New Bamboo Industries and Pro-Poor Impact – Lessons from China and Potential for Mekong Countries

John Marsh¹ and Nigel Smith²

1. Introduction

Rural market sector development remains an important area for targeting poverty and a range of Private Sector Development (PSD) approaches are now in use. How do we prioritise donor investment in one sector over another, and what outcomes and impact timeframes are we expecting? Achieving measurable scaled poverty impacts over the medium term remains a genuine challenge for donors and PSD practice.

Governments and development agencies routinely promote groups of rural sectors at local, provincial or even national levels as the economic engine for a rural development strategy. Unfortunately such strategic prioritisations are rarely based on demand and competitiveness factors which underpin growth potential, and are most often driven by supply-side, local or historical practice. If we are to target sectors, what characteristics of sector potential should we seek to identify? Will the current sectors that the poor predominate in be adequate or even possible candidate sectors to drive the targeted economic development sought by development programmes?

We present an argument here that sector opportunities will be determined by three fundamental factors. The opportunity for impact at scale will depend on capacity for competitiveness within markets of scaled demand, and the impact distribution characteristics of supply chains. In 2006, Oxfam Hong Kong (OHK) and the Mekong Private Sector Development Facility (MPDF) carried out a bamboo sector feasibility for the Mekong countries of Vietnam, Laos and Cambodia (VCL). This study was conducted in close conjunction with a bamboo supply chain involving the pilot domestic private sector, farmers and international buyers in Thanh Hoa province, Viet Nam. This paper presents a worked example of the strategic opportunity for scaled impact offered by the bamboo sector in VCL.

2. Evaluating the Potential Impact of a Sector

In an open economy there are three primary criteria which should be satisfied for any sector and its various segments to achieve targeted pro-poor economic growth for large numbers of people.

1. **Demand and scale potential.** How big is the market being targeted, how is the demand segmented, what is the current profile of demand and the medium to longer term market outlook? What is the scale of production that could be supported by this demand?

2. **Benchmarking and analysis of competitiveness.** Supply chains should compete effectively with local, domestic, regional, or global equivalents. Are potential productivity gains through improvements in technology, skills, and sector enabling environment (SEE) feasible to underpin the competitiveness required to access current and future market demand to grow market share?

3. **Impact and supply side attribution of net benefit.** The supply chain structures should be such that sectors could potentially distribute benefits to achieve intended development outcomes (MDGs, targeted poverty on geographic, ethnic, gender

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groups of people). This approach underlies Value Chain Analysis methods. The analysis should capture the net positive and negative impacts across social, environmental and economic impact.

![Diagram](attachment:image.png)

**Figure 1. Evaluating the opportunity of a sector**

These three conditions enable the determination of the opportunity to create scaled impact on poverty through sector development. A sector missing any of the three conditions will not be an obvious candidate for sustainable market-based impacts on poverty. The following demonstrates this approach with the example of the bamboo sector for VCL.

### 3. Demand – Global Bamboo Markets

#### 3.1 Structure of the sector

Bamboo product markets include the main segments of handicrafts, bamboo shoots, chopsticks, blinds, flooring, furniture, panels, builders’ joinery & carpentry, charcoal and activated carbon, paper/pulp, and domestic household construction. This grouping breaks into three distinct sub-sectors, handicrafts, bamboo shoots, and industrial bamboo, each of which should be regarded as standalone sub-sectors.

#### 3.2 Overview of market size

No authoritative published estimates of the size of the various markets for bamboo products were found in the public domain. Demand analysis of 10 relevant bamboo product sectors were therefore carried out. Paper/pulp and domestic household segments were found to have very limited data owing to their domestic market orientation and are omitted below, resulting in an underestimation of the overall bamboo sector.
Figure 3. Size of selected 'Bamboo Markets' (USD millions)

Figure 3 shows the estimated current size of the various ‘Bamboo Markets’ as segments of the corresponding ‘Global Markets’ of Figure 2. The largest Global Markets of Figure 2 are wooden furniture, wooden panels and wood and laminate flooring. In contrast, Figure 3 shows that the main current markets for bamboo are dominated by the traditional bamboo products of handicrafts, shoots, bamboo furniture, bamboo blinds and chopsticks. These traditional products represent almost 95% of the current world bamboo market.

Total market size for 2006 is estimated at USD 7 billion. 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. Newer industries offer interesting
growth potential and are expected to begin to rival traditional bamboo-related markets over the medium term. Paper/pulp has not been sized, but data collected from firms indicate a highly competitive and low value added segment.

