals and the production of significant volumes of wastewater pose serious environmental concerns to the local environment. For example, a bamboo paper and pulp factory in Thanh Hoa was ordered to suspend production for one month in the dry season in 2005 due to excessive pollution of local water sources (Study survey). In the Mekong, there are now serious challenges for many paper/pulp producers meeting the newly introduced environmental standards, as many businesses were privatised without the necessary investment in waste treatment or pollution control systems. This problem has been further aggravated by the recent decline in profitability and now most businesses do not have the financial resources to make the investments needed to meet environmental standards.

In other industries, the main potential environmental impact is from processing wastes, such as chips and sawdust but also chemicals used in the treatment of bamboo (e.g. hydrogen peroxide, 'borax'). Within a competitive, diversified sector the volume of actual bamboo waste needing disposable is likely to be greatly reduced, as bamboo processing 'waste' from one industry is issued as a raw material for another industry. At these lower levels, most processors are likely to use their bamboo waste that they cannot sell as fuel, either within the workshop or for the workers domestic uses (as already happens in many cases). The greatest risk in this regard is from the development of isolated processing industries specialising in a single product with few options to sell their waste to other users. For the processing chemicals, attention will need to be given to the adoption of good practices for the safe disposal of processing chemicals.

7.5 Summary of impact

The analysis above has assessed the potential impact of the sector from a number of perspectives:

- Scale of impact
- Efficiency of impact
- Gender bias of impact
- Geographical distribution of impact
- Environmental impact

Taken together, these measures indicate clear choices about strategic policy options at both national and provincial levels.

Each of the sub-sectors can make an important contribution to rural development and poverty reduction. However, as shown in Table 7-6, there are important differences in the nature of their impact:

- **Handicrafts:** is most important for employment creation and has the highest impact efficiencies but delivers relatively few benefits to farmers.
- **Bamboo shoots:** is a high impact niche that primarily delivers high levels of benefits to a relatively small group of farmers.
- **Industrial processing:** is most important for overall pro-poor financial impact and is the only sub-sector capable of delivering widespread benefits to farmers.
 - **Premium processing:** has high rates of financial impact efficiency, comparable to bamboo shoots, but on more than twice the scale. It also creates more employment than all other areas, except handicrafts. The scale of the industry should be maximised to take full advantage of available premium grade bamboo.
 - **Medium value processing:** creates substantial employment and pro-poor financial impact. It has impact rates typical of the industrial processing sub-sector as a whole and should be expanded as part of a diversified industrial processing sector.
 - **Low value and bulk processing:** has impact rates of only $\frac{1}{5}$ of premium processing industries and correspondingly low total scale of pro-poor impact. However, the industry has an important role within a diversified industrial processing industry as a value-added user of low grade bamboo, leftovers and processing waste from other industries.
 - **Raw culm supply:** has the lowest rate of pro-poor impact, but is an unavoidable part of the sector due to bamboo's great versatility.

Table 7-6: Summary of Mekong Sector Potential

Mekong Sector Scenario 2 - "Greater share of growing world markets"

Data shown is for the whole supply chain for each sub-sector.

Sub-sector	Overall impact	Impact scale			Impact efficiency			Gender bias of impact % of FTEs to women	Rural bias of impact % of FTEs to rural communities	Environmental Impact
		Pro-poor financial impact	Financial output	Job creation	Pro-poor financial impact	Financial output	Job creation			
		\$m	\$m	FTE (000's)	\$/ha.	\$/ha.	FTE/ha.			
Handicrafts	*****	***	***	*****	*****	*****	*****	*****	*****	*****
		266	336	920	11,300	14,300	39.2	60%	95%	
Bamboo shoots	**	**	*	*	*****	*****	*	*	*****	****
		111	136	16	3,100	3,800	0.4	30%	100%	
Industrial Processing	*****	*****	*****	****	**	**	***	***	***	***
		532	716	296	1,113	1,498	0.6	45%	62%	
Premium Processing	****	***	***	***	****	****	****	****	**	***
		263	340	129	2,400	3,100	1.2	49%	35%	
Medium Value Processing	***	**	**	***	***	**	***	****	****	***
		163	190	123	1,037	1,333	0.9	46%	72%	
Low value & bulk processing	*	*	*	*	*	**	*	**	****	***
		46	126	20	455	1,050	0.2	37%	81%	
Raw bamboo	*	*	*	*	*	*	*	*	*****	****
		60	60	24	360	360	0.1	31%	100%	
Total		909	1,185	1,232	1,690	2,203	2.3	56%	87%	

Source: Study analysis

8 Vietnam

Vietnam has the potential to develop a large scale, diversified and internationally competitive bamboo sector that delivers substantial benefits to farmers and rural communities. This will take time and determined government leadership, especially at a local level in bamboo producing provinces. Strategic support from donors and the development sector can help facilitate this process.

Vietnam has:

- o a sizeable and increasingly diversified industry worth approximately USD 250m p.a,
- o sizeable bamboo resources of approximately 1.4m ha.,
- o growing recognition of the sector from government and others,
- o active interest from buyers and investors,
- o improving business environment for rural SME's,
- o significant market distortions from state enterprises that threaten to handicap the continued growth of the industry,
- o potential to develop a USD 1bn+ industry benefiting poor rural communities and the wider economy.

This section presents a summary of the information and analysis of the bamboo sector in the study provinces and selected details of the industry at a national level in Vietnam. All data is taken from the individual component study reports included as Appendices to this report.

8.1 Current Status

8.1.1 Industry

There is already a sizeable and growing bamboo industry in Vietnam, with exports of USD 179m in 2005, an increase of 28% from 2004. Including domestic demand, the estimated total output of the sector is USD 200m – USD 250m. The sector is currently dominated by handicrafts, accounting for approximately USD 100m of exports in 2005 (55% of total bamboo exports), which in itself is dominated by one province (Ha Tay) that accounts for 50% of bamboo handicraft exports. (IPSARD study report)

Bamboo and rattan handicrafts are the largest segment of the overall handicrafts industry. The Red River Delta, including Ha Tay, has more than 47% of bamboo craft villages. Other major bamboo handicraft regions are North Central (17%), North East (11%) and Mekong Delta (10%). In total, the bamboo and rattan handicrafts sector includes more than 700 craft villages and approximately 340,000 craft workers. (IPSARD study report)

Other major consumers of bamboo include the domestic construction industry and local household construction, paper/pulp production, mat/mat board processors, chopsticks/toothpick workshops and bamboo flooring factories.

Older industries such as paper/pulp production and mat board processing have stagnated in recent years, through a combination of more intensive competition

from imports/alternative products, increasing costs of raw material and diminishing returns. In contrast, other industries such as flooring, chopsticks, charcoal and activated carbon have been expanding. Margins in these expanding industries have also been under pressure from increasing raw material costs. Many private sector businesses have been set-up recently and cannot provide a reliable picture of operating margins and trends.

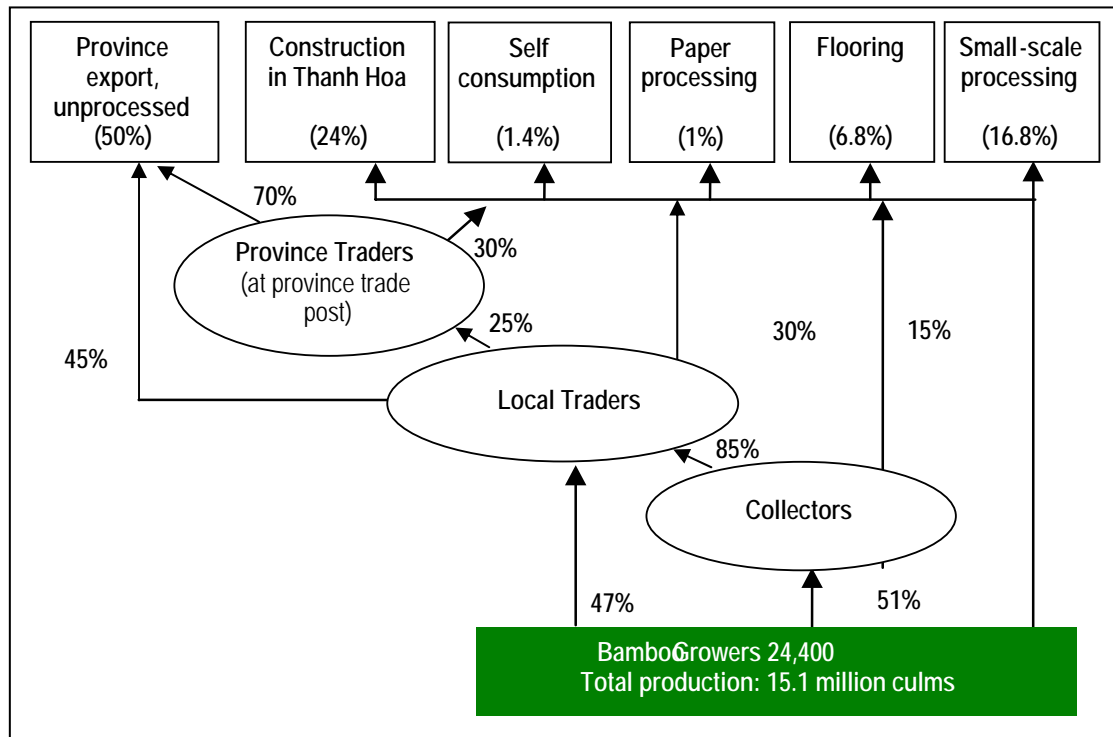
The Vietnamese sector currently has active businesses in each of the main sub-sectors:

1. Handicrafts
2. Shoots
3. Industrial processing (incl. Chopstick, flooring, paper, charcoal, panel etc)

Sector development plans should be structured around each of these sub-sectors so that they can be tailored to reflect specific challenges and opportunities.

Figure 8-1 illustrates the trade flow of the main commercial species in one of the study provinces in 2005.

Figure 8-1: Trade flows of 'luong' bamboo in Thanh Hoa, Vietnam



Source: IDE study report

Major constraints include:

1. Capital investment and access to technologies

While some businesses are using advanced processing techniques and machinery, particularly in industries like flooring and activated carbon, the Vietnamese industry is characterised by relatively low capital investment and the use of out-dated and inefficient technologies and machinery.

2. Underdeveloped Pre-Processing

Within the provinces studied, the dominant practice is for processors to buy unprocessed raw bamboo directly from traders or farmers. They then carry out all of the initial pre-processing of the culm before production of the finished or semi-finished product that is sold to wholesalers or secondary processors. The research has identified a small number of instances of bamboo workshops producing different primary processed 'products' intended for different processors/end products supply chains, in a manner that resembles the current Chinese model of pre-processing hubs supplying different industries.

3. Productivity

Value-added utilisation rates of bamboo for premium and medium value processors, such as flooring and chopsticks, is relatively low (<20%) and only c.50% of their waste material is currently sold to other users. The remainder is either used as fuel or burnt on site as a means of disposal.

4. Competition from State-Owned Enterprises

Despite its growth, the bamboo sector is still affected by significant market distortion from current and former state enterprises that threaten its continued development. For example, in the study provinces the increasing competition for raw material has driven many small processing workshops (especially chopsticks) to the point of ceasing production as they can no longer make a profit and are unable to raise their sales price to reflect increased cost. The situation is created by unfair competition from State Forest Enterprise's (SFE) elsewhere in Vietnam, which produce large volumes of product and artificially suppress market prices. These SFEs do not have to purchase bamboo at market rates but simply pay for the labour and transport to harvest it from their allotted forest land.

5. Land and Finance

Access to suitable land and finance for growth is also a major growth constraint on many current bamboo businesses.

8.1.2 Farmers and resources

1. Inventory

In 1999, Vietnam was reported to have 1.4 million hectares of bamboo of all kinds (both mixed and pure bamboo forests) which had changed little since 1983 (also 1.4m ha). Over the same period the area of bamboo plantation had increased to 75,000 ha. from 46,000 ha. More up-to-date, reliable inventory data

is not readily available although the area of planted bamboo is expected to have continued to increase with the growth of the industry as a whole. At these levels, Vietnam is reported to rank 4th in the world in terms of resources after China, India and Myanmar (Vu Van Dung & Le Viet Lam, 2005)¹³. Current inventory data needs to be improved, particularly at a species and province level.

2. Market conditions for farmers

The reported strong price rises over the last 18 months in several of the main bamboo producing regions, indicate that demand is already growing quicker than supply. This suggests that there will be a need to increase production of commercially important species to support the continued expansion of the industry.

3. Impact on Poor Households

At a national level, bamboo harvesting and cultivation is of greatest importance to the poorest households. Proportionally, bamboo contributes almost 3 times as much income for the poorest 20% of households compared to the richest 20%. In contrast, average household income in handicraft villages is more than 25% higher than the national average and the household poverty rate of 3.7% is just one third of the national average. Because of its potential contribution to rural economic development, the development of the handicraft sector is now a priority for the Government.

In other industries in the study provinces, the emergence of an expanding, diversified bamboo industry has led to less volatility and the gradual increase in price and demand for bamboo. This has created greater opportunities for bamboo farmers in these areas.

In these provinces, where there is an active bamboo sector, bamboo cultivation offers attractive and sustainable returns¹⁴ for farmers as a crop for sloping land.

4. Attractiveness of bamboo versus other crops

Bamboo is most attractive when judged in terms of the net income per day labour, due to its comparatively low labour input. In all but the most remote mountain areas, average net income per day from bamboo is comparable to the short term returns on upland maize, 33% higher than lowland rice and 70% higher than cassava. Only sugarcane produced near to the sugar factory provided higher returns (+25%) on households agricultural work.

Over the short term, the return per hectare on bamboo does not appear to be attractive compared to alternative annual crops. Over the short term, based on net income per ha, bamboo offers only 30% compared to sugar cane, 40% vs upland maize and 75% vs cassava.

¹³ This may not be true if tentative conclusion on Laos resources are proved correct.

¹⁴ Returns were calculated on the basis of net income. Costs for bamboo include the initial costs of plantation depreciated over a 20 year life cycle for a bamboo plantation.

However, over the medium to longer term all of the annual crops when grown on sloping land will suffer from serious soil erosion, nutrient leaching and yields will decline steeply after initial good harvests. As illustrated in Figure 7-4 above, studies from North Vietnam showed that by the third year after the land is cleared from fallow or forest, yields have dropped compared to the first year of cultivation to 44% for Cassava, 32% for upland rice and 24% for Maize.

In contrast, bamboo yields are sustainable over the long term under appropriate management practice. Bamboo is therefore an attractive crop for sloping lands although the short term costs of transition may act as a barrier to farmers wanting to convert.

5. Cultivation practices and farmer support

In the study provinces, current cultivation practices were found to be extensive and so there are likely to be opportunities for intensification of production from existing stands as well as expansion of area under plantation. However, current extension systems do not have the resources or capacity to deliver effective support to bamboo farmers wanting to adopt improved practices.

6. Ethnic minority focus

The suitability of bamboo to upland conditions means that it is of particular relevance for the development of ethnic minority communities in some parts of the country.

For example, as described in Section 7.2.1 above, in Thanh Hoa and Nghe An provinces more than 75% of the bamboo farmers surveyed in this study were from the Thai, Muong and Kho Mu ethnic groups with a further 13% from other ethnic minority groups. Less than 12% were from the dominant Kinh group, which accounts for 84% of the general population of Vietnam (Baulch et al, 2001).

7. Key Issues

Perhaps the greatest barrier to the expansion of bamboo cultivation is the transition from short cycle annual crops (e.g. cassava, maize, upland rice) to a perennial crop that does not provide income for the first 3-5 years. This is aggravated by uncertainty about future demand and prices for bamboo and, in some areas, unsuccessful previous experiences of shifting to centrally promoted perennial crops for which demand did not materialise. Inter-cropping and other approaches offer opportunities to reduce some of the costs of transition.

