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GREEN PRODUCTION AND TRADE MDG:F MDG ACHIEVEMENT FUND

JOINT PROGRAMME ON GREEN PRODUCTION AND TRADE
TO INCREASE INCOME AND EMPLOYMENT OPPORTUNITIES FOR THE RURAL POOR

FINAL REPORT

CLEANER PRODUCTION AND DESIGN FOR SUSTAINABILITY ASSESSMENT FOR FIVE-VALUE CHAINS IN PROJECT AREA

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Hanoi, June 2011

I. Assessment of CP and D4S

I.1. Assessment methodology

The value chain evaluation

The value chain of the industries spread along from pre-harvest, harvest, transportation, pre-process, process until finishing stages. Each stage of the chain could be taken place separately in different organizations or worker houses or together at the same place.

Data collection

- Before the investigation, the data would be collected though informative sources such as newspaper or report to figure out the most common issues.
- Data would be collected at field based on the project survey.

Interview

Questionnaire has been prepared for the common problem at different level of production such as village, commune, district and province at the investigated areas.

Quick assessment at SME

The VNCPC technical consultant works with the SME to do the assessment in order to figure out the solution of their issues. In addition, experts consult the organization about energy efficiency, effective material consumption, increasing the quality of product and improving the product designs.

The assessment including:

- Collecting baseline data
- Identifying problems in the five value chains
- Recommendations for more effective production
- Equipment upgrading recommendation for innovative development

I.2. Results

The field surveys were implemented from December 2010 to March 2011 in the four identified provinces within the project area and some other places including Ha Noi. In total, there are 29 SMEs and cooperatives in the project areas and 19 others outside have been investigated.

During the assessment, along the stages of each value chain, key unsustainable/ problems were indentified and recommendations/opportunities were generated for the sustainable development of the chain and creating value-added for the enterprises. Detailed information of the assessment of each enterprise is in the Quik CP and D4S report. The list of beneficiaries is indicated on the Table below:

Location	Value Chain*				
	B/R	SC	SG	LQ	HP
NGHE AN PROVINCE (8)					
1. Duc Phong Co., Ltd.	X				
2. Duc Quyen Co.,	X				
3. Hai Van Brocade Cooperative		X			
4. Trieu Duong Bamboo and Rattan Co.,Ltd.	X				
5. Lam Giang Sericulture Co		X			
6. Ngoc Canh Co.,Ltd.	X				
7. Phuong Anh Co.,Ltd.	X				
8. Yarn-Silk production JSC		X			
THANH HOA PROVINCE (10)					
1. Duc Thanh Co.,Ltd.		X			
2. Hoang Long Co.,Ltd.			X		
3. My Quang Co.,Ltd.	X				
4. Nam Duong Co.,Ltd.	X				
5. Ninh Huyen Thong Co.,			X		
6. Quoc Dai Co.,Ltd.	X				
7. Son Phu Co.,Ltd.			X		
8. Tan Tho Cooperative.	X				
9. Trieu Son Co.,Ltd.	X				
10. Viet Anh Sedge Production Export Company			X		
PHU THO PROVINCE (6)					
1. Can Lieu Cooperative	X				
2. Duong Thanh Phu Co.,	X				
3. Lv & Oriental Pearl Co.,Ltd.				X	
4. Phu Cat Curtain Weaving Cooperative.	X				
5. Phu Tho Lacquer Coop.				X	
6. Tam Son Lacquer Co.,Ltd.				X	

HOA BINH PROVINCE (5)					
1. Sanda Co.,Ltd.	X				
2. Handmade paper production group					X
3. Tu Dinh Brocade Co.,Ltd.		X			
4. Vong Ngan Cooperative		X			
HA NOI (14)					
1. Au Lac Designs Co.,	x	X	X	X	X
2. CraftLink Co.,		X			
3. Doan Ket Co., Ltd.	X				
4. Dome Co., Ltd					
5. Ha Linh rattan & Bamboo Co,. Ltd	X				
6. Han Hanh Co.,					
7. Kana Co.,		X			
8. Ngoc Son Ltd	X				
9. Phong Chau CO., LTD	X				
10. Phong Nam		X			
11. Sun Co.				X	
12. Thai Linh Co.,				X	
13. Viet Quang Co.,	X				
14. VINAEM Co., Ltd					X
OTHER PLACE (5)					
1. Hiep Hoa Enterprise	x				
2. Ngoc Dong Ha Nam company	X				
3. Phu Khanh Silk Co., ltd		X			
4. Thai Ha Co.,		X			
5. Thanh Binh.,	X				
TOTAL (48)	23	12	5	6	2

* B/R: Bamboo/Rattan; SC: Sericulture; SG: Seagrass; LQ: Lacquerware; HP: Handmade Paper

I.2.1. CP and D4S for bamboo rattan value chain

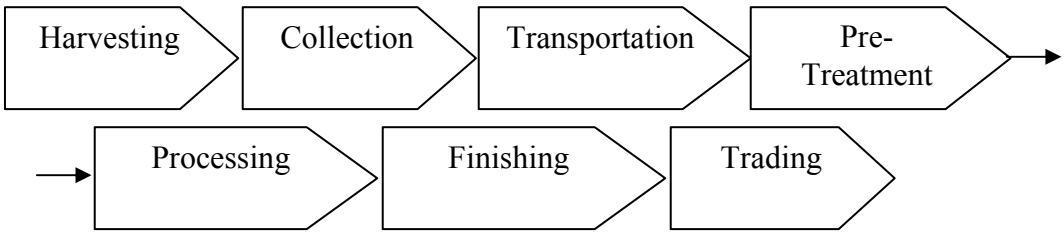


Figure 1. The value chain of bamboo, rattan

I.2.1.1. CP and D4S for bamboo value chain

Bamboo processing requires several steps described in the figure below:

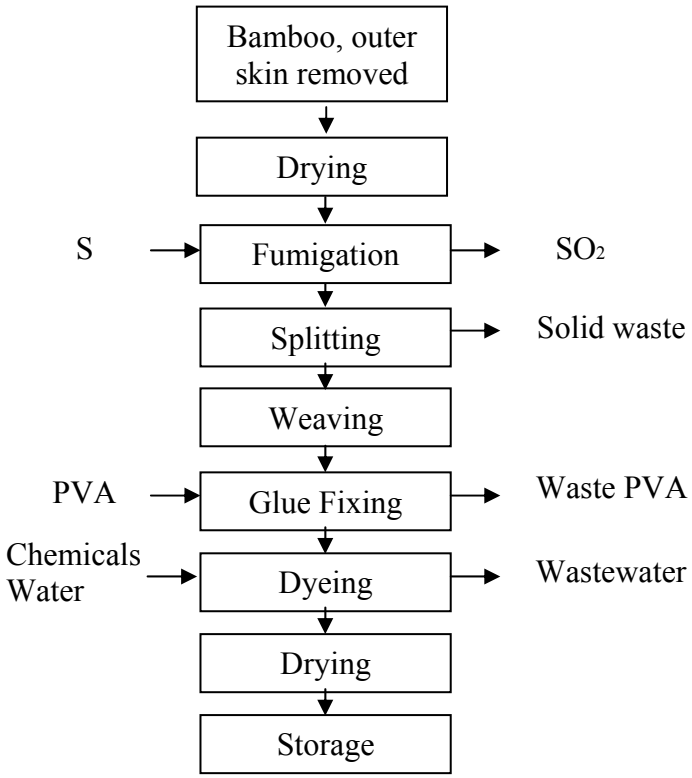


Table 1. Specific consumption benchmarks for 1 kg bamboo product

No	Inputs	Unit	2008	2009
1	Bamboo	Kg	14.2 – 14.4	14.2 - 14.4
2	Lacquer and paint	L	0.012 – 0.014	0.012 – 0.014
3	Sulfur	Kg	0.004	0.004
4	Dye stuff	Kg	0.004	0.004

5	PVA	Kg	0.0036	0.0036
6	Electric	KWh	0.088	0.086
7	Coal	Kg	0.053	0.051
8	Gas	Kg	0.007	0.007

	Problem	Recommendation
Harvesting	Unqualified bamboo is harvested	Standard for harvesting: ➢ The outer layer is blue (in case of deep blue color, the cane is young, the old cane is in yellow) ➢ Height from 6 – 8m. ➢ Diameter over 60 cm ➢ Length of each section over 60 cm ➢ Age from 1.5 to 3 year (if the cane is old, the flexible is not qualify for weaving)
	Un-sustainable harvesting, due to the over-exploitation and degeneration, bamboo quality is decreasing	➢ Select the qualified ones ➢ Remains three generations in the hedges ➢ Harvest in dry season ➢ Plan the bamboo area and giving the land property to the local people ➢ Train harvester on sustainable harvesting and cultivation
Transportation	Only 10-30% of material is used and 70% is wasted	➢ Build the workshop near the harvesting area for drying and splitting before transporting to company
Pre-treatment	Low productivity on peeling outer skin	➢ Apply the new design cutter as below for peeling skin: 

	Drying depends much on the weather	➢ Design the drying room for household level used in rainy season
	Bamboo is easy attacked by fungi, mould and insects	➢ Research on boiling technology for anti mould, fungi and insect
Processing	In rainy season, materials easily attacked by fungi, mould and insects	➢ Install a drying chamber, heated from burning bamboo waste
	Sulfur fumigation results in air pollution	➢ Replace sulfur by applying boiling technique to remove water, sugar content in bamboo, avoiding fungi and insect
	Very high portion of waste (70%)	➢ Use the solid waste of bamboo as combustible for drying chamber, or boiling tank ➢ To make by-products as chop-stick, roasting-jack, or be ground to make fuel cell ➢ Waste from Lung bamboo can be used as additives in plywood making, or producing activated carbon ➢ Design new product from waste bamboo thread

Needs of equipment and technology

The crying need of the bamboo sector in our survey is adequate boiling techniques for treating bamboo with the pospose of replacing sulfur fumigation which is very toxic and un-friendly process. Beside that, in order to increase not only the quality, but also the productivity of this sector, it's very significant to equiped the following equipments:

Enterprise scale:

- Bamboo boiling systen
- Carbonization system to treat bamboo in high pressure, and also create natural color for bamboo products
- Stick spliting machine to reuse in-ner bamboo waste