### 3.2 Growth and future global bamboo market size

Emerging bamboo markets include flooring, building products and laminated furniture. These represent the largest medium term growth opportunities for bamboo owing to their price-point competitiveness in their respective product markets. Strong world demand coupled with China’s export growth and bamboo based industries has produced a competitive emerging bamboo segment within wood-based product industries. Wood supply problems, including demand for certified timber create a positive market outlook for bamboo.

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

- **Global market growth rate**: Growth in global markets in which bamboo products compete, linked to global GDP growth etc.

- **Penetration rates of bamboo into these global markets**: Driven by the attitudes of buyers and the price/performance competitiveness of bamboo products compared to alternatives.

We explored various growth scenarios, and conservative ‘mid-level’ scenarios are reported here. The ‘mid-level’ scenario estimates that 2017 total market for bamboo products to be around USD 17 billion, with much of this growth coming from the emerging segment of bamboo products including laminated furniture, flooring and panels (Figure 4).

![World Bamboo Markets in 2017 ~ USD15-20Bn pa](image)

Figure 4. The growing importance of the new bamboo markets

### 3.3 Mekong bamboo sector growth potential

The assessment of the potential VCL market share is informed by analysis of current production levels as well as national export performance in industrially equivalent sectors. Mekong countries already capture a good share of some world markets. Recent trade performance includes:

- ~8%: footwear, basketwork, ornamental ceramics, pepper, coffee
- ~5%: rice, men’s & women’s overcoats, natural rubber, bicycles
- ~2%: various garments and agricultural products
Furthermore, the required growth rates are feasible, as they are within the range of annual growth rates achieved by Vietnam in several similar sectors since 1999. Of particular relevance may be the emergence of the wood furniture sector which has grown from USD 12 million in 1999 to USD 2.2 billion by 2006, a sustained average annual growth rate >230% p.a. (ITTO, 2004 & 2007).

<table>
<thead>
<tr>
<th>Industry</th>
<th>World Bamboo Market Scenario 1 (Existing market - zero world growth)</th>
<th>World Bamboo Market Scenario 2 (Future mid level world growth)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>World market (USD m)</td>
<td>VCL Market Share (USD m)</td>
</tr>
<tr>
<td>Handicrafts</td>
<td>3,000 60 150 240 240</td>
<td>4,200 84 210 336 336</td>
</tr>
<tr>
<td>Bamboo shoots</td>
<td>1,500 30 75 120 120</td>
<td>1,700 34 85 136 136</td>
</tr>
<tr>
<td>Wood furniture</td>
<td>1,100 22 55 88 55</td>
<td>5,600 112 280 448 280</td>
</tr>
<tr>
<td>Wood flooring</td>
<td>100 2 5 8 8</td>
<td>1,200 24 60 96 60</td>
</tr>
<tr>
<td>Wood panels*</td>
<td>200 4 10 22 22</td>
<td>2,200 44 110 176 110</td>
</tr>
<tr>
<td>Blinds &amp; fish gear</td>
<td>500 10 25 40 25</td>
<td>1,200 24 60 96 60</td>
</tr>
<tr>
<td>Chopsticks</td>
<td>300 6 15 24 15</td>
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<td>Charcoal</td>
<td>100 2 5 8 5</td>
<td>130 3 7 10 7</td>
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<tr>
<td>Activated carbon</td>
<td>20 0 1 2 1</td>
<td>170 3 2 14 9</td>
</tr>
<tr>
<td>Paper/pulp**</td>
<td>n/a n/a n/a n/a 80</td>
<td>n/a n/a n/a n/a n/a</td>
</tr>
<tr>
<td>Raw Culm/const**</td>
<td>n/a n/a n/a n/a 60</td>
<td>n/a n/a n/a n/a n/a</td>
</tr>
<tr>
<td>Total</td>
<td>6,825 137 341 552 630</td>
<td>16,830 337 842 1,346 1,185</td>
</tr>
</tbody>
</table>

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

Table 1 ‘Demand driven’ VCL sector scenarios (underlined figure indicating estimate)

The bamboo sector is launching from a sound base where current market per annum outputs as determined in the study are:

- Vietnam USD 250 million
- Cambodia USD 7 million
- Laos USD 4 million

Confirming market scale potential against available resource base relevant to each of the sub-sectors.

- **Handicrafts and Shoots**. In the case of the handicrafts and bamboo shoots sub-sectors, they require only 24,000 ha (Demand Scenario 1) and 36,000 ha (Demand Scenario 2).

- **Industrial Processing**. A key variable in the resource scenario is the sustainable yield per ha of bamboo. This is approximately 9.5 tonnes/ha/yr (‘luong’ bamboo) in the active bamboo processing areas of the Mekong study. In Anji China, in 2003 the maximum yields achieved by farmers were around 14 tonnes/ha/yr of Moso, an equivalent quality and type of bamboo. Average yields across China are around 9 tonnes/ha.