8.1.3 Policy and Operating Environment

Reforms of land use, production systems and business laws have paved the way for Vietnam's rapid economic growth over recent years. The decentralised model places considerable power at the Provincial level to determine how policies are applied in practice. Provincial authorities also play the leading role in determining local economic development and investment plans. The development of the

bamboo sector will therefore need to be driven as much at a provincial level as at a national level.

In terms of bamboo specific policies, at present there is not yet a national strategy or master plan for the development of the bamboo sector. The main national initiative of greatest relevance is the plan to promote the expansion of the handicraft sector, including bamboo and rattan handicrafts.

The adoption of a new national strategy for forestry and non-timber forest products (NTFPs) to be signed by the Prime Minister is an indicator of the growing prominence of the forestry sector as a whole. While there is a growing interest in bamboo in particular, both at a national level and in some provinces, there is not currently a clear understanding of the role it can play in economic and rural development. There is therefore an opportunity to build on the current momentum of the industry and interest in the sector to develop a national strategy and provincial plans for development of the sector.

While there has been indisputable progress as a result of the wider economic reform process, the study has highlighted the need for continued reforms, in particular to address ongoing market distortions created by current and former state enterprises.

8.2 Competitive advantages

Vietnam appears to have a number of competitive advantages compared to the world leading bamboo sector in China.

This research has shown that raw material and labour are the two largest costs for most premium and medium value processing industries, such as flooring or chopsticks, typical accounting for 60% and 20% of the unit cost of production respectively.

On both these key costs, Vietnam currently has a substantial advantage;

- the current factory gate cost of bamboo in Thanh Hoa, Vietnam, is 45% of the cost of comparable grades of bamboo in Anji, China (Q1 2006: \$80/tonne for 'Moso' bamboo in China, \$37/tonne for 'Luong' bamboo in Vietnam).
- labour cost for bamboo factory workers in Thanh Hoa (approx. \$50/month¹⁵) are only 33% of the cost of workers in Anji (approx. \$150/month)

If the Vietnamese industry could achieve similar levels of productivity and efficiency, the lower costs of bamboo and labour would translate to total production costs in Vietnam of just 55% of those in Anji¹⁶.

¹⁵ The official minimum wage for foreign invested enterprises was increased by nearly 40% as of 1 April 06. Monthly minimum wages are now USD 55 in Ho Chi Minh City and Hanoi; USD 50 per month in mid-size cities, and USD 45 per month in the rest of the country. The minimum wage in China is USD 63 per month (*SFGate.com, 30/5/06*).

¹⁶ Assumes other 20% of costs are comparable. However, in practice energy and transportation costs may be higher in Vietnam's provinces than in China.

On other non-financial measures, there are indications that Vietnam is becoming increasingly competitive. Key buyers have reported noticeable improvements in quality from Vietnamese producers over the last 5 years, both in bamboo and the wood sector. In contrast, Chinese producers have failed to develop a reputation for quality.

Anecdotally, this is reinforced by the experiences of some larger Vietnamese producers who report an increasing interest from customers whose reason for looking to Vietnam is to avoid repeating bad experiences with poor quality products from Chinese producers.

Related to this, Vietnam is regarded by some industry buyers as a potentially more reliable source of certified products compared to China. This appears to be driven both by favourable perceptions of the potential development of effective certification / chain of custody schemes in Vietnam but also by scepticism about the credibility of some certified products in China.

Vietnam's business environment is improving all the time. While it may not yet rival China for ease of doing business, it is rapidly closing the gap. Although their rankings for 'Ease of Doing Business' in the World Bank 'Doing Business 2006' report are 99 and 91 respectively, Vietnam ranked 3rd in the world for 'top reformers'.

The key disadvantage appears to be the structural inefficiency in the current Vietnamese sector. The Vietnamese industry is not currently organised around pre-processing workshops that are able to send each part of the bamboo culm to its highest value application, thus limiting the overall efficiency and value added in the industry. As such, Chinese producers in Anji are currently able to offset their higher basic costs through the greater overall efficiency of the industry.

A related area of disadvantage is the availability and adoption of modern processing technologies and equipment. While these are readily available in the market place at affordable prices, few Vietnamese producers use modern, higher efficiency processing technologies and many have limited awareness of what is available and potential benefits or costs. Financing such investment is also a constraint.

8.3 Sector Potential

Vietnam has the most developed and fastest growing industry of the 3 countries, currently accounting for +95% of output. It is estimated that within 10 years, the Vietnamese sector will account for approx. 97% of the Mekong sector as a whole. Accordingly, within the limits of accuracy of the estimates, the potential of the Vietnamese sector is taken to be the same as the Mekong sector as a whole, as shown below.

Table 8-1: Scale of impact in Vietnam by sub-sector - Scenario 1

Sub-sector	Mekong Sector Scenario 1 (Greater share of existing markets - zero world market growth)					
	Pro-poor financial impact	Financial output	Employment creation	Total direct beneficiaries	Area of bamboo	World bamboo market
	\$m	\$m	FTE	People	Ha.	\$m
Total	478	630	775,000	996,000	327,000	6,800
Handicrafts	190	240	657,000	669,000	17,000	3,000
Bamboo shoots	98	120	14,000	36,000	32,000	1,500
Industrial Processing	191	271	104,100	291,400	278,000	2,300
Premium Processing	49	63	24,000	38,000	21,000	1,200
Medium Value Processing	52	62	42,000	60,000	28,000	1000
Low value & bulk processing	30	86	14,100	52,400	62,000	120
Raw bamboo	60	60	24,000	141,000	167,000	n/a

Table 8-2: Scale of impact in Vietnam by sub-sector – Scenario 2

Sub-sector	Mekong Sector Scenario 2 (Greater share of growing world markets)					
	Pro-poor financial impact	Financial output	Employment creation	Total direct beneficiaries	Area of bamboo	World bamboo market
	\$m	\$m	FTE	People	Ha.	\$m
Total	909	1,185	1,232,000	1,592,000	538,000	16,830
Handicrafts	266	336	920,000	936,000	24,000	4,200
Bamboo shoots	111	136	16,000	41,000	36,000	1,700
Industrial Processing	532	716	296,000	615,000	478,000	10,900
Premium Processing	263	340	129,000	206,000	109,000	6,800
Medium Value Processing	163	190	123,000	194,000	101,000	3,800
Low value & bulk processing	46	126	20,000	74,100	101,000	300
Raw bamboo	60	60	24,000	141,000	167,000	n/a

Source: Study analysis and survey data

8.4 SWOT – Vietnam Bamboo Sector

Strengths	Opportunities
<ul style="list-style-type: none"> • Sizeable and expanding existing industry • Current diversity of industry • Lower basic costs (raw materials (bamboo), labour) compared to key competitors • Growing experience and expertise in the domestic sector • Existing foreign investors • Existing export trade 	<ul style="list-style-type: none"> • Growing awareness of potential of the sector amongst government and other actors • Strong interest from major buyers to source from Vietnam • Potential to build reputation for quality and value, differentiated from other Asia producers • Decentralised investment planning creates opportunities for provincial specialisation in industry development • Demand growing faster than supply, pushing prices up and making the whole sector look more attractive to farmers and business people alike
Weaknesses	Threats
<ul style="list-style-type: none"> • Absence of strategy for sector development at national or provincial level • Lower productivity across the industry, due to processing technologies and current structure of the industry. • Inefficiencies in ‘added value’ utilisation rates for raw material • Over concentration in lower value-adding industries (e.g. chopsticks, paper/pulp) reduces poverty impact of sector • ‘Uneven playing field’ for private businesses versus (former) state enterprises • Under-resourced extension system 	<ul style="list-style-type: none"> • Market distortions could lead to the collapse of large parts of the emerging industry • Demand is growing faster than the supply of raw materials, and market forces do not appear to be sufficient to encourage expansion of supply in time to support current growth rates in the industry

8.5 Summary

In Vietnam there is both a growing bamboo industry as well as growing interest by the Government and development sector in its potential to contribute to rural development. However, a common understanding of the sector's real potential and how best to support it needs to be developed.

Vietnam has the potential to develop a large scale, diversified and internationally competitive bamboo sector. This will take time and determined government leadership, especially at a local level in bamboo producing provinces. The development sector and donors that are prepared to take a strategic view to supporting the sector can play a key role in working alongside the government to develop a vibrant sector that delivers substantial benefits to farmers and rural communities.

With the potential to provide 1,200,000 'full time equivalent' jobs and USD 900m+ of annual pro-poor financial impact, mostly in rural areas, the sector warrants substantial support and investment.

9 Laos

With its good resource base, Laos has the potential to develop a diversified bamboo sector, including both handicrafts and industrial processing, in several provinces over the medium to long term. While smaller in scale than the sector in neighbouring Vietnam, a new bamboo sector in Laos has the potential to rival its neighbour in terms of the quality of impact achieved in rural areas.

Laos has:

- potential to develop a vibrant bamboo industry,
- a large, mostly un-exploited, bamboo resource of >1.4m ha.,
- a small bamboo sector worth approximately USD 4m p.a.,
- growing linkages with neighbouring industries in Vietnam,
- potential to leverage its proximity to the expanding bamboo sectors and markets in China, Vietnam and Thailand,
- a challenging business environment,
- limited recognition of the sector in official policy.

This section presents a summary of the information and analysis of the bamboo sector in Houaphan and Xieng Khouang Provinces and selected details of the industry at a national level in Laos. All data is taken from the individual component study reports included as Appendices to this report, unless indicated otherwise.

9.1 Current Status

9.1.1 Industry

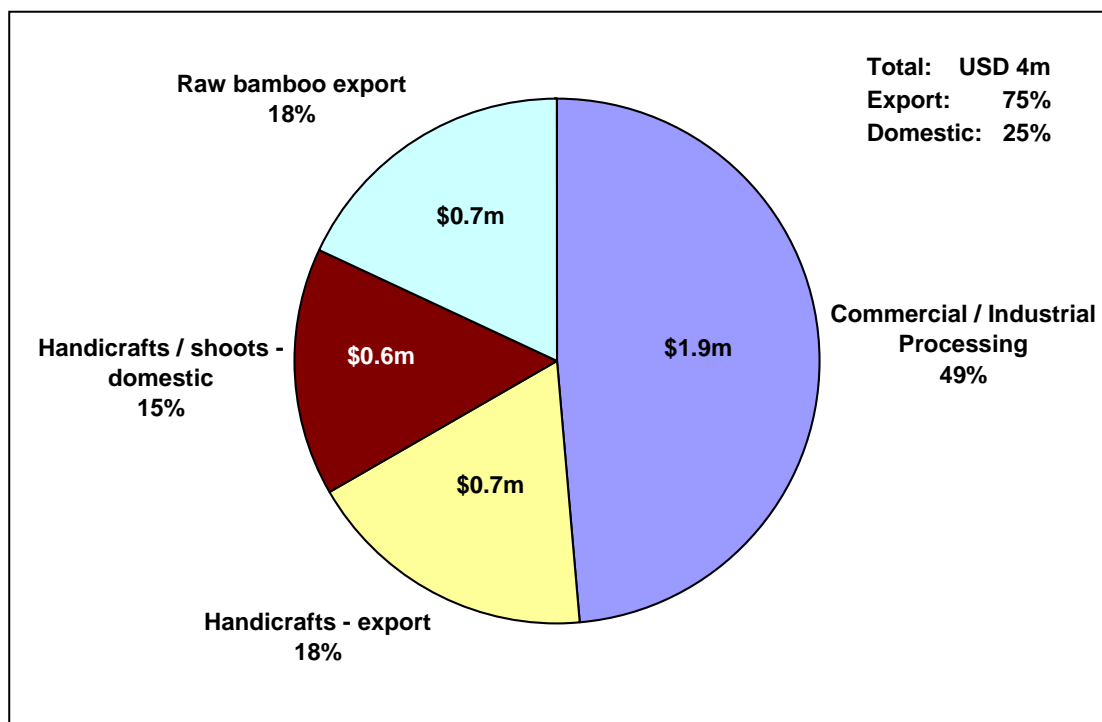
Bamboo is an important resource for domestic use in many rural areas in Laos. In contrast, bamboo processing as an income generating or business activity is largely undeveloped. The total size of the industry is estimated at approximately \$4m output p.a. (Study analysis).

To the extent that a bamboo processing sector exists in Laos, in terms of the level of activity it is primarily based around handicrafts and other household level processing, especially in rural areas. A small number of more commercial bamboo processing businesses are currently operating around the capital Vientiane and elsewhere and, due to their higher value products and larger production quantities, they account for the largest part of the current sector in value terms (see Figure 9-1 below). While the largest of the businesses interviewed as part of this study employs 180 people and consumes more than 20,000 tonnes of bamboo each year, there appears to be few such businesses operating and most of those interviewed appear to have difficulties in finding profitable markets for their products. The sector as a whole is largely undeveloped.

In Houaphan, there is a growing export trade of unprocessed bamboo to Thanh Hoa in Vietnam supplying the chopsticks, pulp and flooring industries. This is currently estimated to be between 5,000 – 10,000 tonnes p.a. although official data substantially understates the volumes compared to information provided by traders. (Study analysis and survey data)

These linkages to the bamboo industry and markets in Vietnam, Thailand and also to China in the north, create distinct opportunities for the emergence of a bamboo sector in suitably located provinces in Laos, supplying finished and semi-processed bamboo products to neighbouring industries and markets.

Figure 9-1: Laos market size estimate¹⁷



Source: Study analysis and survey data

Extrapolation from data collected in this study suggests that at a national level the industry is worth approximately USD 4m p.a.. Commercial and industrial processing accounts for around half of this by value (USD 1.9m) with Export handicrafts (USD 0.7m), Raw bamboo export (USD 0.7m) and Domestic handicrafts and shoot production (USD 0.6m) accounting for broadly equal shares of the remainder.

¹⁷ Provisional estimates extrapolated from interviews with processors, traders and handicraft groups in Vientiane municipality, Vientiane province, Houaphan and Xieng Khoang. It is notable that in 2003, UNIDO observed that *“Statistics on output or employment in the handicraft sector are almost non-existent”*, however they estimated the total output of the entire handicraft sector at \$30-40m, with textiles accounting for around half followed by jewelry and silverware. Production is mainly for the domestic market and exports ‘probably limited to US\$ 5 million at most’ for the whole sector (UNIDO, 2003).

Income from Bamboo

At the village level, income from bamboo handicrafts has been found to vary significantly depending on the products being made. For example, in Houaphan, households making cooked rice boxes and similar products earned approximately USD 1.4 (15,000 kip) per person per day¹⁸, and it is regarded as a secondary income unattractive to younger people. In contrast, woven mat production generates approximately USD 3 (32,000 Kip) per person per day and many younger people are involved in mat production during the dry, off-farm season. Mulberry/bamboo umbrella production in Xieng Khouang generates incomes of USD 1.4 – 1.7 (15-18,000 kip) per person per day year-round and is a main income source for a majority of households in 1 or 2 villages in the province.

Amongst a handicraft group in Vientiane Province, bamboo packing box weaving generates an equivalent average income of USD 1.5 (16,000 Kip) per person per day. However, this is considered a good income from light, flexible work and as a result 90% of the households in the village engage in this bamboo handicraft activity as part of the group. The trader that is the main buyer and organiser for the group generates an estimated net income of around USD 185 per month compared to USD 35 per month for an individual weaver.

For other products in the rural provinces studied, several villages in Xieng Khouang produce fermented bamboo shoots. The best known of these village produces approximately 12.5 tonnes of fermented shoots for the local market from 19 tonnes of raw shoots during the season (June-October). This generates an average monthly income of USD 21 (216,000 Kip) per household.

The Market for Bamboo

Mat and fence exports to Thailand are reported to be strong, with demand exceeding supply, despite somewhat variable quality of the products from suppliers. One of the main uses is for tobacco drying mats. At the other extreme in terms of quality, the one business that is engaged in fine furniture and décor also reports strong and growing international demand for its high-end, hand-crafted designer products. The industrial processing businesses interviewed by this study have had less success in establishing profitable export business (see below).