- Grinding machine and fuel cell making machine of waste bamboo

Household scale

- Outer layer splitting machine

I.2.1.2. CP and D4S for rattan value chain

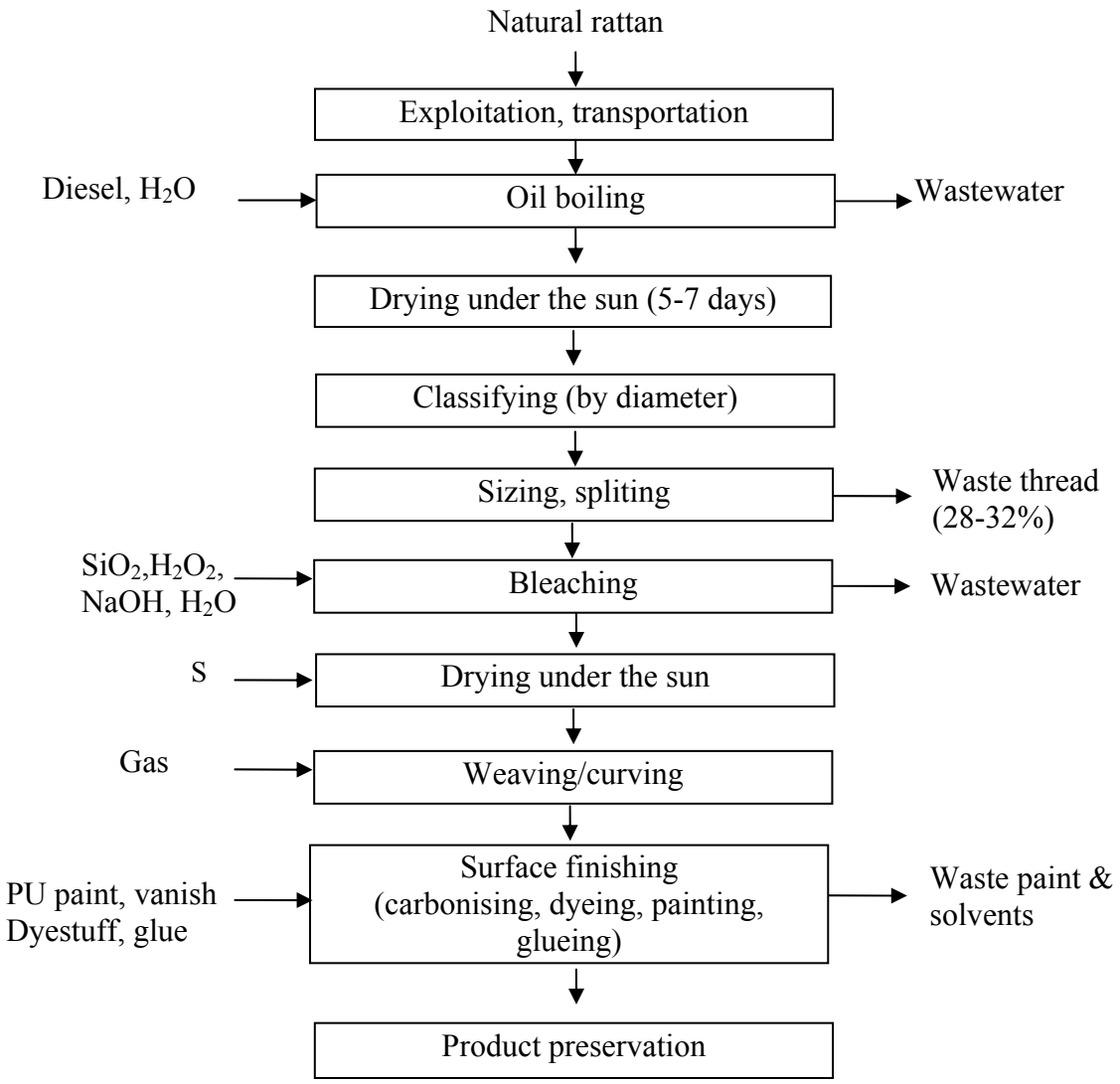


Table 2. Specific consumption benchmarks for 1 ton rattan product

No	Input	Unit	2009	2010
1	Rattan	Ton	2.170	2.01
2	Electric	Kwh	329	339
3	Diesel oil	Lit	4	10

4	Gas	Kg	11	9.3
5	Water	M^3	25	25
6	PVA	Kg	5	5.1
7	Gloss/ TOA Varnish	Lit	15.5	14.8
8	Chemicals: H_2O_2-50% + Na_2SiO_3	Lit	23.45	21.6
9	Sanding paper	Piece	24	24

	Problem	Recommendation
Harvesting	Harvest unqualified rattan	Standard for harvesting: ➢ The outer layer turns from yellow to dark blue ➢ Height over 5 m ➢ Age no less then 3 years ➢ Cut the cane upper 10-15 cm from the ground
	Unsustainable harvesting leads to decrease in quality and quantity	➢ Select the qualified ones ➢ Harvest in dry season ➢ Avoid to harm surroundings ➢ Train harvester on sustainable harvesting and cultivation
Transportation	Only 20-30% of material is used at company, the rest is water and waste	➢ Build the workshop near the harvesting area for oil boiling and drying before transporting to company ➢ Right after be harvested, rattan should be boiled as soon as possible to improve color and quality of the canes

Processing	Rattan boiling by diesel oil which is harmful to labor and impact on the environment	➢ Applying new method of boiling with vegetable oil
	High volume of waste thread rattan	➢ Improve sizing and splitting machine, specially the cutters
	Bleaching stage is not standardized, spending a lots of time, waste of chemicals, water	➢ Applying standardized bleaching process, to understand of the role of each chemicals in order to control the process ➢ Installing carbonization system, to create the color that does not required any chemicals.
	Rattan is easy attacked by fungi because of high humidity	➢ Installing the drying and preservation chamber used solar radiation to keep the rattan material and product in dry-air
	A big volume waste of un-qualified rattan thread	➢ Develop new design of rattan product from waste rattan

Needs of equipment and technology

Enterprise scale:

- Equipment and techniques of boiling rattan used vegetable oil
- Carbonization system to treat rattan and create natural color
- High quality and productivity of sizing, splitting machines
- Equipment and techniques of bleaching, efficiency used of chemicals
- Drying and preservation chamber uses solar radion