Current official estimates for bamboo are Viet Nam 1.4 million ha, Laos 1.5 million ha, and Cambodia 30,000 ha. Allowing for some unreliability in these government estimates we can still assume a total area of 500,000 ha would be available for bamboo production in the Mekong countries – the amount required for the supply of mid-level scenario.

Demand driven scenarios (Table 1) suggest that under favourable domestic conditions the Mekong sector in 2017 could be worth around:

- USD 0.6 billion p.a. by capturing a greater share of the existing world bamboo markets (Figure 4 World Bamboo Market Scenario 1 – zero growth)
- USD 1.2 billion p.a. by capturing a greater share of a growing world bamboo market (Figure 4 World Bamboo Market Scenario 2 – mid-level growth)
Table 2: Contributions of each sub-sector under different scenarios

Table 2 shows that within the existing world bamboo markets (Scenario 1) handicraft, bamboo shoots, 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.

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

4. Benchmarking VCL Bamboo Competitiveness

4.1 Competitiveness and fundamental factors for the Mekong

Based on interviews with businesses in China and VCL, 75-80% of sector output value are bamboo resource and labour costs. In view of this, The VCL cost base compares very favourably:

<table>
<thead>
<tr>
<th></th>
<th>China</th>
<th>Vietnam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Costs (2007)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Raw Bamboo</td>
<td>$100/tonne</td>
<td>$37/tonne</td>
</tr>
<tr>
<td>Labour</td>
<td>$150/month</td>
<td>$50/month</td>
</tr>
</tbody>
</table>

This demonstrates that if efficient supply chains can be developed, the VCL bamboo sector can gain market share.

Investment and technology requirements to achieve this are modest and appropriate to current capacities of poor rural areas in VCL. Barriers to achieving competitive supply chains include a range of Sector Enabling Environment (SEE) issues which should be targeted at the provincial level where supply chains are structured within the bamboo sector. The broad set of issues encompassing SEE are not directly addressed in this paper, but are being considered province by province in the ongoing Mekong Bamboo Consortium project.

At a sub-sector level, supply chain structure and efficiencies vary considerably, and are evaluated separately.

- **Handicrafts**: characterised by manual processing and extremely high value adding to relatively small volumes of raw bamboo. Less than 5% of sector value is in bamboo resources and upwards of 80% of sector output is labour.

- **Bamboo shoots**: a high value agricultural food crop that can also be grown in parallel with the production of culms. As an agricultural food crop with high seasonal variations in production and demand cycles, and high price volatility. In general, much of the sector output is captured by producers (up to 50-85%) provided they are able to supply at times of high demand.

- **Industrial processing**: mechanised processing of large volumes of bamboo culms. The industrial processing sub-sector holds the key opportunities for major growth and pro-poor impacts for rural farming communities. In an efficient industrial bamboo
supply chain, 60% of the output value is in bamboo raw material, with 15-20% in labour.

Figure 5 illustrates the main uses of the different parts of the plant.

4.2 Sub-sector supply chains efficiencies and benchmarking

The following details VCL industrial and handicraft sub-sector opportunities for competitiveness. The shoots sub-sector is a much less complicated supply chain where farmers supply either directly to the market or to processing units which then supply to market. The main barriers to market for VCL are anticipated to be related to market access and linkage, rather than supply chain structure and competitiveness.

4.2.1 Industrial sub-sector and opportunities for efficiencies

The revolution in the industrial bamboo sub-sector arose in China over the past 15 years. Previously, factories would purchase whole culms for production but were unable to utilise much more than 30% by volume of culms. This led ultimately to technical and supply chain innovations introducing the near-source step of pre-processing. Near-source pre-processing workshops with specialised but simple machinery separate the bamboo culm into its various parts and direct them into different supply chains. This creates the opportunity for high resource utilisation rates, industry-wide efficiency and greater local value-adding.

Industrial processing industries can be divided according to the value of the processing and grade of material used:

- Premium processing (eg. flooring, laminated furniture)
- Medium value processing (eg. chopsticks, mat boards)
- Low value and bulk processing (eg. charcoal, paper & pulp)
- Unprocessed culms (e.g. scaffolding and traditional construction)

Premium processing generates the highest rates of pro-poor impact and requires premium parts of the bamboo, typically the middle lower part of large culms (Figure 5). Medium value products can be made with upper sections, and low value can be made with any parts including residues. Mature bamboo supply chains in China now involve networks of businesses producing a variety of products across this premium to low value spectrum creating maximum financial output from given bamboo resource base.