For bamboo processors in the rural provinces studied, the markets for their products are almost exclusively local or passing customers. The exception to this is for the umbrellas where there is more demand in key tourist areas such as Louang Prabang and interest from international customers. As would be expected, market opportunities are currently greatest for processors near Vientiane, both for domestic and export markets. Of the more established bamboo enterprises interviewed around Vientiane, all had some export customers accounting for between 30%-100% of their business. Products currently found to be exported include: charcoal, ceremonial paper, fine furniture & décor, woven mats & fences and packaging boxes.

¹⁸ USD1 = Kip 10,400

In the two rural provinces studied, demand for products such as mats and umbrellas is reported to be increasing (approx. 40% since 2003), attributed to improved road access (for mats) and increasing awareness amongst buyers (for umbrellas). For products such as rice sorting trays, demand is declining due to changes in household practices. Generally, the position of village producers relative to traders has strengthened in recent years. For umbrellas, the increased number of traders competing for products has meant that producers' prices have increased more than 40% since 2003 while wholesale/retail prices have remained broadly the same. Individual trader volumes have declined by 20% due to more direct sales and new traders.

Industrial Processing

The charcoal factory interviewed produces approximately 260 tonnes of formed charcoal blocks p.a. (approx. USD 50,000 output) and is reportedly one of four producers around Vientiane. The company estimates that 30% of its product is exported to Thailand and China, although this is done by traders and not directly by the company itself due to complicated export procedures and fees. With a reported initial investment of USD 340,000 (mostly for land and buildings) the factory is a secondary business for the owner who also has a car assembly factory. The charcoal business was set up in response to the Government's policy for large importers to also produce goods for export. Initially the factory produced chopsticks but switched to charcoal after one year due to low profitability. All of the equipment was designed and manufactured by the owner in his car assembly factory. Production had been reduced in early 2006 pending a price increase. It is notable that the planned 2006 factory gate price for charcoal is equivalent to US\$0.20 /kg whereas a similar product made from pressed coal currently has a retail price of US\$0.10 /kg.

One of the largest bamboo processors is a factory producing ceremonial paper for Chinese religious purpose, exported exclusively to Taiwan (via Thailand). This is one of the few bamboo processors to use imported equipment (and the only one interviewed in this study). In 2005 the factory produced 3060 tonnes of paper consuming 21,500 tonnes of bamboo and employing 180 people. Reported gross profit margins are currently just 3%, as sales prices have declined 25% since 2003. The company is in a weak negotiating position as it has only one customer who is also the manufacturer of its machinery.

Market Outlook

Within the limits of the information gathered during this study, the evidence suggests that the bamboo processing sector in Laos is dominated by informal handicraft production, with very low levels of usage of machinery and minimal investment. Bamboo handicrafts and processing can be a useful income source in rural areas, however the proportion of rural households where this is a key income is low. There is evidently regional and international demand for some of the bamboo products made by Laos, however most of this demand is met by the few more formalised producers and traders in close proximity to Vientiane.

In 2003, a UNIDO report on industrial development for Laos (UNIDO, 2003) concluded that future domestic demand for traditional handicrafts is likely to

decrease as traditional household uses are increasingly replaced by more functional and cheaper imported products of plastic and other materials. They further concluded that *“Lao PDR has to export its handicraft products if it is to maintain, or increase, the present level of employment in the handicraft sector”* and recommended the preparation of a master plan for development of the sector as well as including handicrafts as a “priority sector” under the Law on Domestic Investment.

These conclusions are also true for bamboo handicrafts. These are already exported by producers around Vientiane, but in most rural areas demand is almost exclusively from local and passing customers. This highly local demand is likely to decline over time as people’s lifestyles change and they use alternative, cheaper imported goods to replace traditional bamboo handicraft products.

9.1.2 Farmers & Resources

Inventory

Current data on inventories needs to be improved. Data from 1989 suggests that across the country there was 1.5 million ha. of pure bamboo forest, split 45% in Northern Region, 33% in Central Region and 22% in Southern Region. In addition there is an unknown but possibly greater amount of bamboo in upper mixed deciduous forests. For example, a comparison of sample plot analysis from this study with data from the Lao National Forest Inventory (2004) suggests that in Houaphan Province there may be 500,000 ha. of bamboo in upper mixed deciduous forest compared to just 17,000 ha. in pure bamboo forest. Work is continuing to validate this analysis on a national level through remote sensing inventory analysis. However, if these tentative conclusions are proven to be correct, then Laos would have a substantial natural bamboo resource, exceeding that of Vietnam and most other countries.

In the study provinces, natural bamboo is the main source of bamboo for both the handicrafts industry and the trade in unprocessed bamboo. There are only very limited areas of cultivated bamboo, and this is almost exclusively used for household purposes. The most commonly cultivated species are Bamboo Luong, and Bamboo Phang (Bamboo D. *Ionoifimbriatus*).

While there is currently only limited trade in bamboo, in the few villages in Houaphan, that are engaged in some limited harvesting of bamboo for export traders, bamboo is already an important part of household livelihoods.

Attractiveness of bamboo versus other livelihoods

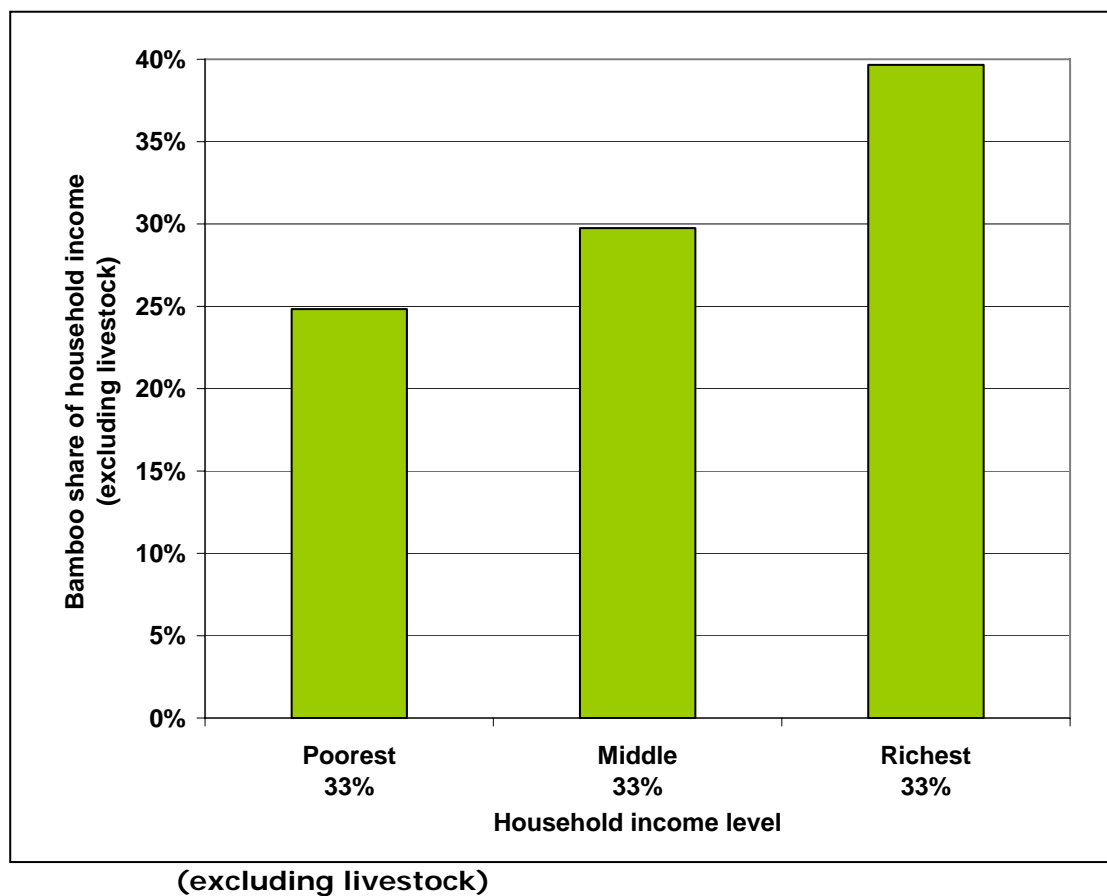
Analysis of household livelihoods in villages currently involved in bamboo harvesting reveals that across households of all income levels, there appear to be four livelihoods that all households participate in to a broadly equal degree:

- paddy rice,
- upland rice,
- NTFP collection,
- off-farm employment/labour.

Livestock is the main basis for differentiation of income levels between households. Bamboo also plays a differential role in household livelihoods. Excluding the impact of livestock, a clear pattern emerges of the richest households benefiting the most from bamboo both in absolute and relative terms. (See Figure 9-2)

The research from China (See Section 4.2 above) would therefore indicate that the bamboo sector in this District is already in the early stages of expansion and is recognised as an attractive livelihood by local farmers.

Figure 9-2: Differential role of bamboo in household livelihoods



Source: Study analysis and survey data

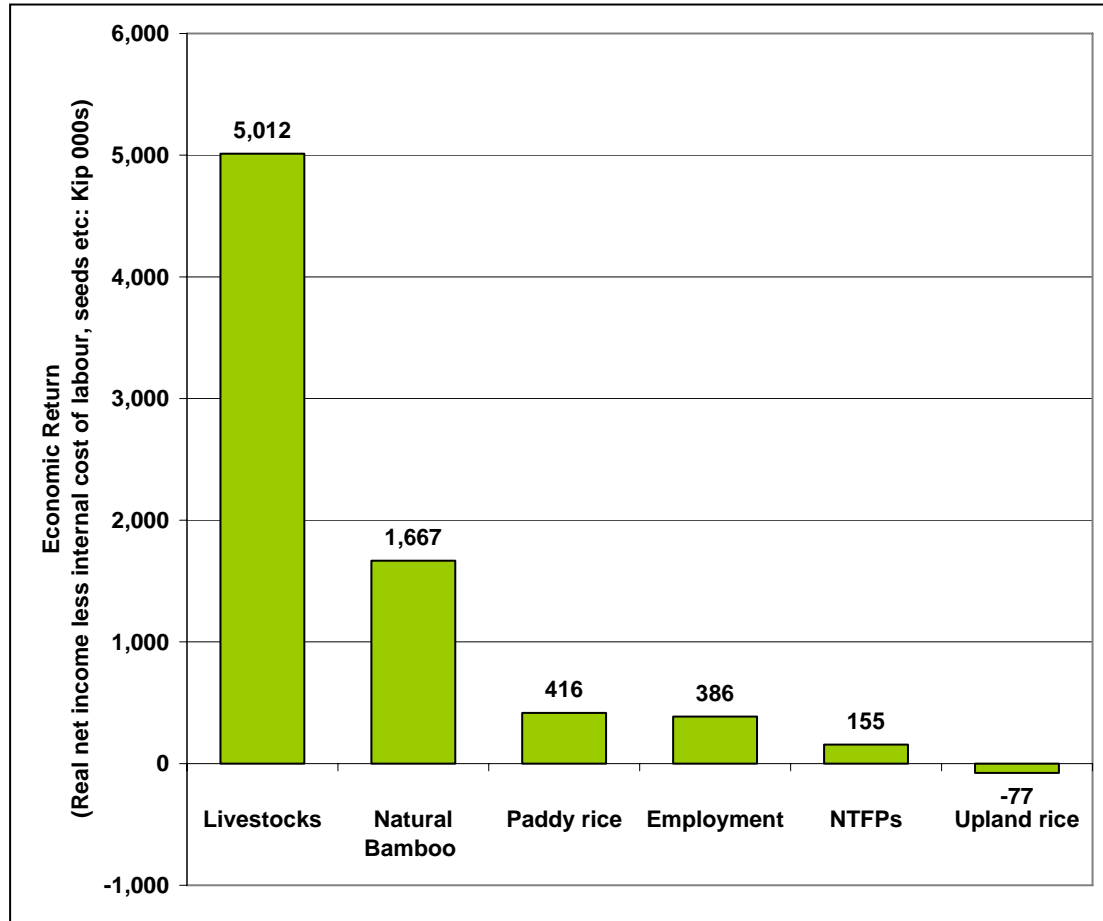
Once the opportunity costs of labour, seeds and capital are taken into consideration, analysis of the economic returns ('land rent') from different household livelihoods demonstrates that bamboo is second only to livestock in terms of return. In both cases this is primarily due to the relatively high revenues and low labour input. The higher returns from these livelihoods is consistent with the richest household gaining most benefit from them both in absolute and relative terms.

The four other 'core' household livelihoods offer only modest economic returns with modest revenue and high labour input. Upland rice in particular has a negative return when the opportunity cost of household labour is considered. i.e. Households would be better not to farm upland rice but spend their time doing something else productive. As upland rice is the main crop on sloping lands (shifting cultivation), bamboo cultivation would appear to have the potential to become an attractive alternative livelihood in these communities.

One reason that the upland rice yields are low is due to the shifting cultivation stabilization program enforced by the Government which allows shorter fallow of the rotation. This leads to soil degradation and falling yields (see Section 7.4.1). Greater cultivation of bamboo would support the Government's effort to stabilize farming systems.

The expansion of the opportunity from bamboo relies on a functioning market for bamboo that farmers understand and can benefit from. With the current 3 - 4 year fallow cycle and very low economic returns from existing shifting cultivation of upland rice, there are also specific opportunities to promote a gradual extension of cultivated bamboo on sloping lands with minimal loss of income during the establishment of bamboo plantations. Furthermore, the extensive natural bamboo resource should allow the gradual expansion of the bamboo trade even before the cultivated bamboo is ready to be harvested.

Figure 9-3: Economic Returns ("land rent") of livelihoods in Viengxay District, Houaphan



Source: Study analysis and survey data

9.1.3 Policy and operating environment

Current natural resource management and forestry policies do not reflect either the economic potential of bamboo nor management practices appropriate to the particular physical characteristics of bamboo species. This can in part be attributed to a historical focus on timber within forestry policies. There is a clear need to engage with Provincial and National forestry authorities to improve understanding of the appropriate management of bamboo as a sustainable resource and its potential economic impact. Similarly the business and investment climate for investors and enterprises operating in the sector does not appear to recognise its potential, and several recent proposals by investor have been declined.

The decentralised nature of decision making and policy implementation means that bamboo sector development will need to be led by Provincial authorities, with the approval of higher authorities, rather than through centrally driven national master plans.

9.2 Competitive advantages

The main competitive advantages of Laos, as with Vietnam, are its low cost of bamboo and labour. In addition, its large natural bamboo resource could be developed into a competitive advantage if industries are developed to exploit it in a sustainable manner. The proximity to three key producer markets in neighbouring countries could also be developed into a competitive advantage with the right focus for industry development.

The main competitive disadvantages are:

- Current lack of recognition of potential of sector by national and provincial authorities and consequently unclear policy and operating context
- The absence of any processing industries outside of Vientiane
- Less favourable business and investment environment: Laos ranks 147th in the latest World Bank 'Ease of Doing Business' ranking, close to Cote d'Ivoire (145), Mali (146) and Congo (148), and substantially worse than China (91), Vietnam (99) and Cambodia (133).

9.3 Sector Potential

With its good resource base and proximity to key producer/end user markets, Laos has the potential to develop a diversified bamboo sector, including both handicrafts and industrial processing in several provinces over the medium to long term. While smaller in scale than the sector in neighbouring Vietnam, a new bamboo sector in Laos has the potential to rival its neighbour in terms of the quality of impact achieved in rural areas.

The current absence of a recognisable 'bamboo industry' means that it is difficult to estimate the scale that the industry could achieve within the given time horizons of the next 7 – 10 years.

It is perhaps reasonable to suggest that the industry in Laos is 10 - 15 years behind the industry in Vietnam in terms of its development, but with the opportunity to leverage the experience, demand and potential investment from its neighbours to develop more quickly in the early stages.

We would therefore suggest that an initial benchmark against which to consider the potential for the sector in Laos in 10 years time, is to consider the current state of the bamboo industry in one of the main bamboo provinces in Vietnam, for example Thanh Hoa.