Household scale

- Spliting, sizing machines

I.2.2. CP and D4S for sea grass value chain

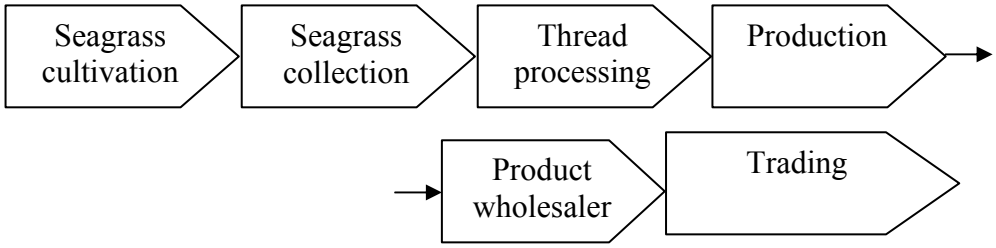


Figure 2. The value chain of sea grass

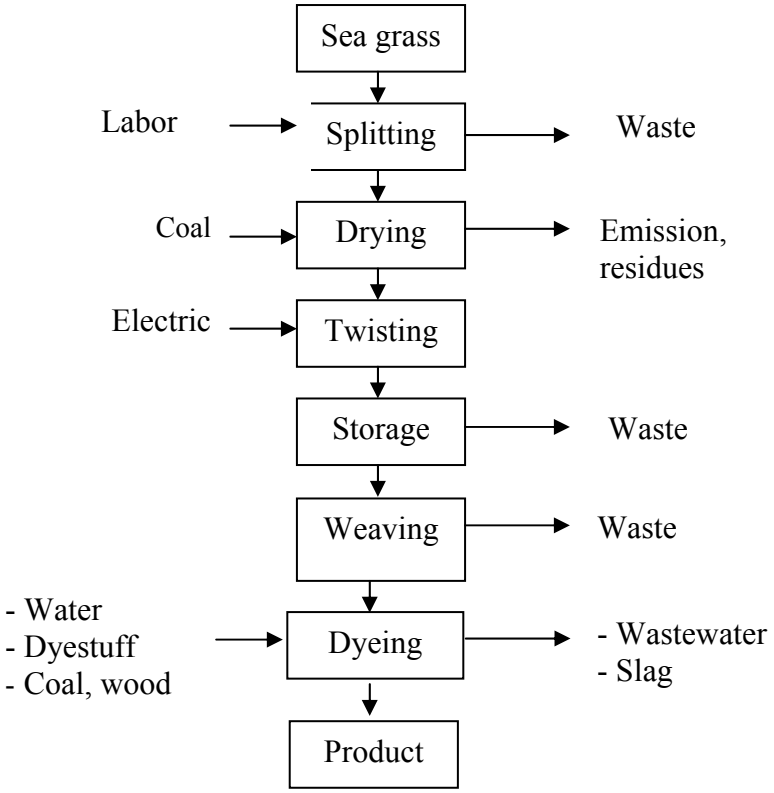


Table 3. Specific consumption benchmarks for 1 ton of sea grass product

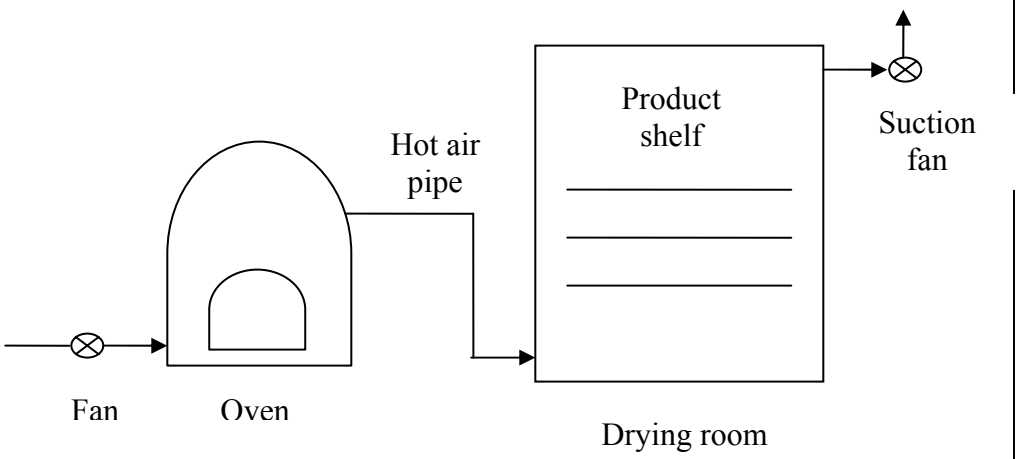
No	Input	Unit	2010
1.	Fresh sea grass	Ton	2
2.	Coal	Ton	0.005
3.	Chemicals: - Dyestuff - PVA (kg)	 Kg Kg	 0.16 0.12
4.	Electric - For manual weaving - For weaving machine	KWh	 10 - 13.2 20 - 25
5.	Gas	Kg	0.08



Harvesting → Splitting → Drying

Storage → Weaving → Dyeing/Drying



<table>
<tr><th></th><th>Problem</th><th>Recommendation</th></tr>
<tr><td rowspan="2">Cultivation</td><td rowspan="2">Degrading on quality and productivity</td><td>➢ Constantly concerning to soil selection, soil preparation, seeding selection, fertilizing and disease protection and prevention</td></tr>
<tr><td>➢ The timing of harvest should be set at:
o The right mature of the crop
o The suitable weather for highest performance processing.
o Good preparation for the next season</td></tr>
<tr><td>Processing</td><td>High rate of mold attacked seagrass materials due to inappropriate drying and preservation</td><td>➢ Applying in-direct drying system as below:
 

Drying chamber must be designed for the highest contact capability of the hot air to the product such as z shape.
- The door of the chamber must be totally closed.
- The product arrangement should keep the small distance between products for the air go thoughand contact to all surfaces of them.</td></tr>
</table>

		➢ Use the transparent panels on the roof to collect the heat and light from the sun. ➢ The door must be closed during raining, high humidity weather and opened when in dry. ➢ The raw material should be wrapped tight by nylon or other covers ➢ The material and product must be placed upper ground at least 10cm. ➢ Humidity removal system established in the storage room – if possible. ➢ Storing product at 10 - 15°C and humidity below 14% condition ➢ Product protection by glue fixing
	Poor designing of products	➢ Develop new design of combination seagrass with other materials
		➢ Reuse unqualified thread seagrass to make new products

The technique needs to be investigated:

- Efficiency seagrass drying
- Solar radiation drying chamber
- Mold prevention

The equipment needed:

- Enterprise scale:
  - Mat weaving machine
  - Seagrass automatic splitting machine
- Group or family scale:
  - Mat weaving machine
  - Seagrass automatic splitting machine
  - Storage facility.