The pre-processing step also permits transportation and waste handling savings, and the potential for virtually 100% utilisation rates (zero waste), in short a model for achieving maximum resource utility. Business, research institutes and government collaborated in technology development to drive this innovation. The current situation in VCL mirrors the situation prior to the pre-processing innovation in China.

![Figure 6. Pre-processing model underpins sector efficiency and fundamental to competitiveness](image)

4.2.2 Handicraft sub-sector and opportunities for efficiencies

The VCL bamboo handicraft industry is characterized by low-productivity manual production where the most advanced technology is often a kitchen knife. Supply chains are unsophisticated with significant market disconnects between end customer and the household producers. Domestic markets are still probably the largest segment, but export represents the growth and higher margin opportunities. But access to lead export markets of Japan, USA and Europe requires responsive, flexible supply chains which are generally lacking in the region. The competitiveness constraint limits impact for everyone along the supply chain from household producers to larger exporters.

The handicraft sub-sector in VCL is predominated by a pre-industrial economic structure which embodies many traditional social habits, monopolistic practices, fragmentation and poor market information and connections between producers and various (Figure 7). This complexity creates difficulty in identifying the best entry points for intervention to shift the sub-sector to a more modern basis based on efficiencies, competitiveness which can connect producers to growing demand. Consequently there is a plethora of development initiatives in the region which target various parts of this sub-sector. Opportunities for competitiveness improvements are likely in the two areas shown in (Figure 7).
Figure 7 Uncompetitive traditional bamboo handicraft supply chain structure common in VCL

Opportunities for production efficiencies

With reference to the production steps of the supply chain shown in Figure 7, there are three principle areas to focus on efficiencies:

- **Raw material supply.** Since bamboo resource represents such a minor component of sector value, this is not a relevant area of focus.

- **Pre-processing technology.** In a parallel to the industrial pre-processing step, this will address quality and increase productivity.

- **‘Factory’ productivity.** Technology and process innovations in producing the final product. Power looms for blind making and mat weaving are now driving the scaling up of village household businesses in China.

The case study of Quang Ngai province Vietnam (Figure 8) demonstrates the impact of shifting from manual to technology-based pre-processing step of making bamboo slivers for a household basket weaving business. Technology would introduce a 4-6 fold gain in the pre-processing step which is a current low productivity bottleneck, resulting in overall production and daily income gains for the household. It would also enhance quality control, as well as permitting producer to reduce unit wholesale price, each of these being key factors in increasing competitiveness in the market place. Ensuring scaled demand for such innovations and increased production will remain critical for success.
Opportunities for supply chain efficiencies

There is a need for specific product segment supply chain analysis to identify key constraints and opportunities. Likely areas to enhance supply chain efficiencies include:

- Linkage of the handicraft sub-sector to the pre-processing workshops of the industrial bamboo sub-sector (e.g., pre-processed rather than hand-made inputs for woven mats and blinds production).
- Compression of supply chain structures and improvements in market information flows in both directions, especially for rapidly changing product markets;
- Access to finance for village level groups to achieve scale/volumes required for market access and compression of supply chains;
- Trade promotion, branding (national, village etc), quality standard schemes.

Already there is considerable maturation and industrialisation of the sector in some locations (e.g., Ha Tay province, Vietnam). Further analysis and the development of pilot supply chain innovation pilots for different handicraft market segments is necessary as a precursor to scaled intervention.

5. The Potential Impact of the Bamboo Sector

5.1 Impact measures.

The potential socio-economic and environmental impact of the VCL bamboo sector has been assessed using a combination of measures as follows.

Socio-economic impact

- **Overall financial impact**: the total value of the output of the sector or supply chain.
- **Pro-poor financial impact**: the component of the overall financial impact captured by wages, farmer incomes and small businesses close to source.
Employment creation: the total number of Full Time Equivalent (FTE) jobs created in farming, pre-processing, secondary processing and in associated activities.

Total direct beneficiaries: the total number of workers and farmers gaining full or part time direct benefit from the sector.

Each of these measures can be expressed as a unit rate of impact derived from unit of key resource, in this case land area. We call this the efficiency of impact, and from a policy point of view this analysis can be used underpin strategic prioritisation.

Efficiency of impact: measures the rate of employment creation and financial impact (pro-poor and total) created throughout the sector per hectare of land committed to bamboo production. This measure provides the underpinning evidence for comparing competing options for land use and developing strategy and policy to maximise development outcomes.

Distributional impacts include

Distribution of benefits between men and women: the percentage distribution of benefits between men and women.

Rural distribution of benefits: the rural distribution of employment creation along each supply chain, between farmers, traders, pre-processing and secondary processing workers.