While Laos has a total population of 5.7m people, the remoteness of many areas means that only a proportion are located in areas suitable for the development of the bamboo sector. Thanh Hoa has a population of 3.6m people, but better infrastructure and access. Both Thanh Hoa and Laos have large bamboo resources.

Thus, taking Thanh Hoa as a benchmark we could realistically expect the Laos sector to develop into a mix of handicraft and industrial processing industries, with processing industries including several semi-intensive processing industries such as chopsticks, pre-processing workshops, charcoal, pulp, blinds and mat producers each with clusters of between 5 – 30 workshops, as well as possibly one or two larger processing factories producing high value products such as flooring or furniture.

Total production in processing industries and export of semi-processed or raw material may reach 300,000 tonnes p.a. (equivalent to 15m 'luong' culms) with a raw bamboo value of perhaps USD 10m at today's prices of USD 37 /tonne at the factory gate and a total industry output of approaching USD 20m (assuming raw material costs are 60% of total production costs, with a 10% profit margin).

While this is only illustrative we would suggest that this is feasible. For example, when compared to the size of the current total Vietnamese sector of USD 200m – USD 250m, this estimate would imply that the Laos sector could grow to around one tenth of the size of the current Vietnamese industry within 10 years, thereby creating employment and income opportunities for around 45,000 workers and farmers.

9.4 SWOT – Laos Bamboo Sector

Strengths	Opportunities
<ul style="list-style-type: none"> • Large natural resource of bamboo • Lower basic costs (bamboo, labour) compared to key competitors • Proximity to key producer markets and end user markets in China, Vietnam and Thailand • Strong comparative attractiveness of bamboo as an emerging livelihood in some areas. • Some existing trade with neighbouring industries 	<ul style="list-style-type: none"> • Current interest from investors for establishing processing workshops • Existing and growing interest from buyers in Vietnam for the supply of raw and part processed bamboo • Recent experience in supporting supply chain development in Thanh Hoa could be extended to Houaphan and other areas of Laos • Demonstrable recognition of bamboo as an attractive livelihood for farmers (as seen in Viengxay District) should allow the relatively fast expansion of raw material supply if demand is forthcoming
Weaknesses	Threats
<ul style="list-style-type: none"> • Unclear policy context on bamboo • Absence of any significant processing industry • Reliance of rural handicraft producers on local markets with limited opportunities for demand growth • Low technology usage and capital investment • Challenging business and investment context 	<ul style="list-style-type: none"> • Industry could develop as a supplier of unprocessed raw material with little value being captured by the local economy • Failure to establish an enabling cross-border trade environment could prevent expansion of sector • Concentration of risk for current exporters due to reliance on 1 or 2 customers.

9.5 Summary

The bamboo sector in Laos is under-developed and its potential largely unrecognised. Given the current state of economic development, the bamboo sector provides an attractive alternative to begin the process of rural economic development and industrialisation in some provinces. It could be of particular value as a more sustainable alternative to traditional shifting cultivation practices in mountainous areas such as Houaphan.

The presence of rapidly expanding bamboo sectors in China and Vietnam, creates unique opportunities for the development of the sector in Laos, both as a source of investment and expertise as well as a market for Laos producers. It is likely that, with the right investment, trade and export conditions, the Laos industry could become a supplier of semi-processed bamboo to producers in its neighbours, increasing the benefit to the Laos economy. Over the medium term, stronger links to the industries in neighbouring countries could also be leveraged to increase direct access to end markets and buyers.

10 Cambodia

The steep decline in bamboo resources over the last 40 years is characteristic of the current status of bamboo in rural livelihoods in Cambodia – small plots of domestic bamboo are widely grown in villages for household use, but exploitation of bamboo for household income is often a marginal activity of last resort. Successful exploitation of bamboo is limited to the few districts and businesses engaged in basket or fishgear production and the bamboo cutters who supply them. Bamboo shoot production is a declining industry with weak demand and reducing areas under cultivation. There are opportunities to support productivity improvements and market diversification for the existing small-scale industries and localised intensification of raw material production. Heavy reliance on a single industry (baskets) and a single export market (Thailand) means that the Cambodian sector is very vulnerable to disruptions to this key market.

Cambodia has:

- a small established sector based around household, micro and small enterprise level basket and fish gear production and a declining bamboo shoots industry.
- potential to improve the productivity and impact of its existing industries,
- declining bamboo resources,
- challenging operating conditions for enterprises and farmers,
- limited current opportunities for developing a diversified bamboo processing industry.

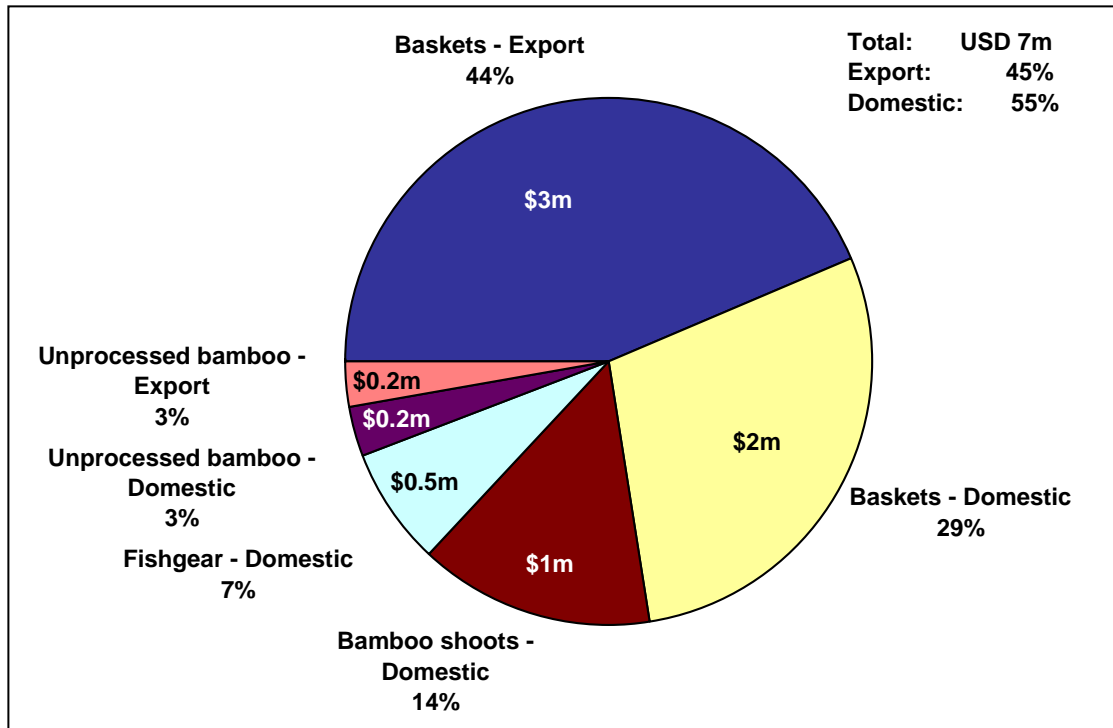
This section presents a summary of the information and analysis of the bamboo sector around selected supply chains spanning several provinces including Kampong Chhnang, Kampong Cham, Kratie and also Pursat, Battambang, Krung Pailin and Banteay Meanchey. All data is taken from the Cambodia study report included as an Appendix to this report.

10.1 Current Status

10.1.1 Industry

While bamboo is widely used for household applications, the industry in Cambodia is limited to household and small enterprise production of baskets (USD 5m p.a.), fishgear (USD 0.5m p.a.) and some trading and export of culms (USD 0.4m p.a.). Plantation production of 'Chinese' bamboo shoots (USD 1m p.a.) was started in 1970s but there is now over-supply and the industry is in decline (See Figure 10-1).

Figure 10-1: Cambodia market size estimate¹⁹



Source: Study analysis and survey data

Baskets

Kampong Chhnang is the main basket producing province. Based on survey data from this study, it is estimated that total basket production in Kampong Chhnang amounts to around 7m baskets per year, worth approx. USD 3.5m at wholesale prices (Poipet – Thai border or Phnom Penh) and approx. USD 2.1m at village gate prices. Exports to Thailand account for approx. 75% with the remaining 25% sold in the domestic market. This suggests exports from Kampong Chhnang are approx 5m pieces p.a., worth approx. USD 2.5m. While basket production in Kampong Chhnang is sizeable, it requires only around 1500 ha. of bamboo to meet its annual raw material demand (Study analysis and survey data).

Indicative estimates suggest that nationwide, the wholesale basket market may be worth around USD 5m p.a. of which around USD 3m may be exported to Thailand, assuming that Kampong Chhnang represents $\frac{2}{3}$ of production and $\frac{4}{5}$ of exports for the country as a whole (Study analysis).

The export trade to Thailand is primarily for functional baskets and similar products. Almost all export trade passes through Poipet market in Cambodia to Long Kuer Market (Thailand). The majority of the products sold in Poipet come from Kampong Chhnang province, but also from Siem Reap, Svay Rieng, Prey Veng.

¹⁹ Provisional estimates

Of potential concern are anecdotal reports from some exporters of declining demand from the Thai market. During this study, the main export transit warehouse in Poipet market and several traders reported a year-on-year decline in total basket sales of almost 70% for the first quarter of 2006. This decrease is due, at least in part, to increases in transportation costs and informal costs at many checkpoints. At present this apparent decline in demand among exporters is not reflected in falling demand from producers in Kampong Chhnang, who reported strong demand.

There are a number of potential explanations, including an increased number of traders, development of new channels to market (e.g. by passing storage warehouses) or that basket exports to Thailand are indeed very price sensitive and high fuel costs and formal and informal transaction costs of crossing the border (22.4%) are reducing demand but with other Cambodian provinces absorbing most of the declines. Should the fall in demand reported by the export warehouse and traders be sustained across the market for the full year it would equate to a 30% slump in the Cambodian bamboo sector as a whole. This issue is currently being investigated further.

Fishgear

Fish fences are predominantly made from forest bamboo, typically supplied from Kratie province, and are used by fishing lots around the Tonle Sap lake. An estimated 440,000 culms are used each year to produce the equivalent of 600,000m² of fish fence, split evenly between regular and extra strong grades (Regular= USD 0.6 per m². Strong= USD 1.1 per m²). The total wholesale value of fishgear production is estimated to be worth USD 0.5m p.a. (Study analysis and survey data).

In general, bamboo fences reinforced with nylon string are more durable than rattan and can be used as long as three years. However, bamboo fishgear is increasingly being replaced by nylon fishing nets due to increasing prices of bamboo and greater availability of lower cost nets.

Unlike bamboo basket processing, bamboo fish fence processing generates a great deal of waste. At each fish fence production site, piles of bamboo remnants can be seen.

Bamboo shoots

Production of fresh shoots is broadly estimated to be between 10,000 – 20,000 tonnes p.a. sold almost exclusively in the domestic market. Wholesale prices of fresh shoots currently average around USD 75 per tonne (300 Riel/kg) but vary seasonally from USD 50 to USD 125 per tonne. This suggests that nationally, the wholesale fresh shoot market may be worth around USD 0.75m – USD 1.5m p.a.. Between 1,500 and 3,000 tonnes of fresh shoots are processed and sold in tins to the domestic market with factory gate prices of around USD 700 per tonne (net weight) and retail prices in Phnom Penh around USD 1,100 per tonne.

Kampong Cham is one of the main bamboo shoot producing areas with typical yields of around 8 tonnes per ha.. However, traders and farmers in Kampong Cham report weak domestic demand and oversupply of both fresh and processed

shoots. These difficult market conditions have led to a 40% decrease in the area of land used for shoot production since 2002 in favour of rubber and other crops in the commune surveyed. Anecdotal evidence suggests that this is not an isolated case.

In 2003 the Export Promotion Department of the Ministry of Commerce facilitated initial enquiries of potential export markets for processed shoots. However, there is not currently an established export trade in bamboo shoots from Cambodia.

Raw bamboo trade

Forest bamboo (mainly Russey Prey) is actively traded between provinces and also for export. One estimate suggests that around 0.9m culms of forest bamboo are currently traded each year. An estimated 45% is used for fishgear, 30% for domestic construction and around 25% for export (mainly to Thailand). Current wholesale prices for raw bamboo from Kratie province are USD 0.75 (3000 Riel) per culm. This suggests the wholesale trade in raw bamboo is worth approx. USD 0.7m p.a. with export and construction markets accounting for approx. USD 0.4m of this.

More than 50% of forest bamboo used in the provinces along the Mekong River and Tonle Sap Lake (including the fishgear production areas) comes from Kratie province, both as whole and split bamboo. During both rainy and dry seasons, rafts of bamboo are floated along the Mekong River while split bamboo is loaded onto trucks and transported to traders' depots.

10.1.2 Farmers and resources

Inventory

Bamboo resources are almost certainly in steep decline, although reliable data on current resources does not exist.

In 1960, bamboo was estimated to account for 387,000 hectares, or 3 % of the total forest area. Forest Administration interpretation of Landsat satellite imagery data (30 meter resolution) from 2002-2003 suggests that bamboo now covers only 28,000 hectares, a reduction of around 90%. Such Landsat imagery analysis does not allow identification of areas of bamboo of less than 1 hectare. Consequently, the analysis will not account for the widespread domestic cultivation of bamboo in small plots in villages. Regardless of this underestimation, it is clear that there has been a large decline in bamboo resources. This is validated by anecdotal reports from provincial Forestry Administration staff and villagers in many provinces.

In areas of basket and fishgear production, many processors report increasing difficulties in sourcing bamboo, indicating increasing local supply shortages. In bamboo shoot producing areas, there is a general trend towards replacing bamboo plantations with other crops perceived to have greater potential.

Attractiveness of bamboo versus other livelihoods

The attractiveness of bamboo harvesting or cultivation varies greatly between provinces. In those areas close to major basket production centres (e.g. Kampong Chhnang) or specialising in bamboo plantation (e.g. Kampong Cham) farmers can make reasonable returns from bamboo.

However, the situation is very different in other provinces such as Kratie province, where most forest bamboo is harvested. In Kratie, most families use their own labour for all sectors such as rice cultivation, cropping, and wild bamboo cutting. On an economic basis, all livelihood activities of each family will not deliver a profit at all. For example bamboo cutting, one of the high risk jobs due to the risk of disease or injury, pays only about USD 50 (200,000 Riels) for two months, so if jobs were available to farmers with payment of even USD1.25 (5,000 Riels) per day, they could make more money than cutting bamboo. Despite the low income from cutting bamboo, there are villagers who are willing to do this work as they have no alternative livelihoods for survival.

10.1.3 Policy and operating environment

The policy environment for the management of bamboo, and NTFPs in general, is weak. For natural resource management and environment, some of the communes focus on organizing a community forest. Some communities choose to plant bamboos within the community forest, but bamboo processing plants have not yet been developed. Community forestry, while promising, is still in its infancy in Cambodia.

More generally, there are two types of bamboos. Russey Prey (forest bamboo) grows naturally on state land under the management of Forestry Administration (Ministry of Agriculture, Forestry and Fisheries). It is therefore considered a non-timber forest product (NTFP). There is no restriction on the harvesting of such bamboo for local people, who are allowed to harvest according to their ability and requirement. Article 40 of the Forestry Law provides that the purchaser of bamboo is required to pay tax to the state. Some forest bamboo areas, for instance in Kampong Thom province, are occupied by private individuals, and local people have to pay USD 12.5 (50,000 Riels) in order to have permission to harvest 1 ha of bamboo (100-200 stems). Russey Srok (domestic bamboo) is mainly planted on private land of each family under the management of the owner.

The challenging business environment in Cambodia also inhibits growth of micro and small enterprises and investment in larger businesses.

10.2 Competitive advantages

From a strategic perspective, the challenge for the Cambodian sector is to identify the particular segments of the market where it may be possible to develop a comparative advantage.

One of the main advantages of the Cambodian sector is its proximities to growing markets in Thailand and Vietnam. The Cambodian basket sector has had considerable success in exploiting this and penetrating markets in Thailand.