I.2.3. CP and D4S for sericulture value chain

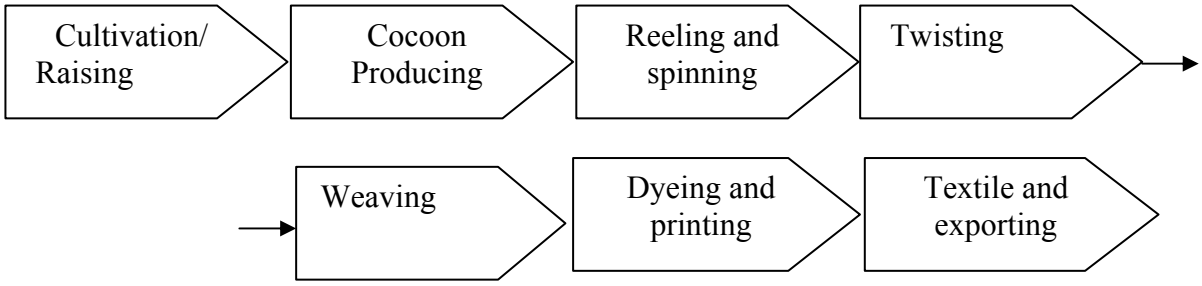


Figure 3. The Vietnamese sericulture value chain

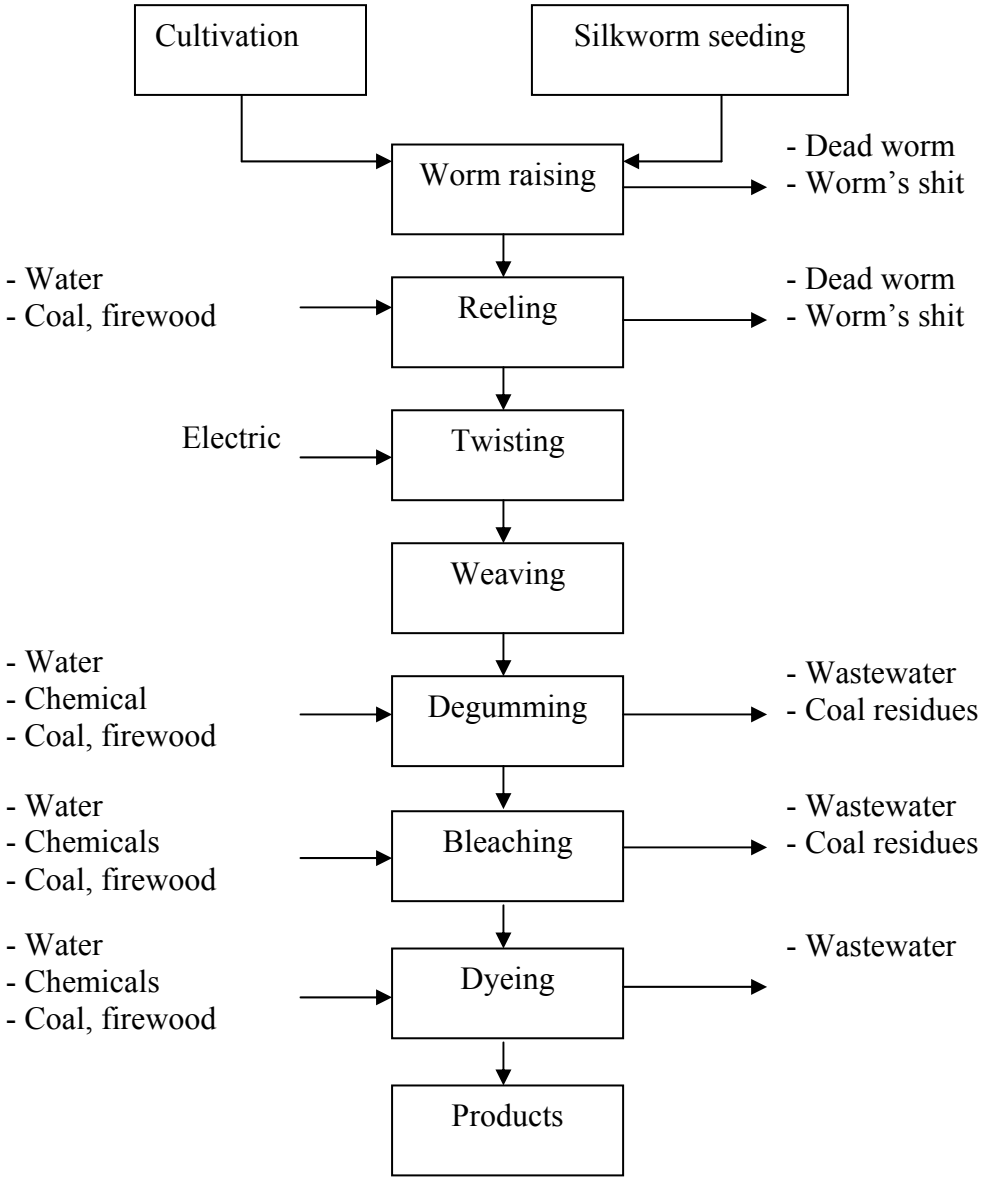


Table 4. Specific consumption benchmarks for 1 kg of silk product

No	Inputs	Unit	2010
1.	Raw cocoon	Kg	4 - 7.5
2.	Coal	Kg	3 - 12.5
3.	Firewood	Kg	6 – 25
4.	Water	Lit	35 – 240
5.	Electric	Wh	92.5