Environmental Impact

There are two main environmental considerations from the supply side:

(i) Raw material production: Does the cultivation and harvesting of bamboo have discernable positive or negative environmental impacts?

(ii) Processing: What are the main environmental impacts of the different processing industries?

5.2 What is ‘pro-poor financial impact’?

The study determined how much created value is captured by poor communities compared to being taken as profits of larger businesses, imported production items such as fuel, interest payments, or other expenditures that do not attribute value to the local rural economy. We have used the term ‘pro-poor financial impact’ to describe this local component of total revenue that is captured within production areas.

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

It is only a proxy measure, and the main limitations are that it:

under-estimates the total impact as it is a direct cost by not capturing secondary economic effects of increased expenditure by farmers, workers and local traders back into the local economy;

over-estimates the direct ‘pro-poor’ impact as they also include local transportation costs and does not differentiate between the benefit captured by non-poor farmers and traders and the genuine poor. Transportation over 20km adds around 10% to farm gate price.

5.3 Efficiency of impact

The efficiency of impact is determined for each of the individual industry supply chains for the five socio-economic measures outlined above (Table 3).
Table 3. Efficiency of impact of bamboo industry supply chains.

Table 3 confirms important differences between and within the different sub-sectors.

1. **Handicrafts**: Pro-poor financial impact of USD11,300/ha and 39 FTE/ha confirming that most benefit is gained by small scale processors and workers. [Due to the large and varied nature of the current handicrafts sub-sector and the small number of businesses interviewed these data should be regarded as indicative rather than definitive. More detailed handicraft sub-sector work begins in June.]

2. **Bamboo shoots**: Pro-Poor financial impact of USD 3,100/ha and 0.4 FTE/ha. Most of the financial benefits are retained by farmers themselves and not distributed along the supply chain.

3. **Industrial processing**: Figure 9 shows the differential pro-poor impact of different product groups. Ultimate sub-sector pro-poor financial impact efficiency and FTE/ha is only determined by the mix of products produced across the industrial sub-sector. Figure 11 indicates that impact can range from around USD 400/ha and 0.2 FTE/ha up to USD 850/ha and 0.4 FTE/ha.

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Table 3

<table>
<thead>
<tr>
<th>Industry segment</th>
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</thead>
<tbody>
<tr>
<td>Overall financial output</td>
</tr>
<tr>
<td>USD/ha</td>
</tr>
<tr>
<td>Handicrafts (VN)</td>
</tr>
<tr>
<td>Bamboo Shoots (China)</td>
</tr>
<tr>
<td>Flooring (VN)</td>
</tr>
<tr>
<td>Chopsticks (VN)</td>
</tr>
<tr>
<td>Woven mat (VN)</td>
</tr>
<tr>
<td>Mat board (VN, panels)</td>
</tr>
<tr>
<td>Charcoal (briquettes, China)</td>
</tr>
<tr>
<td>Charcoal (briquettes, Laos)</td>
</tr>
<tr>
<td>Paper + pulp (VN)</td>
</tr>
<tr>
<td>Raw culms (VN)</td>
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</tbody>
</table>

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Figure 9. Impact by sub-sector product grouping in the industrial sub-sector
• **Low value and bulk processing industries:** such as charcoal, paper and pulp, have low rates of both pro-poor financial impact and employment creation. They achieve only marginally higher levels than selling unprocessed *raw bamboo culms* to the construction industry. Sector efficiency is achieved if only residues or lower grade bamboo is used for this segment.

• **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.

• **Premium processing industries:** such as laminated 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.

• **5.4 Gender-based disaggregation of impact**

1. Handicraft sub-sector has 60% women participants.
   - Harvesting, collection and cultivation has estimated men to women activity ratio of approximately 2:1, but this is only a small component of the sub-sector workforce.
   - Handicraft production is mostly done by women: In Vietnam, women represent 60% of 340,000 bamboo and rattan craft workers (JICA-MARD 2004);
   - In all of the countries, handicrafts are an important activity for off season work and for the elderly and young.

2. Bamboo shoots sub-sector is mostly highly male dominated segment with only 31% of sector participants being women.

3. Industrial sub-sector.
   - The balance of employment in pre-processing and secondary processing is evenly split between women and men;
   - Some enterprises have a predominance of women in clerical roles (~60% women) offset by more men in other areas (eg. ‘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 value furniture business in Laos.

The overall gender distribution of impact within the different parts of the bamboo sector is summarised in Figure 10.