Although high fuel prices are currently threatening to disrupt this market, past success indicates a potential source of competitive advantage which could be exploited in other parts of the sector where there is a need to diversify beyond the domestic market if they are to grow, e.g. fishgear and blinds.

However, outside of the garment sector, the absence of manufacturing industries is characteristic of the adverse impact of the challenging business environment on the export competitiveness of Cambodian manufacturing.

Cambodia currently ranks 133 in the World Bank's 'Ease of Doing Businesses' ranking, surrounded by Senegal (132), Haiti (134) Angola (135) and Sierra Leone (136).

10.3 Sector Potential

With improvements in productivity and well targeted diversification into new product areas, it is conceivable that the Cambodia basket and fishgear (cf. blinds) sector could begin to grow through targeting export markets, perhaps at around 5% p.a. under favourable conditions.

Similarly, with appropriate investment in technologies and quality control, the bamboo shoots industry could begin to target export markets to stimulate growth.

However, it may take several years for producers to adapt and improve their competitiveness and so export-led growth may take several years to materialise. Indeed, over the short term it is possible that the sector may decline if demand for baskets from the Thai market is disrupted. The extent to which high fuel prices are sustained could have a large impact on the capacity of Cambodian producers to compete in the important Thia markets.

Should the sector be able to maintain its current scale in the short term and achieve 5% growth over the second half of the current 10 year time horizon, this would indicate a potential future industry worth approx. USD 9m in 10 years time.

The current potential for larger-scale growth in industrial processing of bamboo is limited. However, should the operating environment improve over the coming years then new opportunities for growth will emerge.

10.4 SWOT - Cambodia Bamboo Sector

Strengths	Opportunities
<ul style="list-style-type: none"> • Proximity to key markets in Thailand, Vietnam and China • Favourable trade conditions with key markets • Established 'mass' handicrafts sector (baskets) • Existing export trade with Thailand 	<ul style="list-style-type: none"> • Strong interest from donors in rural development and industrialisation • Emerging Community Forestry programme • Scope for significant productivity improvements in existing industries • Potential for product diversification to target new markets (e.g. fishgear -> blinds and mats)
Weaknesses	Threats
<ul style="list-style-type: none"> • Unclear policy context on bamboo • Small, declining natural resource of bamboo • Absence of any larger processing industries • Reliance of fishgear and bamboo shoots industries on domestic market (limited growth prospects) • Low technology usage and capital investment • Challenging business and investment context 	<ul style="list-style-type: none"> • Over-reliance of basket sector on Thai export market, increasing vulnerability to market disruptions • Increasing competition from imported substitute products (e.g. nylon fish nets, plastic containers) • Stagnant domestic markets • Investor prejudice and business environment reputation

10.5 Summary

There is an established industry dominated by basket production but also including fishgear and bamboo shoots. Parts of the industry are already in decline and the main basket sector is vulnerable to disruptions to key markets in Thailand.

There has been a widespread decline in bamboo resources across the country over the last 40 years, and while bamboo cultivation is an attractive livelihood in some areas close to centres of demand, in more remote areas the harvesting of wild bamboo is often marginal and an activity of last resort.

There are opportunities for increasing the productivity and competitiveness of the existing industries, but diversification into new markets is also needed.

11 Recommendations

Conclusions and recommendations from the study are presented at two levels:

- General conclusions: relevant to the development of the sector in all of the three countries.
- Country specific recommendations: giving detailed conclusions and recommendations for each country covering:
 - Policy, strategy and research,
 - Markets and processing industries,
 - Resources and farmers.

The recommendations outlined below should be incorporated into the design of a full Phase 2 programme.

11.1 General conclusions

The study has highlighted several important lessons which provide the context for the country specific recommendations that follow. The main lessons include:

11.1.1 The need for a long view

The scale and long time horizons required to develop the sector argue strongly for the co-ordinated involvement of a broad group of participants who share a common interest in supporting the longer term development of all, or part, of the sector.

The role of national and local government will be of central importance in providing consistent and sustained leadership for the development of the sector.

Different organisations will have their own areas of interests and capacity for action that will change over time. The Phase 2 programme should promote and accommodate these within a broadly co-ordinated framework.

11.1.2 Borrowing the keys to China's success

The three most critical features of China's success that should be replicated in each of the three country programmes are:

1. Sustained and consistent leadership by local and national government to promote the development of the sector,
2. Development linked to clear market demand,
3. Parallel development of processing industries and bamboo resources.

In addition, development of the bamboo sector is contingent on a supportive operating context in terms of:

- Land tenure system: Clear land ownership and usage rights,
- Supportive business environment,
- Opening to international engagement.

11.1.3 Differences between the three countries

There are large differences in the stage of development of the bamboo sectors in Vietnam, Laos and Cambodia. Interventions should be predominantly based around country specific strategies and programmes to reflect the priorities in each country.

In addition, there will be issues which are best addressed at a co-ordinated regional level, for example research on common technical/market issues, areas for joint action and co-ordination of financial and technical support.

11.1.4 The bamboo sector is not one industry but several

Bamboo's many uses, from food to fuel to flooring, mean that there are a multitude of processing industries and markets for bamboo based products. From a production perspective, while some of these have similar characteristics and technologies, such as flooring or panel production, others are quite distinct both in the processing involved as well as the organisation of the supply chains e.g. paper vs handicrafts.

There are three distinct sub-sectors, with each sub-sector defined by one or more linked value chains that share common issues. For example, chopsticks, flooring, furniture and, to some extent, paper all have similar raw material supply issues and can either cooperate or compete. The sub-sectors are:

1. Shoots
2. Handicrafts
3. Industrial processing (incl. Chopstick, flooring, furniture, paper, charcoal, panel etc)

11.1.5 Industry Recommendations

Handicrafts: The primary 'input' for handicrafts is skilled craft labour rather than bamboo. As such, when judged per hectare of bamboo consumed, it delivers the highest levels of employment creation and value addition of any of the bamboo processing industries. However, it is not a bulk consumer of bamboo and delivers proportionally little benefit to farmers. As such it should be encouraged to develop as a key rural industry within the context of the overall development of the wider handicraft sector. Growth of the sector will rely on expansion of export trade as domestic markets in all 3 countries are insufficient to drive sustained growth in the existing handicraft industries.

Bamboo Shoots: If markets can be developed, these deliver the highest levels of returns to farmers per hectare and so should be encouraged as a high value crop within the development of rural agriculture. At the rates of return and yields currently achieved in China and pilot areas in Vietnam, it is possible that bamboo shoots could deliver higher returns than many other crops, such as lowland rice or sugarcane in either lowland or sloping land conditions. It has sufficient potential to be the basis for widespread poverty reduction in selected areas, with or without a bamboo culm processing industry. This industry should be promoted in selected areas in line with the expected market opportunities.

Industrial Processing Industries:

Taken together, the Industrial Processing sub-sector is the dominant consumer of bamboo culms and therefore of greatest importance when considering impact on farmers. To be competitive in international markets, each bamboo producing area should develop a diversified Industrial Processing sub-sector with a combination of premium, medium-value and lower value processing industries to increase the 'value-added' utilisation rate of the available bamboo.

Premium processing industries: (e.g. flooring, laminated furniture) These industries create the greatest pro-poor financial impact and highest levels of employment of all the industrial processing industries. However, they require premium grade bamboo. As such they should be encouraged to develop in line with the expected supply of premium grade bamboo.

Medium-value processing industries : (e.g. Chopsticks, mat board) These industries create comparable levels of employment but only half the pro-poor financial impact compared to premium processing industries. As such they benefit both farmers and workers and have an important role in creating additional marginal value within a diversified processing sub-sector. They should be encouraged to develop in line with the expected availability of lower grade bamboo (either as upper parts of premium bamboo culms (see Figure 3-1) or other species).

Lower value and bulk processing industries: (e.g. Paper/pulp, charcoal, particleboard) As with medium-value processing industries, these have an important role in creating additional marginal value within a diversified processing sub-sector. While they create the lowest levels of employment and pro-poor financial impact, they should be encouraged to develop in line with the expected availability of lower grade bamboo and leftovers and processing waste from other industries. These industries should not be encouraged to grow to a scale where their demand for raw material leads them to compete with other higher value bamboo processing industries for raw material supply as this would destroy value in the sector.

11.2 Vietnam recommendations

11.2.1 Summary

In Vietnam there is a growing bamboo industry as well as growing interest within the Government and development sector in its potential to contribute to rural development. However, a common understanding of the sector's real potential and how best to support its development needs to be developed.

Vietnam has the potential to develop a large scale, diversified and internationally competitive bamboo sector. This will take time and determined Government leadership, particularly at a local level in bamboo producing Provinces. Donors and development organisations prepared to take a strategic view in supporting the sector can play a key role in working alongside the Government to develop a vibrant sector that delivers substantial benefits to rural communities.

With potential to provide 1,200,000 'full time equivalent' jobs and USD 900m+ of annual pro-poor financial impact, mostly in rural areas, the sector warrants substantial support and investment.

An early priority for Phase 2 should be to work with MARD to develop a national sector development strategy. This will require replicating parts of this study in additional Provinces and sub-sectors to build a clearer national picture. Coordinated with this, work should begin with local authorities in selected bamboo production Provinces to assess the potential of the bamboo sector in the context of the local economic development plans and their future competitive advantage.

Work phasing is critical. The natural momentum of value chains development that has been established, in particular around industrial processing in Thanh Hoa, should be supported. Preliminary project funding is required to avoid gaps which could result in the failure of segments of the value chain and negative impacts on farmers and businesses who have committed to the sector. We should seek funding immediately for infant value chains, and build the plan for a co-ordinated phase two in parallel to this immediate ongoing programming.

A co-ordinated Phase 2 programme should:

- Create a supportive policy environment at national and provincial level.
- Support the development of the sector in several bamboo producing Provinces, working at the local level.
- Support the development of handicrafts, bamboo shoots and industrial processing industries through 3 industry specific programmes.
- Develop and implement practical policies and plans to support the intensification and expansion of production of commercially important bamboo species in line with expected demand.

Given the need for both immediate action in some areas as well as further consultation to define the exact nature of a larger Phase 2 programme we recommend the establishment of a Preliminary Programme that will:

- Continue to support the development of value chains in Thanh Hoa, working both with enterprises and farmers.
- Work with MARD to develop a draft national bamboo strategy
- Begin work with selected Provinces on economic/investment planning and evaluation of the bamboo sector
- Provide further investigation of sectors not fully investigated in Phase 1 (e.g Vietnam paper/pulp market, domestic construction/household users, Asian bamboo shoot markets)
- Define detailed plans, partnerships and funding for a co-ordinated Phase 2.

The Preliminary Programme should act as the inception phase for the main programme and should be aimed to roll-over into a full Phase 2 programme within 6 months.

11.2.2 Policy, strategy and research

No.	Recommendations	Rationale
V.1	Actively engage with provincial and national authorities to drive the development of the sector.	Sustained, consistent leadership, especially by local government, is critical to the development of a large scale competitive industry.
V.2	Engage with provincial and district authorities to assess the relative attractiveness of bamboo sector development compared to available alternatives in the context of medium term investment and economic development planning.	The bamboo sector has significant potential but is not appropriate to all agro-ecological-economic conditions. The development of the sector should only be promoted in locations where it provides a favourable alternative to other industries and livelihoods and where the production and processing of bamboo is appropriate to local ecological conditions.
V.3	Promote provincial/district level sector development strategies based on the parallel development of the resource base and processing industries.	Sector development requires the parallel development of bamboo resources and processing industries. Given the time delay associated with expanding areas of bamboo and increasing yields from existing stands, there needs to be strategic leadership to encourage resource development in parallel with the development of processing industries.
V.4	Engage with provincial authorities in selected bamboo producing Provinces to assess the current constraints in the local business environment and promote improvements.	An appropriate business enabling environment (BEE) is necessary for the rapid development of the sector
V.5	Advocate for the review of SFE's and planned paper industry developments that impact the bamboo sector on the basis of maximising development impact from available resources.	At present there are significant market distortions that threaten the development of a diversified sector. This is seen both in unfair competition within markets, e.g. chopsticks, but also in access to raw material, e.g. planned developments in the paper industry. The scale of these distortions are sufficient to threaten large sections of the emerging sector.

11.2.3 Markets and processing industries

No.	Recommendations	Rationale
V.6	<p>The development of the Vietnamese bamboo sector should include tailored support programmes to each of the three main sub-sectors:</p> <ol style="list-style-type: none"> 1. Handicrafts 2. Bamboo shoots 3. Industrial Processing 	<p>Vietnam has current industries in each of the three sub-sectors and favourable conditions for the growth of each. Demand and supply side issues are distinct between each sub-sector and need different support.</p>
V.7	<p>In each bamboo processing area, a mix of industries should be promoted using premium, medium and lower grade bamboo, in line with the available supply of the different grades of raw material.</p>	<p>For industrial processing, the competitiveness of the sector will be heavily influenced by the 'value-added' utilisation rate of bamboo. This requires an appropriate mix of processing industries.</p>
V.8	<p>The development of pre-processing hubs should be promoted within industrial processing supply chains, through a combination of supply chain pilots, model business development, technology dissemination and capacity building of pre-processing workshops and other measures to improve material recovery and utilisation rates.</p>	<p>In addition to an appropriate mix of industries, the supply chains need to be structure to facilitate the efficient and cost effective allocation of raw material to its most appropriate usage.</p>
V.9	<p>Targeted promotion to investors/buyers should be carried out to encourage the development of processing industries in the 'gaps' in each bamboo province.</p>	<p>The natural mix of industrial processing enterprises is unlikely to be a close match to the ideal mix for overall industry competitiveness. There may be 'gaps' in the mix of businesses, which will limit the value-added utilisation of parts of the available raw material and consequently raise the overall cost of materials for other industries.</p>
V.10	<p>Trade and investment promotion should target markets and investors in Asia and the 'South' as well as developed country markets.</p>	<p>There are significant markets and production expertise in other developing countries in Asia, especially China. These markets have different price/performance criteria to developed countries and can provide useful opportunities to exploit during the development of the sector.</p>

No.	Recommendations	Rationale
V.11	<p>Support the development of a bamboo trade association(s) and networks to:</p> <ul style="list-style-type: none"> • Assist export buyers to identify suppliers • Improve access to market info about demand and buyers/customers • Share technologies and production good practices • Advocate for the interests of the sector • Offer training and services (outsourced or in-house) 	<p>There are currently no associations or market structures for the whole sector that effectively link government, private sector, farmers, buyers and other actors.</p>
V.12	<p>Pro-actively promote technology awareness and dissemination in priority provinces, through model businesses, demonstration sites, skills development as well as engaging with equipment suppliers (linked to improved access to finance).</p>	<p>Processing technologies are already fully commercialised and so do not need development. However, there is a need for greater awareness and better access to the modern processing technologies within the domestic industry.</p>
V.13	<p>Investigate the development of alternative financing products, with existing financial institutions, for rural enterprises and farmers wanting to invest in bamboo e.g. leasing, hire purchase, inventory financing, factoring, lines of credit.</p>	<p>SME Credit and investment financing is still hard to obtain for rural enterprises.</p>
V.14	<p>Mechanisms should be developed to deliver 'business advisory services' to rural enterprises in the sector. These should ideally be delivered through private sector suppliers, trade associations, model businesses and other mechanisms geared to financial sustainability.</p>	<p>Despite a strong entrepreneurial spirit, many micro- and small enterprises lack important business skills needed to grow into larger more competitive businesses, particularly in terms of accounting, productivity improvement, quality control, investment planning and marketing.</p>
V.15	<p>Vietnam should develop a strategy to build a reputation for quality and value in its bamboo industries. The potential for a Vietnam brand and 'Bamboo Quality Mark' covering processing and raw material chain of custody issues should be evaluated taking Anji's 'Nieyou' traceability system as a starting point (Section 4.3.2)</p>	<p>Quality of products is a critical issue for many buyers, both in terms of the processing quality but also the source of the raw material. This creates an opportunity to develop a competitive advantage, especially compared to Chinese producers who have failed to establish a reputation for quality.</p>

11.2.4 Resources and farmers

No.	Recommendations	Rationale
V.16	Reliable bamboo inventories should be compiled for each province, with an emphasis on commercially useful species.	Current data on bamboo inventories at a species/provincial level is incomplete and sometimes contradictory.
V.17	Policy measures and promotion activities should be implemented at province / district level to encourage intensification and expansion of bamboo production. In particular, approaches should be developed to minimise the risks and costs of transition from annual to perennial crops and reflect the relative attractiveness of bamboo vs other livelihoods in the local context.	Current resources of commercially important species, especially for higher value processing, are unlikely to be sufficient to support the development of the industry over the medium term. Market forces alone do not appear to be sufficient to encourage sufficient planting or intensification. Experience in China (e.g. Anji) and Vietnam (e.g. Quan Hoa) could inform measures to address this issue.
V.18	Models for improved farmer extension and support should be tested and implemented at a local level, including testing private sector delivery. These should include support on cultivation, management, pest control, harvesting and other techniques to improve quality and yields.	Current farmer practices are extensive with opportunities to improve cultivation, harvesting and management practices. At the same time, the current extension systems are under resourced and only provide limited support to bamboo farmers.
V.19	Technical expertise should be brought in to assist in defining practical strategies and extension messages for the improvement of bamboo cultivation practices in line with current international best practice.	There is considerable experience in the intensification and management of sympodial bamboo, especially in China.