	Problem	Recommendation
Cultivation	Low productivity and disease	➢ New variety with the higher disease resistance ➢ Cultivation area planning on the suitable soil such as river bank soil ➢ Good soil preparation for highest productivity and better quality ➢ Fertilization and pesticide using as instruction.
	High rate of dead silk worm, low productivity of cocoon	➢ Choose the suitable silkworm variety for the area(for example, the yellow one is fit for the warm weather while the white one is potential for the cool area) ➢ Good storage facility to maintain the quality of the silkworm, such as aluminum box. ➢ The caterpillar feeding should be in separated area to avoid the contamination from the air, pesticide… ➢ Air conditioner for the storage room would be great. ➢ Periodical cleaning and sanitation.
Processing	High consumption of coal/firewood	➢ The hot water chamber should have good insulation to avoid heat loss
	Big volume of wastewater is discharged directly to the sewage system without any treatment.	➢ Build the biogas system for treatment of high BOD, COD wastewater to recover the gas for domestic uses
	Residues from cocoon after reeling are waste	➢ could be sold to the collector who re-sell to Chinese silk-processing with better machine to get it.

	High consumption of chemicals and discharge big volume of polluted wastewater	➢ Control the purity of water used for dyeing ➢ Use environmental friendly dyestuff ➢ Apply natural dyeing

Needs of equipment and technology

Techniques needs to be investigated:

- Chemicals for deguming process in which discharges less toxic chemicals to the environment
- Research on natural dyeing which can create wide range of colors and stable

Equipment needs:

- Enterprise scale:
  - Dyeing machine with low density solution
  - Reeling machine
- Household scale:
  - Reeling machine
  - Manual reeling equipment
  - Sewing machine

I.2.4. CP and D4S for lacquer ware value chain

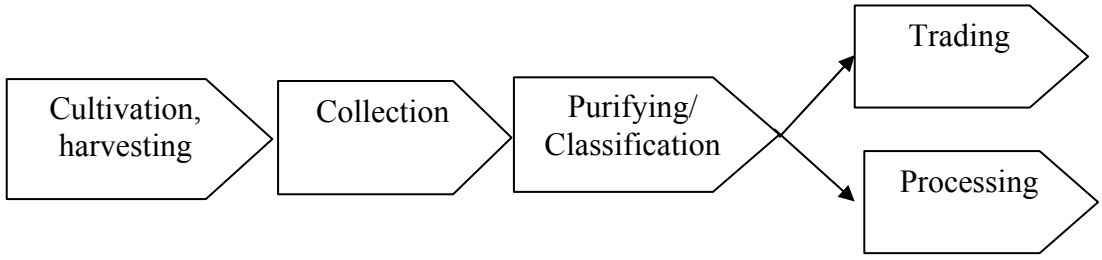
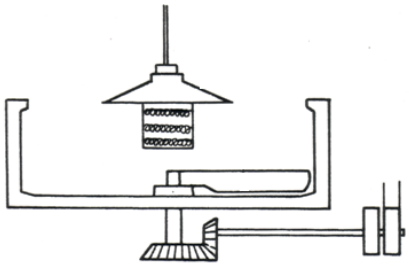


Figure 5. The lacquer ware value chain

	Problem	Recommendation
Preservation	Water content and impurities in the sap	➢ Identify the qualified mature lacquer tree and separate the saps of different species ➢ Do not collect lacquer liquid in rainy weather ➢ Avoid lacquer liquid contacting directly with sunlight ➢ Avoid impurities mix on the sap during collection
	Store lacquer without follow the principle of FIFO (first in first out)	➢ The storage room should be redesigned to avoid the moisture.

Processing	Drying time is very long (3 days)	➢ Mix with Japanese or Chinese lacquer ➢ Add laccol, urushiol, acetone extracted from raw lacquer of Vietnam or China ➢ Supplement laccase
	Poor shining	➢ - Research on the processing technology to produce lacquer from raw material to final product as" Raw sap → Refining/Filtration → Korome process (grinding, stirring and heating) → Pigment mixing
	Low ability of pigment mixing	

Needs of equipment and technology

Techniques needs to be investigated:

Lacquerware processing technique to meet the following criterias:

+ Quik drying

+ High glossy

+ Can be mixed to create diversified colors

Equipment needs:

Enterprise scale:

- Pilot for lacquerware processing

Household scale (sap collectors):