![Figure 10. Women in the bamboo supply chains (% of total FTEs)](image-url)
5.5 Geographical and ethnic bias of impact

Firstly, upland farmers will achieve relatively high returns over the medium term from bamboo per hectare compared to other crops such as cassava, maize and upland rice. The same however does not apply in lowland agriculture and bamboo does not compete well with lowland crops such as paddy rice. This means that upland farmers are the ones who should benefit most from a demand for raw bamboo, and a bamboo sector which optimises the various comparative advantages within VCL should emerge in upland areas.

Farmers, traders and transporters operate primarily in rural areas. In the mature industry in China, pre-processing is situated near source in rural areas, as this typically reduces transport costs and has the potential to increase the efficiency of allocation and utilisation of resources.

In most of the provinces covered by this study, there is 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.

5.6 Environmental impact

Cultivation and harvesting: Bamboo is widely regarded to have several environmental benefits compared to alternative land use or industrial economic development options (eg Environmental Bamboo Foundation). The main environmental benefits of bamboo include:

- Bamboo is a sustainable cropping system for sloping lands, reducing soil erosion, and delivering sustainable farming systems;
- Bamboo is suitable for the recovery of degraded lands;
- Bamboo reduces rain run-off and downstream flooding and retaining additional water in the watershed;
- Bamboo’s rapid growth rate and selective harvesting sequesters up to 12 tonnes of CO₂ per ha. It releases 35% more oxygen than equivalent areas of trees;
- Bamboo may be produced competitively with zero fertiliser and pesticide input.

However, one main drawback is the biodiversity risk from bamboo through the development of mono-cultures, but this outcome should be compared to alternative land use options.

The wider environmental impact is primarily driven by the extent to which bamboo products substitute hardwood timber products in the market.

Processing industries: The main industries of concern from an environment perspective include paper/pulp and fibreboard production which consume relatively greater quantities of chemicals and produce significant volumes of wastewater.

In other industries, the main potential environmental impact is from processing wastes, such as chips and sawdust. The volume of bamboo waste would be reduced in the new industrial models. Some chemicals are used in the preservation treatment of bamboo at processing workshops (eg. hydrogen peroxide, borax).

6. The Opportunity for Scaled Impact of the Bamboo Sector in Mekong Countries

6.1 Scale of impact

The previously developed Mekong 2017 demand based scenario of a USD 1.2 billion bamboo sector (Table 2) combined with impact efficiency data (Table 3) provides an overall scale of impact across the various indicators (Table 4). Each of the sub-sectors make an important contribution to rural development and poverty reduction.
Table 4. Summary of potential impact for Mekong bamboo sector, 2017.

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

- **Handicrafts**: the most important source of employment creation, accounting for more than 75% of all employment in the sector under both scenarios.

- **Bamboo shoots**: 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.
  
  i) **Premium processing**: has a high rate 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.

  ii) **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.

  iii) **Low value and bulk processing**: has an impact rate 20% of that for premium processing 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 and processing residues.

  iv) **Raw culm supply**: has the lowest rate of pro-poor impact, but is an important part of a mixed sub-sector.

6.2 Developing evidence for shaping policy

As indicated so far, each sub-sector is structured differently, affords different impacts and outcomes, and requires different interventions for their development.
The underlying evidence for shaping policy have been developed for the industrial bamboo sub-sector and these are included below. Sector competitiveness is achieved through the pre-processing step and this is a cornerstone to building a high volume high impact sub-sector.

Detailed analysis of the segmented handicraft sub-sector is anticipated to demonstrate a different structuring to policy options. As for bamboo shoots, the challenges are more associated with market access and linkage. The industrial sub-sector analysis is included below.

6.2.1 Policy analysis example - the industrial sub-sector

To illustrate sub-sector development options, we shall consider four different industrial mixes as shown in Table 5:

(i) An industry built around raw bamboo culms;
(ii) A bulk processing led industry, as you would see in an industry where paper/pulp industry predominates;
(iii) An industry with some medium value products and bulk processing
(iv) A new industrial model with a balance of premium, medium and low value and bulk processing (modelled on global leader, China).

<table>
<thead>
<tr>
<th>Industry model</th>
<th>Industry type</th>
<th>Raw bamboo supply</th>
<th>Low value &amp; bulk processing</th>
<th>Medium value processing</th>
<th>Premium processing</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw material producer</td>
<td></td>
<td>80%</td>
<td>15%</td>
<td>5%</td>
<td></td>
<td>100%</td>
</tr>
<tr>
<td>Low value bulk processing</td>
<td></td>
<td>55%</td>
<td>40%</td>
<td>5%</td>
<td></td>
<td>100%</td>
</tr>
<tr>
<td>Medium value &amp; bulk processing industry</td>
<td></td>
<td>55%</td>
<td>20%</td>
<td>20%</td>
<td>5%</td>
<td>100%</td>
</tr>
<tr>
<td>New industrial model</td>
<td></td>
<td>40%</td>
<td>30%</td>
<td>15%</td>
<td>15%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 5. Industry mix in different industrial models

Figure 11 demonstrates the impact of different industry models for a provincial industrial sub-sector built on 50,000 ha of bamboo. This is a realistic model for Vietnam and Laos provincial policy makers.