11.3 Laos recommendations

11.3.1 Summary

The bamboo sector in Laos is under-developed and its potential largely unrecognised. Given the current state of economic development, the bamboo sector provides an attractive alternative to begin the process of rural economic development and industrialisation in some provinces. It could be of particular value as a more sustainable alternative to traditional shifting cultivation practices in mountainous areas such as Houaphan.

With its good resource bases, Laos has the potential to develop a diversified bamboo sector in several provinces over the medium to long term. While smaller in scale than the sector in neighbouring Vietnam, a new bamboo sector in Laos has the potential to rival its neighbour in terms of the quality of impact achieved in rural areas.

The presence of rapidly expanding bamboo sectors in China and Vietnam (and possible also Thai markets) create unique opportunities for the development of the sector in Laos, both as a source of investment and expertise as well as a market for Laos producers. It is highly likely that, with the right trade and export conditions, the Laos industry could quickly become a supplier of semi-processed bamboo to producers in its neighbours, increasing the benefit to the Laos economy. Over the medium term, stronger links to the neighbouring industries could also be leveraged to increase direct access to end markets and buyers.

11.3.2 Policy, strategy and research

No.	Recommendations	Rationale
L.1	Engage with provincial and national authorities to assess the relative attractiveness of bamboo sector development compared to available alternatives in the context of medium term economic development planning.	Bamboo sector development should only be promoted in areas where it is an attractive alternative to other sectors. The nature of policy implementation means that sector development should be led by provincial authorities.
L.2	Engage with provincial authorities in selected bamboo producing Provinces to assess current constraints in the local business environment / farming context and promote improvements.	An appropriate business enabling environment (BEE) and farming context is needed for the sector's development, in particular relating to land and resource usage rights as well as export and investment facilitation.
L.3	Engage with provincial and national forestry authorities to improve understanding of the appropriate management of bamboo as a sustainable resource and its potential economic impact.	Current NRM and forestry policies do not reflect the economic potential of bamboo nor management practices appropriate to the particular characteristics of bamboo species, due to a historical focus on timber.

11.3.3 Markets and processing industries

No.	Recommendations	Rationale
L.4	<p>The development of industrial processing clusters should be a priority, both around Vientiane and in rural areas with reasonable market access (e.g. to Thailand, Vietnam or China). Three industry segments stand out as potential first step towards developing a more diversified, higher value processing industry:</p> <ol style="list-style-type: none"> 1. Pre-processing and sticks (chopstick, toothpicks, blinds etc.) - supplying to secondary processors and buyers in neighbouring markets, 2. Charcoal/activated carbon – as a user of waste from the pre-processing industries and to exploit the large natural bamboo resource, 3. Pulp production (dry bailed) - as a use of waste / natural bamboo, supplying to regional paper industries where there is a chronic pulp shortage. 	<p>The industrial bamboo processing sector is confined to a handful of businesses, mostly in and around Vientiane, many of which are struggling to develop profitable markets for their products. In rural areas covered by the study, there is almost no industrial processing at present despite interest from several investors and proximity to growing markets in neighbouring countries.</p>
L.5	<p>Development of the handicraft industry should be promoted around export driven market opportunities, with an emphasis on productivity and quality improvements of local producers.</p>	<p>The handicrafts industry is currently the most widespread part of the bamboo sector in Laos. Producer groups around Vientiane have demonstrated the potential for developing profitable export markets. In contrast, there are limited market growth opportunities for handicraft industries in more remote rural areas with poor physical market access.</p>
L.6	<p>Further investigations should be made of the potential to develop an export led bamboo shoots industry, in particular in northern regions targeting the Chinese market.</p>	<p>Domestic markets for bamboo shoots are limited and the cost of accessing export markets will determine the potential for developing an export led bamboo shoots industry.</p>

No.	Recommendations	Rationale
L.7	The promotion of investment from neighbouring bamboo industries should be actively encouraged as a key component in the development of the Laos sector.	The presence of rapidly expanding bamboo sectors in China and Vietnam creates unique opportunities for the development of the sector in some provinces of Laos, both as a source of investment and expertise as well as a market for Laos producers.
L.8	Linked to investment promotion, there should be a programme of technology dissemination in priority provinces through model businesses, demonstration sites as well as engaging with equipment suppliers to enable better access and ongoing support.	Processing technologies are already fully commercialised and so do not need development. However, there is a need for greater awareness and better access to the modern processing technologies within the domestic sectors.
L.9	Targeted support projects should be implemented to catalyse the development of specific cross-border supply chains between Laos producers and neighbouring industries.	While viable once established, the inherent risks of establishing new cross-border supply chains may mean that market forces alone are insufficient to lead to their spontaneous establishment by market players. Recent experiences in the support of supply chain development in Thanh Hoa could form the basis for developing similar support activities catalysing cross-border supply chains.

11.3.4 Resources and farmers

No.	Recommendations	Rationale
L.10	Policy measures and promotion activities should be implemented at province / district level to encourage intensification and expansion of bamboo production. In particular, approaches should be developed to minimise the risks and costs of transition from annual to perennial crops and reflect the relative attractiveness of bamboo vs other livelihoods in the local context.	Current resources of commercially important species, especially for higher value processing, are unlikely to be sufficient to support the development of the industry over the medium term. Market forces alone do not appear to be sufficient to encourage sufficient planting or intensification. Experience in China (e.g. Anji) and Vietnam (e.g. Quan Hoa) could inform measures to address this issue.
L.11	Reliable bamboo inventories should be compiled for each province, with an emphasis on commercially useful species.	Current data on bamboo inventories at a species/provincial level is incomplete and sometimes contradictory.
L.12	In line with expected growth in demand, approaches should be developed to promote the gradual extension of bamboo plantation on sloping lands previously used for shifting cultivation, including measures to minimise the perceived risks and costs of transition from annual to perennial crops.	In some provinces with potential for sector development, bamboo appears to be a potentially attractive alternative to existing shifting cultivation systems, providing higher returns and more favourable environmental impacts. This relies on a functioning market for bamboo that farmers understand and can benefit from.
L.13	Models for improved delivery of farmer extension activities should be implemented at a local level, including testing of private sector delivery. These should include support on bamboo harvesting, cultivation, management and other techniques to improve quality and yields.	Cultivation of bamboo for income is not widely practiced, so knowledge and techniques are limited. At the same time, the current extension systems are under-resourced and only providing limited support to farmers.
L.14	Technical expertise should be brought in to assist in defining practical strategies and extension messages for the improvement of bamboo cultivation practices in line with current international best practice.	There is considerable experience in the intensification and management of sympodial bamboo, especially in China.

11.4 Cambodia recommendations

11.4.1 Summary

Given the framework conditions and declining bamboo resource base, the strategy for a Cambodia programme should be to **'start small and build on existing industries and businesses.'**

In the short term, the focus should be on upgrading the current basket, fishgear/blinds and bamboo shoots micro and small enterprises with an emphasis on productivity and quality improvements. This should be based on further detailed investigation of existing and new regional and international markets. Over the medium term, the strategy should be to promote diversification into new products and markets.

In terms of resource management and sector development, there is an opportunity to build on the recent Community Forestry work and also to work with selected local authorities to incorporate the development of specific bamboo industries into Provincial, District and Commune development plans.

Cambodia's particular framework conditions cannot be ignored and interventions to support the development of the bamboo sector should be aligned to other initiatives aimed at improving the operating context for both farmers and enterprises.

11.4.2 Policy, strategy and research

No.	Recommendations	Rationale
C.1	Interventions to support the development of the bamboo sector should be aligned to other initiatives aimed at improving the operating context for farmers and enterprises.	Framework conditions are likely to remain the single biggest barrier to the development of a competitive bamboo sector.
C.2	Sector development plans should be developed at a local level, linked to community forestry plans and provincial, district and commune development plans.	Given the current state of the sector and resources, it is not appropriate to develop a national sector development strategy at present. However, local sector development plans would be beneficial in areas where bamboo plays an important role in the local economy.
C.3	Staff capacity in the Forest Administration (FA) Community Forestry and Forest Industry units should be upgraded, to enable them to effectively support the small-scale private sector in developing the Cambodian bamboo industry.	Capacity in the FA and other concerned institutions for promotion of the bamboo sector is limited. Several staff of the FA Community Forestry Unit and of other ministries played key roles in this study and gained significant insight into the sector.

11.4.3 Markets and processing industries

No.	Recommendations	Rationale
C.4	Investment in industrial processing industries should not be encouraged at this stage of Cambodia's bamboo industry development.	Framework constraints in the Cambodian business environment make it difficult for investment in formal sector, medium to large enterprises to succeed.
C.5	Detailed market studies should be conducted into existing and potential markets for Cambodian producers in the region and internationally to identify specific opportunities for growth and/or diversification.	The potential and drivers of growth for Cambodian baskets in the Thai market and the market requirements to supply bamboo shoots to Asian markets are poorly understood. The market potential for new products such as blinds, mats or charcoal are also poorly understood.
C.6	Subject to the identification of suitable market opportunities, existing local entrepreneurs (traders, small producers) should be assisted to adopt simple improved technologies and processing techniques to enhance productivity, quality and/or produce new products.	Almost all bamboo processing is micro-scale cottage industry using ancient technology with inefficient utilization of labour and raw materials. Simple technological improvements will have major positive impacts on the returns to women's labour and seasonal efficiency of producers.
C.7	Traders should be targeted alongside producers as a key component in the growth and diversification of the existing industry, with an emphasis on measures to facilitate increased trade flows and the development of new markets.	Market linkages are "traditional" comprising many steps and with limited information flow or other supply-chain synergies. The bamboo traders represent an important resource of social capital and will play a key role in the development of new markets and the growth of the sector.
C.8	Subject to the identification of suitable market opportunities, Cambodian bamboo shoot producers and processors should be supported to adopt improved production and processing techniques and develop new markets.	The Cambodian bamboo shoot industry is under-developed with farmers switching to apparently more profitable crops. Current processing standards are impeding development of potential markets. However, evidence from Vietnam and China shows that bamboo shoots can be a profitable enterprise with the right production and market strategies.

No.	Recommendations	Rationale
C.9	Information about prices and market opportunities, new technologies, and business skills should be made available through appropriate channels (e.g. radio, video narrow-casting, posters, model sites)	The flow of market information is relatively weak in the long, physically dispersed supply chains. This reduces the responsiveness of producers to market changes, inhibits investment and innovation and creates opportunities for benefits to be captured unevenly between supply chain participants.
C.10	ACLEDA and other banks should be encouraged to become involved in the development of the bamboo industry, as part of a programme to support the upgrading and investment in local enterprises.	ACLEDA and other banks in Cambodia are beginning to introduce financial instruments for the collateralization of inventory and other finance products.

11.4.4 Resources and farmers

No.	Recommendations	Rationale
C.11	Improved models for the delivery of extension and farmer support activities should be piloted at a local level (province / district), including the testing of market oriented delivery.	Current extension systems are under-resourced and do not have the capacity to provide appropriate support to farmers and entrepreneurs in the bamboo sector.
C.12	Efforts at developing an inventory of Cambodian bamboo resources should begin in those areas identified as offering promise for success in a community forestry approach.	There is currently little, if any, reliable data about bamboo inventories in Cambodia, preventing factually informed decision making on resource management issues.
C.13	Village groups should be supported to develop plantations of russey srok and russey ping-pong in line with expected demand growth, using existing technology.	The supply of village bamboo is becoming a limiting factor for basket and handicraft production in some areas. The initial modest successes of the NGO CONCERN program in Kampong Chhnang provide a starting point for the promotion of village bamboo cultivation.

12 Phase 2 Programming

12.1 Overall structure

The long time-scales required to facilitate the development of the sector in the different countries dictate that national and local governments will need to play a central role and provide consistent and sustained leadership in the development of the sector.

One of the primary objectives of any programme must be to develop a widely supported framework for the development of the sector to guide the actions of a range of different participants including government, private sector, farmer and producer groups, donors and the development sectors.

Furthermore, the management of regional and national sector development work requires a management structure which is able to:

- coordinate the wide interests of donors and those already engaged or interested in supporting a coordinated approach to the sector's development,
- build appropriate partnerships and management mechanisms to manage an ambitious programme such as this,
- support farmers', domestic businesses' and multinational companies' participation in the range of initiatives required to develop the sector,
- support/advise government engagement in national, provincial and local strategies and plans to create an enabling environment for the development of the sector,
- identify, initiate and coordinate a range of projects and initiatives.

The final structure of the programme will need to evolve over time with the input from governments, key donors or other participants. However, based on the considerations outlined above, we recommend the programme framework below (see Figure 12-1). The speed of implementation of this framework in each country should reflect the local conditions and priorities.

Within the proposed framework, some activities will be managed and funded through a core programme while others will be implemented by other organisations which are broadly aligned to the overall framework for the development of the sector. The core programme in each country should not seek to manage the funding and delivery of all the activities needed, but act in a co-ordination and facilitation role between donors, governments and other sector participants.

This partnership based approach should provide greater diversity and more sustainable momentum. However, to work well, it will also require greater investment in coordination.

Figure 12-1: Phase 2 Programme Structure

	Vietnam	Laos	Cambodia	Regional	Key Focus
Co-ordination & management	<ul style="list-style-type: none"> VN dev. aid coordination and promotion. VN networks Project & policy co-ordination 	<ul style="list-style-type: none"> Laos dev. aid coordination & promotion. Laos networks Project & policy co-ordination 	<ul style="list-style-type: none"> Local dev. aid coordination and promotion. Local networks. Project & policy coordination 	<ul style="list-style-type: none"> Regional dev. aid coordination and promotion. International & regional networks 	<ul style="list-style-type: none"> Pro-active leadership of: Project and policy coordination. Development aid coordination. Network facilitation
Policy, strategy & research	<ul style="list-style-type: none"> National strategy & development plan Provincial dev. plans BEE / farmer policy 	<ul style="list-style-type: none"> Local sector development plans BEE Farmer & forestry policies 	<ul style="list-style-type: none"> BEE Land use / farmer context Integration into local development plans 	<ul style="list-style-type: none"> Regional & int'l trade promotion. Impact monitoring Knowledge sharing 	<ul style="list-style-type: none"> National & local policies & planning to stimulate the parallel growth of: markets & industries farmers & resources
Markets & processing industries	<ul style="list-style-type: none"> Investment promotion Technology & mgt dissemination Value chain pilots Market access 	<ul style="list-style-type: none"> Investment promotion Technology & mgt dissemination Value chain pilots Market access 	<ul style="list-style-type: none"> Small enterprise focus Upgrading handicraft, shoots & fishgear sectors Market research (e.g. Thai baskets) 	<ul style="list-style-type: none"> Market Research Technology adaptation Standards development FDI promotion 	<ul style="list-style-type: none"> Development of 3 distinct industry groups: Handicrafts Industrial processing Bamboo shoots
Resources & farmers	<ul style="list-style-type: none"> Awareness promotion Farmer extension & support Production pilots and trial 	<ul style="list-style-type: none"> Awareness promotion Farmer extension & support Production pilots and trial 	<ul style="list-style-type: none"> Link to community forestry plans Farmer extension & support 	<ul style="list-style-type: none"> Knowledge sharing Resource planning coordination 	<ul style="list-style-type: none"> Intensification and expansion of bamboo production to meet expected future demand for commercial species.
Steering Group	Government, MPDF, Oxfam, Key donors	Government, MPDF, Oxfam, Key donors	Government, MPDF, Oxfam, Key donors	MPDF, Oxfam, Key donors	

12.2 Next Steps

We believe that there are sufficient immediate opportunities for the establishment of preliminary programmes in Vietnam and at the Regional level in order to establish the full second Phase of the OHK-MPDF bamboo development initiative.