- Electronic equipment to examine the lacquer quality

I.2.5. CP and D4S for hand made paper value chain

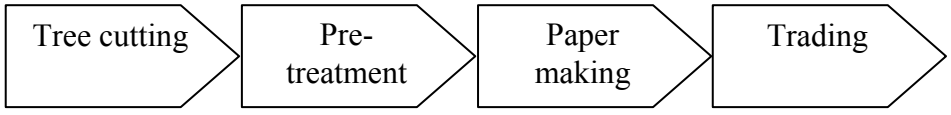


Figure 6. The handmade paper value chain

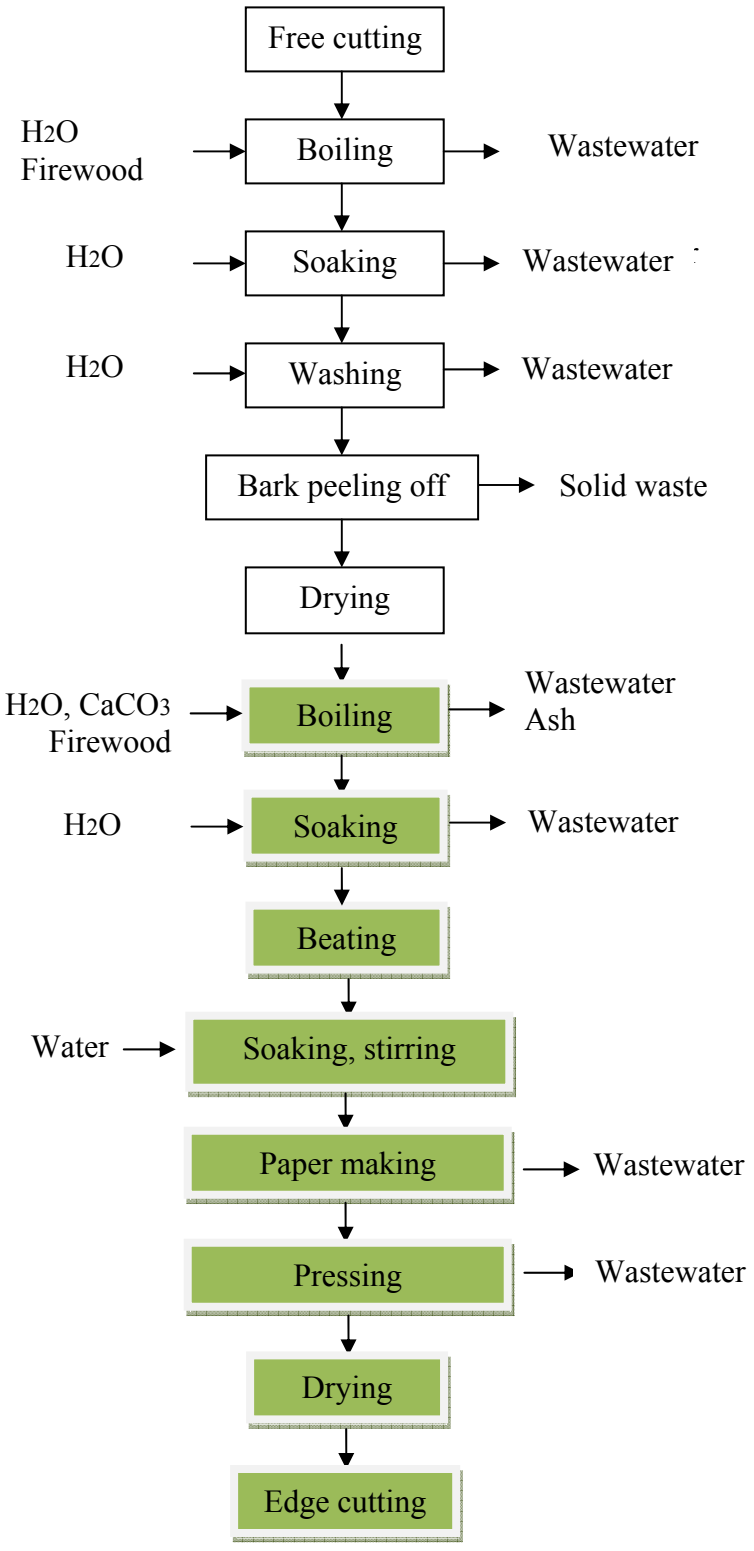

Free cutting
H2O
Firewood
Boiling
Wastewater
H2O
Soaking
Wastewater
H2O
Washing
Wastewater
Bark peeling off
Solid waste
Drying
H2O, CaCO3
Firewood
Boiling
Wastewater
Ash
H2O
Soaking
Wastewater
Beating
Water
Soaking, stirring
Paper making
Wastewater
Pressing
Wastewater
Drying
Edge cutting

Table 5. Specific consumption benchmarks for 1 ton handmade paper product

No	Inputs	Unit	2010
1.	Bark of Do tree	Ton	1.2
2.	$CaCO_3$	Kg	5-10
3.	Javen	Kg	15-50
4.	H_2O	m^3	75-150
5.	Firewood	Kg	0.08

	Problem	Recommendation
Pre-processing	"Duong", "do" tree becoming exhausted because of unsustainable exploitation	➢ The commune should be trained on sustainable harvesting (proper cutting tool, avoid harm for the tree branches and roots) ➢ Land allocation and germination needed to be transfer to the local people
	High consumption of water and firewood	➢ Should collect enough volume of raw material (tree bark) for a batch of boiling ➢ Replace the current boiling tank (iron barrel) by stainless steel to avoid corroding
Processing	Paper quality is unstable	➢ Need the standardization for paper making process ➢ The boiling tank should have a cover to protect the mixture from ash, dirt ➢ Control the quality of water used for soaking stage ➢ Install panel receiving solar radiation in the roof of workshop to assist drying process in case of rain weather
	Low productivity	➢ Research on replacing beating process by crashing used mechanical operation to increase the productivity

Needs of equipment and technology

Research on natural dyeing for handmade paper with the wide range of colors.

Equipment needs:

- Bark tree crushing machine
- Compressing machine
- Drying house uses solar radiation

II. Conduct Training of Trainer courses on integrated CP and D4S

Objectives of the courses:

- To build up capacities on CP and D4S of the five specific sectors in order to assist handicrafts involving in the two supply chains of the 4 provinces, in improving and creating value added for their business.
- After the course, qualified participants will be able to undertake the follow up activities in delivering the training with the further support from VNCPC

Criteria for the recruitment of participants:

The participants should satisfy the following criteria:

- Have experiences on working with community and handicraft productions
- Would be time available for delivering the trainings

The number of participants from each province will be around 8-12 person composed of:

- - Representatives of the provincial government officers from the Department of Industry and Commerce, the Department of Agriculture and Rural Development.
- - Representatives of vocational school, coordinators of district level
- - Technical manager of typical enterprises or cooperatives.