Figure 11. Comparison of the impact of the four product segments as policy choice
The new industrial model creates twice the pro-poor impact of either the raw material producer or bulk processing industrial models. This creates good poverty impact options for policy makers in bamboo producing areas, where today plans for large-scale paper mills are moving again.

This should be seen in dramatic contrast with the experience in Anji County, Zhejiang province, China where an equivalent production from 50,000 ha produces an annual pro-poor financial impact of USD 72 million. Most of the USD32 million difference between the VCL scenario and China, is captured by farmers in higher bamboo prices and a further approximately 10% by workers in higher wages. As was experienced in China (Ruiz Pérez et al 2004) the future prospects for the development of a competitive sector such as bamboo for VCL can be expected to drive up prices of farm produce and wages of the poor over time, leading to broad based poverty impact.

![Figure 12. Comparison with the Anji (China) experience](image)

6.3 An intervention design to capture the opportunity.

The purpose of the USD250,000 feasibility study was to determine if the bamboo sector in the Mekong has the potential to impact poverty at scale over the medium to long term. The work which engaged many people and agencies also established a range of entry points for action and partnerships for collaboration. This enabled the design of the Mekong Bamboo Consortium (MBC) project which is currently in a scaling up phase.

The MBC project is based around the following elements:

- It is a collaborative project linking resources and interests from development and private sector across all dimensions of supply chain from the levels of farmers, manufacturing businesses, investors, development agencies, governments, and wholesalers/traders. Interventions are not formulaic but simply target recognised weak points, supply chain log jams or other barriers to market entry and growth be they policy, farmers and resources, enabling environment, technology, investment, information, service markets etc.
The MBC leads model supply chain activities and supports replications. The MBC develops supply chain pilots to experiment, then capture learning and experiences. The package of experience is then available, and resources are embedded to support other development project owners to replicate within their own projects, partnerships and project modalities within the region. Model activities will include businesses which we assist to invest in innovations. There are currently 12 agencies, as consortium partners in the region, at various stages of planning and implementation of replication supply chains across the 3 bamboo sub-sectors. We expect this number to exceed 30.

The MBC leads sector level activities. Things such as national policy development, databases of bamboo manufacturers, resource inventory, and research and technology innovation are being carried out with partners across the region. This enables appropriate levels of resourcing for high quality, regionally relevant outcomes and products.

The value of these model supply chain and sector level activities becomes increasingly leveraged as the number of projects (consortium partners) grows. This replication model is the backbone of the plan to achieve poverty impact at scale.

It is a regional project to facilitate the cross border nature of market linkages, eg, Laos opportunities in the industrial bamboo sub-sector are most likely to supply pre-processed bamboo into Vietnam.

It is coordinated at regional level, with national steering groups.

Figure 13. Activity Structure of the MBC project
• It has a 10 year project horizon. The MBC is not a master plan but a platform for collaboration to ‘build the regional bamboo pie’.

• We anticipate that the project will generate and spin-off sector specific bodies and initiatives resourced by the businesses gaining specific value. These include market information systems, consultancies, bamboo business associations, farmer processing cooperatives etc.

• We anticipate around USD200-400 million of private sector investment will be required over the coming decade from small investors through to large processing facilities. There is a considerable need to attract financial institution partners, and this is underway.

• Its budget, around USD2.5million for this coming year is funded primarily by SDC, Ireland Aid, IFC/MPDF, and Oxfam Hong Kong.

The MBC project activities are structured as shown in Figure 13

7. A Proposition to Estimate Return on Development Investment

We have estimated that the three sub-sectors could together provide direct targeted income resulting in 1-1.5million shifting across the poverty line in the region over the next decade. The greatest poverty impact potential is in industrial bamboo (~1million out of poverty), followed by handicrafts (~450,000 out of poverty), and bamboo shoots (~100,000 out of poverty). This analysis will be elaborated in a subsequent publication, and will be further developed and tested as the project moves forward.

We also estimate that over the coming decade, donor and public investments to the order of USD 40million will be required to develop this sector opportunity, with public sector investments decreasing (in Vietnam at least) as the private sector develops its own means to promote sector growth in partnership with government.

In return on investment terms, this would equate to the following development outcome returns:

• 800,000 jobs at $50 per job in the bamboo sector;

• USD17million/year local economy output and growing by 2017, per USD1million invested over the coming decade

• USD$40-60 per person out of poverty directly from the bamboo sector

While these are estimates, this does at least provide an approach to establishing the relative merits of sector development investments.