In Laos and Cambodia, we recommend that the initial implementation be completed on a more pragmatic, project-by-project basis with a strong provincial focus. Initially, this work should be co-ordinated through the regional programme and local partners, with distinct country programmes being established when the scale and momentum warrants it.

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Appendix 1 The 'Global markets' in which bamboo competes

This section provides a brief overview of selected existing and potential 'global markets' for bamboo.

A1.1 Handicrafts

Summary

The handicrafts market covers a number of categories including wooden kitchenware, textiles, potteries, wood-based products, ornaments, paintings, souvenirs etc. As such it is a fragmented market, often based on traditional practices, and therefore best regarded as a series of small separate markets. In the world market, handcrafted, semi-handcrafted and machine-crafted goods vie with each other for customer attention in a broad segment described as "gifts and decoratives", which itself forms a sub-segment of a wider market called "interior goods". USA is the largest and principal destination of gifts and decorative products manufactured in various developing countries of Asia.

Market size and growth

The size of world trade in handicrafts in 1999 was estimated at US\$ 75 billion. It is estimated that the world market would conservatively be worth US\$ 100 billion in 2005 based on 5% p.a. growth. The US Dept Of State estimate the US handicraft market to be worth US\$ 10 billion p.a. Similarly, the UK gift and home industry is worth around £10 billion. The US is the world's largest handicraft importing country, spending annually approx, US\$ 2 billion on imports of carpet, nearly US\$ 1 billion on imports of blinds, US\$ 660 million on potteries, US\$ 500 million on rattan and bamboo products, and US\$ 800 million on embroideries. Major supplying countries to the US are China, India, Mexico, Turkey, and Spain. Taking the US share of bamboo and rattan and adjusting for higher natural fiber use in Asian markets, gives an estimated bamboo & rattan handicrafts market worth US\$6 billion.

Demand economics

From 2000 to 2004, Vietnam's handicraft export value to the US rose from US\$ 13.1 million to US\$ 55.2 million in '04 and to US\$ 73.5 million in the first 5 months of 2005. The US market accounts for between 15-20% of the country's total export turnover of handicrafts. Handicraft exports have been assisted by the US Bilateral Trade Agreement (BTA) signed in 2002.

It would appear that the Vietnamese handicraft industry has potential to grow further, particularly if it focuses on areas that are not being developed by China. This should ensure it can maximise the margins for its products. Given Vietnam's rapid export development of furniture, it is feasible that it could dramatically increase its exports of handicrafts.

Key Issues

Vietnam currently has a total export turnover of handicrafts of approx. US\$ 316 million, of which an estimated US\$ 100 million is from bamboo and rattan. It

plans to increase this to US\$ 660 million by 2010. There are a number of constraints faced by this sector. One is non-tariff barriers in western markets based on norms and safety standards. Exporters also face impediments in the form of procedural delays at Customs, disputes in nomenclature and duty calculations. The handicrafts sector could benefit from being recognised as an "industry" rather than as a number of 'cottage enterprises'. By recognising this sector as an industry there should be scope for an efficient, modern sector to emerge. Given Vietnam's success in developing furniture markets, it is likely it could capture a greater part of the handicrafts market.

A1.2 Bamboo Shoots

Summary

The market for bamboo shoots is largely a domestic market with most production consumed in Asia (exports are largely inter-Asian). China is the largest producer and exporter worldwide. The main other producers are Thailand and Indonesia. Main (non-SE Asian) importers are Japan, US, UK, Germany, Australia, the Netherlands, France and Sth Korea. Exports are mainly preserved (canned or other) shoots, domestic markets consume a mixture of fresh and preserved. Data is difficult to come by as it is in international terms a relatively small market. Prices at export have on average dropped over the last 5 years. Supply appears to be reasonably static, demand the same. Bamboo shoots have high nutritional value and low fat, and are a good source of fibre. Bamboo shoots are rich in vitamins, cellulose and amino acids. There is thus potential to develop the bamboo shoot market in developed countries based on their health properties.

Market size and growth

Total world production is estimated at 6 Million Tonnes p.a..

China and Japan are the two biggest markets. Chinese production estimated to be around 4 million metric tonnes per year, with 2.4m Tonnes (60%) consumed domestically. With Japanese consumption also of 2.4m Tonnes (19kg/capita p.a.)

INBAR estimate that the wholesale fresh price in China is \$0.25-1.2 per kg, i.e. \$250-\$1000 / tonnes. At US\$ 250 per tonne the total world market is estimated at US\$ 1.5 billion (in fresh shoot value).

Note: There is significant variation in data between FAO and INBAR relating to bamboo shoots. EO have therefore taken INBAR's lower estimates for the purpose of market estimation

Demand economics

Demand is largely domestic and inter-Asian. Inbar estimate that China's exports amount to 1.6 million Tonnes. Japan is the principal export market. Figures for domestic demand in Asian countries are not available.

Prices for fresh shoots are highly seasonal, for example in China these currently peak \$1.20/kg off-season (near Tet Festival) dropping to \$0.25/kg within 6 weeks.

The USA imports only around 27.5 tonnes per year for a value of \$15.3 Million. Imports into the EU are estimated to be similar.

Key Issues

Vietnam is a small player in this market on the world stage, accounting for under 1% of exports. The export market itself does not appear to be a high-growth high-value market. Production of bamboo shoots would most likely be a domestic and inter-Asian oriented strategy as it is unlikely that Vietnam could compete in this market with China's volumes.

A1.3 Chopsticks

Summary

Disposable chopsticks are common everyday implements in Japan and South Korea, used in restaurants and takeaway lunches and are generally made from white birch or bamboo and imported from China. According to research by the Japanese Forestry Agency, the domestic supply of disposable chopsticks in 2000 came to around 25,155 billion pairs, of which over 96% were imported. Annual per capita consumption is over 200 pairs. Prices of imported chopsticks are less than half of domestically manufactured ones in Japan. As well as the increase in cheap imports, growing price-cutting competition among businesses such as gyudon ("beef rice bowl") chains is feeding growing demands from users for further cost reductions. White birch disposable chopsticks used to be imported from Russia though these have been entirely replaced by Chinese chopsticks. China is the world's largest maker of disposable chopsticks, with more than 300 plants employing about 60,000 workers. In Japan, there are 450 chopstick factories that produce 5 million pairs of chopsticks per month.

Market size and growth

The Chinese use 45 billion pairs of disposable chopsticks every year (123m per day). The Japanese overall market size is estimated at 130 million disposable chopsticks per day. Sth Korea's consumption is around 27 million pairs a day. The total value of the market is currently estimated at US\$ 310m. (The value of the Japanese chopstick market was estimated at approximately US\$ 120m in 2001). We estimate Chinese consumption to be worth some US\$ 116m and Sth Korea US\$ 46m. The total potential size, including Vietnam could be another US\$ 78.5m giving an overall market value of US\$ 388.5m+.

Demand economics

Demand for disposable chopsticks is driven by the restaurant trade. As more people dine out in Asia, so does demand increase for chopsticks. The market is forecast to keep growing as GDP per capita increases in the whole Asian region which should mean more people dining out in restaurants.

Key Issues

Growth of disposable chopsticks has largely been due to concerns over hygiene, improved quality of the products and convenience. Health scares such as SARS

have contributed to the growth of this market. However, environmental concerns have been raised regarding the impact of producing and then discarding so many chopsticks. China is now trying to persuade its people to use metal or plastic chopsticks instead of disposable ones and has imposed a 5% tax on 'one time chopsticks' from 1 April 2006. This could favour the development of a 'green' or environmentally friendly disposable bamboo industry in Vietnam.

Bamboo chopsticks could provide a small diversified market opportunity for Vietnamese bamboo growers.

A1.4 Furniture

Summary

The furniture industry creates considerable demand for wood products and EWPs. It uses sawnwood, panels, hardwood components and profiled wood. This is similar to other Value Added Wood Products (VAWPs) such as carpentry, joinery, flooring and architectural trimmings except that furniture is a much more fashion-oriented industry. Trends are seasonal and demand can alter very rapidly for a certain design or product. Strong demand in export markets has mostly favoured China, but also Vietnam whose export volumes have risen 5-fold since 2000. Strong demand is driven by consumer confidence and strong housing markets in developed markets, but also loss of market share from US and European producers to China and Vietnam. China in turn is focusing on adding value to its production by consolidating into larger production units and moving into higher-end furniture to improve earnings. Vietnam's success in exporting furniture could be leveraged to develop the export of bamboo-based products based on particleboard or high quality EWP furniture.

Market size and growth

The total wood furniture industry is worth US\$ 57 billion. It is the largest low-tech sector worldwide. The biggest exporters are Italy (18%), China (12%), and Canada (8%, 2002). The fastest growing exporter of scale is Vietnam. The industry is divided into different product groups, each with distinct segments i.e. office, bedroom, dining/living, shop furniture. Cane and bamboo accounted for 4.3% of the world wood furniture export market in 2002, with Italy also the biggest producer. In aggregate, the world's 5 largest importers (US, Germany, France, UK and Japan) purchased US\$29.2 billion of wooden furniture in 2004. This was an increase of 15% on the previous year, largely driven by the growth in housing markets. The US is the largest importer of furniture, with imports worth US\$ 14.5 billion in '04 (up 14.6% on '03).

Demand economics

Mid-2004 saw Chinese imports stagnate in the US, where anti-dumping duties were imposed. This allowed Vietnamese and Malaysian firms to gain market share, but this trend stopped when lower than anticipated final duties on Chinese imports were announced.

Demand for furniture is driven by housing markets and GDP. Growth is thus forecast to stay strong. The growth in world furniture trade has two determinants: increasing openness of the markets and the growth in world consumption. Developing countries are seen as current and future potential customers for middle and upper-middle range furniture produced in industrial countries. Demand looks strong for the medium term.

Key Issues

Vietnam is now the 6th largest exporter of furniture to the US. This shift is having a significant effect on the wood furniture export industry in Vietnam. According to Vietnam's Ministry of Agriculture and Rural Development, in 2004 Vietnam exported around USD 1.2 billion in wooden products, most of which was furniture, but that is expected to have risen to between USD 1.4-1.6 billion during 2005 (a five-fold increase since 2000). Vietnam Economic Times estimates that there are 1200 companies exporting furniture to over 120 countries. China furthered its position as the leading source of U.S. furniture imports with imports of nearly USD 5.9 billion during the first nine months of 2005, an increase of 20% over the same period in 2004.

A1.5 Flooring

Summary

Carpet (textile) products remain the dominant flooring product by total volume. This has largely been due to price differentials. Wood and laminate flooring has typically been a more expensive covering. However, the wood and laminate floor markets have grown rapidly since the 1970s. There are numerous European and US-based producers producing a range of products of different quality. China's wood flooring industry has witnessed a boom since 1990, due to the country's robust urban construction, increased expenditure on home decoration and unrelenting demand from the construction industries of the developed nations. CTCA statistics show that China now has more than 1,000 wood flooring manufacturers around the country. Cork and bamboo represent one of the fastest-growing segments of the wood flooring industry. Hardwood shortages, a rise in awareness of the environmental impact of deforestation, forest certification programs all are contributing to the attractiveness of bamboo as a substitute product in flooring markets.

Market size and growth

The world flooring and carpet market is estimated to be worth approximately US\$ 95 billion. Of this, wood and laminate is estimated to be worth US\$ 14 bn. In 2005, the hard surface flooring industry was estimated to be worth US\$ 6.3 bn in the US. The flooring market in Europe is today estimated at approx. US\$ 38 bn in sales p.a. (1,900 M m² of sales) with wood and laminate floors approx. US\$ 5 bn (360 million m² of sales) US market is 1850 M m² p.a. EU laminate flooring market has had 29% average annual growth. Laminate is growing much faster than hardwood. Growth rates for all flooring products are forecast to be 4%p.a. in Europe, 5.5% in North America and the fastest growing areas remain Asia Pacific

and Eastern Europe both 8%+. Current estimated China bamboo flooring production is US\$ 50-60 m p.a..

Demand economics

Global floor covering demand is forecast to grow 4.3 % per year through 2008 to reach 12.6 billion square meters in 2008*. China, Thailand, India, Russia, Turkey and South Korea will show some of the strongest gains, with Western European and Japanese demand also strengthening. Laminate, ceramic tile and other non-resilient products will grow the fastest. The US will remain the largest floor covering market, accounting for over one-fifth of 2008 world demand, followed in size by China, Japan, Germany and France. However, by 2013 the Chinese carpet and flooring market is forecast to rival that of the US.

Impregnated paper laminate flooring accounts for a large share of the wood flooring market due to its low price (Currently 55% of Chinese production)

Key Issues

The European flooring market is highly fragmented with a large number of manufacturers competing with each other and recently having to deal with competition from China. This has plunged the industry into crisis with oversupply of carpet and laminate on the market. Consolidation has taken place in the US market, fewer but larger producers exist. This makes it better able to respond to Asian competition. Changes are underway amongst suppliers in the US and Europe. Some are investing in new technologies and offshore production to compete with China, others (i.e. Mohawk Industries) are moving away from pure flooring markets into areas as diverse as maintenance, window blinds, other home textiles and wall coverings.

A1.6 Panels/Board

Summary

Demand for panels and boards have been rising at around 7% p.a in developed markets since the early 1990's. Wood-based panels are subdivided into three main categories: plywood (higher value), particleboard and fibreboard. Veneer is also considered as a wood-based panel though it is mostly used for plywood production rather than direct application, and is a semi-product. Consumption of EWP (engineered wood products) is derived from the building, cabinet and furniture industries. It is thus affected by the growth in those markets and the prices of substitute products such as solid timber and steel. The growth of the market has been encouraged by the worldwide adoption of performance based building codes. OSB (Oriented Strand Board) is a newer product and production is strong and growing in the USA and is growing in Europe but is not used in Asia (apart from Japan). OSB production in North America increased by 3% in '04 reaching a record volume of 23.1 M m³ Hardboard is forecast to be replaced by MDF over the short-medium term.

Market size and growth

The total apparent market size in 2004 for Wood Panels was approx. 224 Million m³. Growth has been strong since 1995. Chinese demand has grown 22%, Korea 16% and Japan 10%. It is expected that economic growth (particularly in APAC) will contribute to sustained strong demand for wood panels. However, prices have dropped over the period for plywood, MDF and particleboard, largely driven by improvements in efficiency and lower cost Chinese production. Industry consultants report an oversupply of particleboard in Asia contributing to its price decline in the region. Volume of EWPs produced in China has grown 9% p.a between '95 and '02. China is now the biggest producer of wood panels and board in the world. Brazil increased its exports to the US by 31% between '04 and '05.

Demand economics

Demand for wood panels and board is closely related to overall world GDP growth. As economies grow, so too does demand for panels and other materials used in construction. Similarly, demand for steel and hard wood puts pressure on prices for panels and board as they are seen as substitutes for light construction activities.