Content of the trainings:

- Brief introduction about purpose of the ToT , trainees expectation from the course and requirements to be a trainer of the project
- Actual situation and unsustainable issues of the five sectors
- What are CP and D4S and its benefits
- How to do CP and D4S
- Applications of CP and D4S for the five sectors
- Company visit, assignment and group discussion

Training materials:

A training package was developed for each value chain which composed of the following items as:

(1) PowerPoint presentations

(2) Color printing plain language factsheets

(3) Back ground text focuses on assessment of CP and D4S of each specific value chain

Results:

VNCPC cooperated with UNIDO Programme Coordinator to select the invitees, at the recommendation of PMU, and well made necessary logistical and other significant arrangements for the trainings.

1. The first TOT course was organized in Ha Noi from 25th – 28th April 2011 for bamboo/rattan and lacquerware sectors with the attendance of 25 participants.
2. The second TOT course was organized in Ha Noi from 4th – 6th May 2011 seagrass, handmade paper and sericulture with the attendance of 20 participants.

During the courses, VNCPC and UNIDO Programme Coordinator also observed the individual performance of participants in order to select the qualified candidates for grassroot trainings, participants were active in contributing their ideas, sharing experiences, and did not hesitate to raise questions of unclear and interested issues. After the course, participants got familiar with related CP and D4S concepts, understood CP and D4S methodology and its applications for specific sectors and very happy to be able to deliver the acquired knowledge from the course applying to handicrafts.

There are 35 trainees received the certificate for completing the training. The list of recommended trainer is illustrated on the table below.

LIST OF RECOMMENED TRAINER FOR GRASS-ROOT TRAINING

No	Name	Organization/Enterprise	Sector
1.	Mr. Nguyen Van Ngo	Công ty Đức Phong, Nghệ An	Luong bamboo
2.	Mr. Vo Van Canh	Công ty Ngọc Cành, Nghệ An	Luong bamboo
3.	Mr. Le Phu Tien	Công ty TNHH Nam Dương, Thanh Hóa	Rattan
4.	Ms. Nguyen Thi Thu	Công ty TNHH Sanda Hòa Bình	Rattan
5.	Ms. Ngo Thi Thang	Tổ sản xuất mây tre đan Liên Sơn, Lương Sơn	Rattan
6.	Mr. Nguyen Chi Thang	Ủy ban kiểm tra Đảng huyện Tam Nông	Lacquer
7.	Mr. Ta Minh Tuan	Phó Chủ tịch xã Dị Nậu huyện Tam Nông	Lacquer
8.	Ms. Sam Thi Bich	HTX Hoa Tiến, Quỳ Châu Nghệ An	Sericulture

9.	Ms. Sam Thi Khuyen	HTX Hoa Tiến, Quỳ Châu Nghệ An	Sericulture
10.	Ms. Chu Thi Phuong Dong	Công ty Nga Sơn, Thanh Hóa	Seagrass
11.	Mr. Hoang Viet Duc.	Công ty Đức Thanh, Thanh Hóa	Sericulture
12.	Ms. Hoang Thi Cuc	Tổ SX giấy dó Hợp Hòa, Lương Sơn, Hòa Bình	Handmade paper
13.	Ms. Bui Thi Lan Phuong	HTX Thổ cẩm Vọng Ngàn, Tân Lạc, Hòa Bình	Sericulture
14.	Ms. Mua Y Ganh	Tổ sản xuất thổ cẩm Pà Cò, Mai Châu, Hòa Bình	Sericulture
15.	Mr. Nguyen Van Hoa	Chủ nhiệm HTX Tình Cương, Phú Thọ	Sericulture

III. Conclusion and recommendation

Conclusion:

After carrying out quick Cleaner Production and Design for Sustainability assessment in enterprises in the project area and in their value chain, following conclusions can be drawn out:

Cleaner Production:

- Cleaner production concept is not widely known in nearly all enterprises.
- Most companies are of medium, small and even very small size, so they do not have the habit of recording data on operation as well as material, energy and chemical consumption.
- Due to the lack of data, it is difficult to compare the consumption among enterprises of the same sector; however, basing on CP assessment experiences of CP experts, there are a lot of potentials in reducing material, energy and chemical consumption, improving economic profit and reducing environmental impacts.
- Production and business activities are based on experiences and lesson-learnt from other enterprises and households in the same sector sharing the same interest in science and technology.
- Production technologies and equipment are obsolete and some rudimental tools bring low efficiency.

- The attention of management board and workers on CP is limited. Most of them think that CP implementation requires high investment and is only efficient with big-sized enterprises.

Design for Sustainability:

- Products of most enterprises share the same designs and have no formalized feature.
- Except for the orders from big companies, the product designs are mainly based on enterprise's ideas without taking unsustainability issues into consideration: high material, energy, chemical consumption, product's life cycle as well as transportation…
- Few enterprises has product design department. If there is a design department, they do not have knowledge on D4S concept.

Training:

- Trainees who are representatives from enterprises, local authorities and associations proactively take part in training courses.
- In general, after training, trainees have relative knowledge on CP and D4S in the training sector. Due to the various education level and knowledge of participants, VNCPC selects trainers for the project and provides support for trainers during training courses for local people.

Recommendations:

- Implementing deep research on technology for some chains like: anti wood eater and white aunt boiling technology, lacquer processing technology
- Selecting potential enterprises for full CP and D4S assessment to support their development and help them become examples for other enterprises
- Training enterprises on sustainable product innovation
- Selecting some machines to support households to improve productivity