Furthermore, the overall approach outlined in this paper can be applied across multiple sectors, ultimately enabling agencies and government partners to compare and prioritise a portfolio of sectors which together diversify risk and maximise returns for development investments in terms of achieving targeted economic development outcomes. This proposition forms the basis of a second major initiative, called the ‘Portfolio Project’ currently being implemented by Oxfam Hong Kong and partners in the Mekong Region.

This approach and the estimates we have made will be evaluated as the both MBC and Portfolio projects develop, to test the viability of this proposition for determining development investment strategy.

8. Summary

The approach of analysing demand, competitiveness and impact and synthesising these factors into an overall sector opportunity has been demonstrated for the bamboo sector in the Mekong countries of Vietnam, Laos and Cambodia.

The analysis demonstrated the following:
Demand for bamboo products is on the rise, and is accessible to Mekong countries.

Owing to Chinese technological innovations and supply chain efficiencies which increased the range and competitiveness of bamboo products, they now capture increasing segments of existing large global markets in a range of timber and pulp markets (furniture, construction, fibre product markets),

- The global bamboo market is growing (today USD7 billion, 2017 estimate USD15-20 billion).

<table>
<thead>
<tr>
<th>2007 Market Share (USD):</th>
<th>Global</th>
<th>China</th>
<th>Vietnam</th>
<th>Laos</th>
<th>Cambodia</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7Bn</td>
<td>5.5Bn</td>
<td>250Mn</td>
<td>4Mn</td>
<td>7Mn</td>
</tr>
</tbody>
</table>

The Mekong countries are potentially very competitive to capture market share.

Across the sector 75-80% of sector production costs are bamboo resource and labour.

- On the cost of both resources and labour, VCL out-competes the global leader, China.

<table>
<thead>
<tr>
<th>Costs:</th>
<th>China</th>
<th>Vietnam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw Bamboo</td>
<td>$100/tonne</td>
<td>$37/tonne</td>
</tr>
<tr>
<td>Labour</td>
<td>$150/month</td>
<td>$50/month</td>
</tr>
</tbody>
</table>

- If efficient supply chains can be developed VCL can gain market share;
- The investment and technology requirements to achieve competitive supply chains are modest and appropriate to current capacities of poor rural areas;
- Sector Enabling Environment (SEE) issues – which focus at the provincial level, can be addressed, although initial targeting of provinces with better enabling environments will be the best way to realise the regional sector opportunity.

Bamboo supply chains impact the poor.

Seventy-five percent of the total sector financial output is pro-poor – either as farmer incomes or as labour throughout supply chains. But the benefits accrue differently:

- In the industrial bamboo sub-sector farmers are the main beneficiaries (60% of sub-sector output);
- Labourers in the handicraft sub-sector, 60% of whom are women, are the main beneficiaries capturing 80% of sub-sector output;
- Bamboo shoots is a smaller sub-sector, and farmers are the major beneficiaries of this a relatively lucrative food crop;
- In the uplands, bamboo provides perhaps one of the best sustainable returns on sloping land, while in the lowlands bamboo is uncompetitive.
- There is an inherent opportunity for an emerging industrial bamboo sub-sector, with direct supply linkages into a handicraft sub-sector to map directly onto existing poor upland areas, with considerable benefit to poor rural communities.

Opportunities for Scaled Impact

These Mekong countries have the potential to grow the current USD 260million sector presently employing 400,000 to a sector in the order of 1.2 billion employing around 1.2 million by 2017. At these levels, it also has the potential to directly lift 1-1.5 million people out of poverty in this period. Both Vietnam and Laos have considerable bamboo resources, and all countries have the capacity to grow bamboo. With comparative advantages of raw material and labour costs, and an ability to develop a competitive industry at scale, the prospects for Mekong countries, headed by Vietnam look strong.
Success will depend on the ability to transfer experiences from China. Appropriate targeted support and government leadership is needed to create progressive farming and business environments to ensure financial viability and good returns on investment for farmers, processors and others in the emerging supply chain. Into the coming decade, it appears feasible to create many USD billions of additional pro-poor income and hundreds of thousands of new jobs in the Mekong region in the bamboo sector. Public sector investment needed to achieve this is estimated as approximately USD40m over the next ten years.

The approach we have developed to demonstrate the bamboo sector opportunity in VCL has the potential to be applied to other sectors. Sector potential, and the investments needed to develop them can be compared and prioritised. In this way the approach can assist in building targeted rural growth and sector diversification strategies which coordinate development assistance and maximise impacts on poverty.

9. References