Key Issues

Bamboo has been trialed for the use of panels. To-date, results appear mixed. China in particular has commercial production of bamboo strip plywood, curtain laminated board, paper-overlaid board, bamboo particleboard, bamboo thin veneer and composite board. International industry experts appear to be less enthusiastic about the commercial realities of using bamboo, notably:

- The increased production costs and reduced sales price
- Small production scale
- Poor/unstable quality of products
- Mills/machinery are not set-up for non-wood panels. Investment would be required to address this though financial returns would need to be compelling.
- Issues with wastewater processing in non-wood fibreboard mills

A1.7 Builders' Joinery and Carpentry (BJC)

Summary

The world's top 5 importers of profiled wood for joinery and carpentry are the same as for furniture (US, Germany, France, UK and Japan). This market is seeing a move towards standardisation as more homes are 'pre-fabricated' or contain large elements of pre-fabricated components (i.e. beams, panels, structures etc.) There is a growing trend towards this in the US (where over 85% of homes are still made of wood). Wood, steel and concrete that are pre-made to specifications determined by building codes are fast becoming the norm. It is the rise of standardised construction codes that is driving a lot of the growth in wood

panels and BJC. The sector is directly correlated to the housing market – the construction industry absorbing builder’s joinery and carpentry products and profiled wood (products such as doors, windows, roof trusses etc.)

Market size and growth

The top 5 importers imported some US\$ 5.1 billion of BJC products in '04 (up some 19% on the previous year). The total market size for BJC is estimated at US\$ 7.2 billion. The US imported some US\$ 2.5 billion of BJC products in 2004. Germany was the second largest importer although imports are considerably less than the US (only around 7% of houses in Europe are made of wood).

Imports of Profiled Wood were up 33% between '03 and '04. Total imports into the top 5 markets were valued at US\$ 2.4 billion in '04 against US\$ 1.8 billion in '03. The US imported US\$ 1.5 billion in '04 (up 50% on '03). Japan was the second biggest importer with US\$ 0.3 billion.

Demand economics

Demand in this market is nearly all derived from new house building and renovations. As with demand for wood panels and furniture, as GDP grows, housing starts and home renovations grow. This in turn affects demand for BJC and profiled wood products.

US demand for BJC continues to be strong on the back of a strong housing market. In particular, the US market is consuming more glulam timber, I Beams and LVL (Laminated Veneer Lumber). Market acceptance of LVL for beams and headers makes LVL the fastest growing engineered wood product in North America.

Key Issues

Engineered wood products achieve new performance characteristics by combining primary products such as sawnwood and veneer into higher value products of glulam and LVL. Flakes and fibres are reconstituted with resins and adhesives to produce new products that meet construction specification standards. EWP growth continues in the US, but also in Japan and Europe. The UK has opened up its market far more to Asian production (35% market share). It is anticipated that like other manufactured wood products, higher volumes of BJCs and profiled woods will be imported from Eastern Europe, China and other Asian countries. Whilst inter-regional growth is impressive, it is not as great as the growth in the furniture trade.

A1.8 Charcoal

Summary

Charcoal in its natural form is a high volume, low value product. It is an important fuel in many developing countries for cooking and for traditional and commercial activities. Traditionally it is a natural forest product mostly produced by the poor in rural areas. As such, it is mostly traded locally and often is not monetized. Some countries have large scale production and commercial trade in charcoal. In these areas, charcoal may be produced from a variety of wood-sources. The production and flow of charcoal from producers to end users is a complex system with a large number of actors. Generally, charcoal remains a domestic market, mainly because it is uneconomical to transport over large distances. Conversion into charcoal briquettes through compression is a useful product that is easier to transport and makes good use of coal dust. Demand is forecast to grow due to sustained high oil prices, a higher demand for energy and a push towards more biomass fuel usage. Activated carbon is a growing associated market with an array of potential usages (see Section A1.9).

Market size and growth

FOA estimates indicate that world production of charcoal is around 44 million Tonnes, but that only about 1 million tonnes is exported (2%). Applying a domestic production value of US\$ 0.07/kg (US\$ 70/tonne), gives an estimated world market for charcoal of US\$ 3 billion per annum. However, exports are considerably higher value per tonne, so we would estimate that the export market for charcoal is approximately US\$ 375 m (FOB, 1m tonnes x \$375/tonne)

Demand economics

Due to the stated biomass objectives of the US and EU nations, it is likely that charcoal and other biomass-based products will become more valuable. Charcoal is an important step up the 'fuel ladder' in developing countries. Its wide range of applications and relative high energy content make it a product for which demand is likely to keep growing in the near to medium term.

The EU aims to be using 12% renewable energy sources by 2010. This is encouraging the trade of energy chips and pellets. A study by US Dept. of Energy envisaged that 10% of industrial chemicals and materials would come from renewable sources by 2020 – this market alone is worth some \$400 B p.a. By 2030, it is estimated that 36% of US gasoline will be from biomass ethanol - a significant portion (30%) could come from wood products.

Key Issues

Developments in activated carbon and 'nano-coal' industries are particularly worth investigating further as these markets have significant added-value and could allow the development of knowledge intensive industries in the sector. (See below)

A1.9 Activated Carbon

Summary

Activated charcoal is a type of amorphous carbon prepared by destructive distillation of wood, vegetables and coconut shell materials that have much higher surface areas than charcoal itself. It is a fine, black powder of largely pure carbon. The large surface area of activated charcoal confers a great absorptive capacity to this material. This is the basis for its many industrial as well as medical uses. There are different types of activated charcoal with different absorption characteristics. The absorptive characteristics are determined by the configuration of the surface of activated charcoal. Activated charcoal is widely used in medical/pharmaceutical treatments, water purification and other industrial uses such as decolorization, air filters etc. The market is seen as growing, driven by increasing industrial output and a greater emphasis on environmental issues in developing countries.

Market size and growth

The worldwide market for granular and powdered carbon is about 800,000 tonnes p.a with a value of US\$ 1.2 billion. The US market for activated carbon was estimated at \$240 M p.a in 2002. Western Europe at \$116 M p.a., Japan - \$ 226 M p.a., China – \$75 M p.a (forecast to grow to approx \$165 M by 2007), Other Asia Pacific - \$186 M p.a.

Rapid growth is expected in emerging economies, such as Latin America, Eastern Europe, Africa, Asia, and the Middle East.

A recent survey of activated carbon production in China found that 'activated carbon from other ligneous materials like bamboo, furfural meal is also available but the actual production ignorable.'

Demand economics

US activated carbon demand is forecast to rise 3-5% p.a. through 2008 based on growing requirements for motor vehicle emission canisters and greater use in industrial mercury removal. Newer uses include cat litter odor control, ultra-capacitor and fuel cell electrode production, indoor air contaminant absorption, and consumer water purification.

The Chinese market demand for activated carbon is forecast to increase by 6.6% p.a. to 2010. Chinese demand is forecast to be 110,000 metric tonnes in 2007. The world's more mature markets-North America, Western Europe, and Japan - will account for 56% of demand in 2007, but are growing more slowly.

Key Issues

Wood (at 130,000 tonnes/year) is by far the most common source of activated carbon, followed closely by coal (100,000 tonnes); coconut shell (35,000 tonnes) and peat (35,000 tonnes). Bamboo is used for the creation of activated carbon. During the process of conversion into other products, bamboo generates waste material in dust & chip forms, about 30-40% by weight of the bamboo culm. Bamboo wastes are suitable for conversion into activated carbon. This is a growth

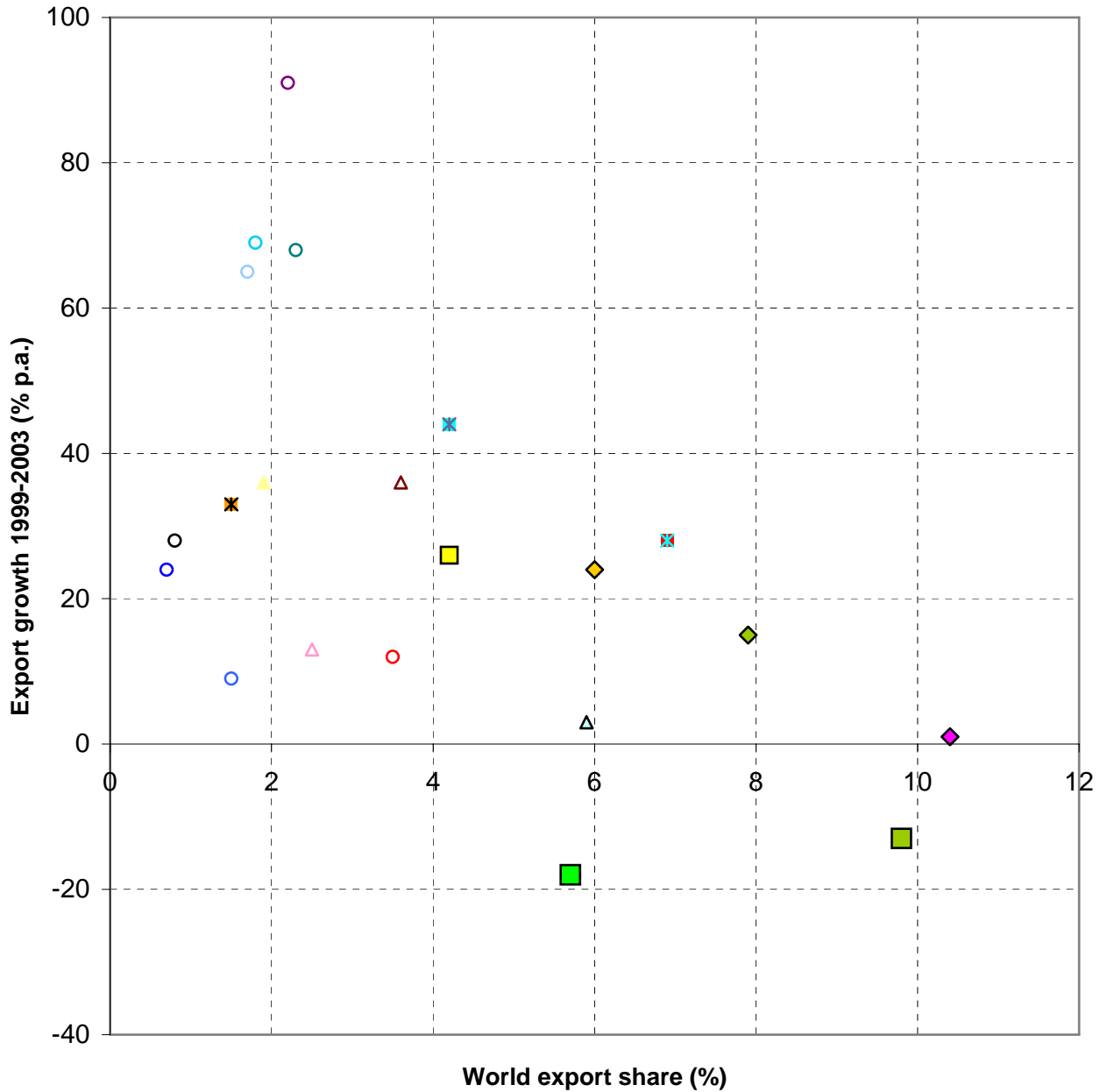
market with many applications, presenting a useful diversification industry away from construction-related businesses. It is also an industry that would allow the development of ancillary value-added industries with 'relative ease' i.e. from being a provider of activated carbon, one could set up a water filter factory etc.

Appendix 2 Trade performance data

Vietnam Exports of Selected Agri-products & Light manufacturing products
Source: UN Comtrade Database

World Rank	HS code and product label	Share in world 2003	Export growth 1999-2003	Leading markets			
		(%)	% p.a.	1st	%	2nd	%
5	6404 Footwear, upper of textile mat	10.4	1	FRA	17	DEU	15
36	0904 Pepper, peppers and capsicum	9.8	-13	USA	22	DEU	8
4	6402 Footwear nes, outer soles and uppers of rubber or plastics	7.9	15	DEU	22	FRA	13
9	0901 Coffee	7.1	-6	DEU	16	USA	15
37	4602 Basketwork, wickerwork & other articles from plaiting materials	6.9	28	JPN	19	DEU	17
31	6913 Statuettes and other ornamental ceramic articles	6.6	6	DEU	20	USA	20
2	6403 Footwear, upper of leather	6	24	GBR	20	DEU	15
12	6201 Men's overcoats, capes, windjackets etc	5.9	3	USA	42	JPN	17
13	1006 Rice	5.7	-18	IDN	30	PHL	23
28	8712 (*) Bicycles & other cycles, not motorised	4.2	44	GBR	32	DEU	26
17	4001 Natural rubber, balata, etc	4.2	26	CHN	27	DEU	9
27	6105 Men's shirts, knitted or crocheted	3.6	36	USA	79	JPN	7
21	6202 Women's overcoats, capes, wind-jackets etc	3.5	12	USA	44	DEU	20
26	6211 Track suits, ski suits and swimwear; other garments	3	8	JPN	54	USA	24
22	6205 Men's shirts	2.5	13	USA	45	DEU	15
34	6106 Women's blouses & shirts, knitted or crocheted	2.3	68	USA	81	SGP	6
29	6104 Women's suits, dresses ,skirt & shorts etc, knit/croch	2.2	91	USA	82	GBR	3
10	6203 Men's suits, jackets, trousers etc & shorts	1.9	36	USA	65	JPN	14
7	6110 Jerseys, pullovers, cardigans, etc, knitted or crocheted	1.8	69	USA	87	JPN	4
8	6204 Women's suits, jackets, dresses skirts & shorts etc.	1.7	65	USA	79	JPN	6
6	9403 Other furniture and parts thereof	1.5	33	USA	28	JPN	21
35	6212 Brassieres, girdles, corsets, braces, suspenders etc	1.5	9	JPN	52	GBR	10
38	6302 Bed, table, toilet and kitchen linens	0.9	4	JPN	51	USA	18
40	6206 Women's blouses & shirts	0.8	28	USA	64	JPN	10
30	6109 T-shirts, singlets and other vests, knitted or crocheted	0.7	24	USA	59	JPN	11

Vietnam Export Performance, Selected products (1999 - 2003)



Source: Comtrade

- | | |
|---|---|
| ■ 1006 Rice | ■ 0904 Pepper, peppers and capsicum |
| ■ 4001 Natural rubber, balata, gutta-percha etc | ■ 4602 Basketwork, wickerwork & other plaited articles |
| ■ 8712 (*) Bicycles & other cycles, not motorised | ■ 9403 Other furniture and parts thereof |
| △ 6105 Men's shirts, knitted or crocheted | △ 6201 Men's overcoats, capes, windjackets etc |
| ▲ 6203 Men's suits, jackets, trousers etc & shorts | ▲ 6205 Men's shirts |
| ○ 6104 Women's suits, dresses, skirt etc & short, knit/croch | ○ 6106 Women's blouses & shirts, knitted or crocheted |
| ○ 6202 Women's overcoats, capes, wind-jackets etc | ○ 6204 Women's suits, jackets, dresses skirts etc & shorts |
| ○ 6206 Women's blouses & shirts | ○ 6212 Brassieres, girdles, corsets, braces, suspenders etc & parts |
| ○ 6109 T-shirts, singlets and other vests, knitted or crocheted | ○ 6110 Jerseys, pullovers, cardigans, etc, knitted or crocheted |
| ◆ 6402 Footwear nes, outer soles and uppers of rubber or plastics | ◆ 6403 Footwear, upper of leather |
| ◆ 6404 Footwear, upper of textile mat | |

Appendix 3 Exchange Rates

Exchange rates in early 2006 were:

Country	Currency	Abbreviation	Per USD
Cambodia	Riel	Riel	4,000
China	Yuan	RMB	8.3
Laos	Kip	Kip	10,400
Vietnam	Dong	VND	15,950
Euro Zone	Euro	EUR	0.82