Performing Basic Bamboo processing

Level-II

Based on Nov 2021, Version 1 Occupational standards

Module Title: - Performing Basic Bamboo processing

LG Code: ND BPP2 M02 LO (5-10) LG (5-9)

TTLM Code: ND BPP2 TTLM 1121v1

November, 2021

Adama, Ethiopia

Table of Contents

LG #5	LO #1- Prepare for work

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Observing PPE, 5S, and safety procedures
- Preparing work station
- Identifying and confirming production process
- Selecting bamboo
- Identifying and checking tools and equipment
- Planning carbonizing process

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Observe PPE, 5S, and safety procedures
- Prepare work station
- Identify and confirm production process
- Select bamboo
- Identify and check tools and equipment
- Plan carbonizing process

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks
5. Perform Operation Sheets
6. Do the “LAP test”

1.1 Information Sheet 1- Observing PPE, 5S, and safety procedures

1.1 Introduction

PPE is equipment worn by a worker to minimize exposure to specific hazards. Examples of PPE include respirators, gloves, aprons, fall protection, and full body suits, as well as head, eye and foot protection. Using PPE is only one element in a complete hazard control program that would use a variety of strategies to maintain a safe and healthy environment. PPE does not reduce the hazard itself nor does it guarantee permanent or total protection

5S is a philosophy and a way of organizing and managing the workspace and work flow with the intent to improve efficiency by eliminating waste, improving flow and reducing process unreasonableness.

1.2 Work procedure

1.2.1 PPE must be:

- appropriate to the task and level of risk
- used in every situation where the need has been identified (through a risk assessment/in a safe work procedure or other relevant safety information)
- selected, used and maintained in accordance with the relevant legislation, , Code of Practice and manufacturer's instructions
- selected and, where necessary, fitted to suit the individual user

1.2.2 5S stands for the 5 steps :

Sort, Set in Order, Shine, Standardize, Sustain. These steps involve going through everything in a space, deciding what's necessary and what isn't, putting things in order, cleaning, and setting up procedures for performing these tasks on a regular basis.

1.2.3 While working in the bamboo field you must observe certain health and safety precautions. Failing these precautions there are chances of accidents or health

hazards. The important precautions are as follows:

- You should ensure availability of all the necessary first Aid for safety measures
- Proper procedure for felling should be followed to avoid crush type of accidents.

- You must effectively use all the necessary safety material and follow all the preventive measures to avoid any injury during usage/application of pesticide.
- Dispose the chemical safely after treatment.
- All chemical formulations contain toxic components and should be handled with great care. Precautions are necessary during preparation of solution, treating operations and handling.

https://www.flinders.edu.au/content/dam/documents/staff/policies/health-safety/personal-protective-equipment-procedures.pdf
https://nios.ac.in/media/documents/vocational/bamboo_cultivation_(673)/Lesson-07.pdf

Self-check 1	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Choose the best answer (5 point)

1. Which one of the following is 5s step

   A. sort B. set in order C. shine D, all

2. Which one of the following is not health and safety precautions

   A. You should ensure availability of all the necessary first Aid for safety measures

   B. Dispose the chemical safely after treatment.

   C. Proper procedure for felling should be followed to avoid crush type of accidents

   D, none

You can ask your teacher for the copy of the correct answers.

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**

Information Sheet 2- preparing work station

2.1 Introduction

Preparing of bamboo work station is the main activity throughout the prediction process of bamboo goods. In case of job type preparing of work station also differs. Jobs can be well processed if the work shop organized and prepared based on the standard of qualifications.

To prepare bamboo work station some criteria's should be analyzed

- Efficiency and reliability of necessary tools and equipment's
- Available of safety inputs
- Safety of work area

Figure 1 bamboo work station

Self-check 2	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Choose the best answer (10 point)

1. What are the criteria's considered to prepare the work station
   A. Efficiency and reliability of necessary tools and equipment's
   B. Available of safety inputs
   C. Safety of work D, none
   D. All

You can ask your teacher for the copy of the correct answers.

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**

Information Sheet 3- Identifying and confirming production process

2.1. Bamboo production processes

2.2.1 Cutting the Bamboo

Bamboo is cut according to the size of products to divide the raw bamboo into sections of certain length in accordance with the size of final products, to utilize the raw material rationally and economically, taking into consideration its crookedness and obliqueness.

The cutting operation should be carried out in the following order:

- To cut off the end of raw bamboo with the traces of hacking.
- To start the cutting operation from the root part.
- The thickness of culm wall is quite big under the height of 1.5 meters.
- During the cross-cutting of bamboo culm with great crookedness, it is better to make more short sections for inner layers.
- The bamboo sections must have proper margin of processing.

2.2.2 Splitting / Ripping

In order to produce bamboo veneer the bamboo sections must be split into two or three fragments. Bamboo sections are split with a splitting machine

2.2.3 Slitting

Slitting is applied to slit the surface of furniture parts for connection

2.2.4 Crushing

Crushing of bamboo strips by crashing machine

2.2.5 Waning

It is generally believed that if bamboo is harvested during the bright phase (waxing period) or during full moon it is liable to be attacked whereas bamboo harvested during the dark phase (waning period) escapes borer damage

Self-Check – 3	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. Write down all the necessary bamboo production processes.
2. Write down cutting operations to be followed?

Note: **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**

You can ask you teacher for the copy of the correct answers.

Information Sheet 4- Selecting bamboo

3.1 Introduction

When specifying or selecting bamboo, it is important to ensure that it comes from a sustainable source and is harvested, procured and visually graded by a reputable and experienced organization (note current visual grading is very limited in detail, mostly comes from experience, and has not yet been correlated with strength data).

3.2 Criteria's should be included in selecting bamboo

- exact species and origin
- acceptable age range
- culm length, minimum external diameter and minimum wall thickness
- taper
- straightness (1% out-of-straightness limit recommended)
- splitting (no splitting is acceptable) (this should be checked after the material has been dried)
- no insect and fungal damage
- Treatment, fumigation and seasoning.
- Moisture content (recommend it is delivered dry).

https://www.researchgate.net/publication/305808084_Structural_use_of_bamboo_Part_1_Introduction_to_bamboo

Self-Check – 4	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions (5 points)

1. Why we select bamboo?
2. List down the criteria's followed to select bamboo?

Note: **Satisfactory rating – 10 points** **Unsatisfactory - below 10 points**

You can ask you teacher for the copy of the correct answers.

Information Sheet 5- Identifying and checking tools and equipment

4.1 Identifying and checking tools and equipment use to bamboo production

A,

Twin rip saw

B,

Manual splitter

C,

Splitting machine

D,

Carbonize chamber

E,

Whickering machine

F,

Four side planner machine

G,

Doweling gadget

H,

Pole cutter

I,

J,

Hand saw

knife

K,

Machete/bolo

Self-Check – 5	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions (10 points)

1. Mention at least five equipment's used to bamboo production?

Note: **Satisfactory rating – 10 points** **Unsatisfactory - below 10 points**

You can ask you teacher for the copy of the correct answers.

Information Sheet 6- Planning carbonizing process

5.1 Introduction

Production planning and control can be viewed as nervous system of the production operation. This function aims at efficient utilization of material resources, people and facilities in any undertaking through planning, coordinating and controlling the production activities that transform the raw material into finished products or components as a most optimal manner.

All the activities in manufacturing or production cycle must be planned, coordinated, organized and controlling to its objectives. Production planning and control as a department plays a vital role in manufacturing organizations. It is clear from name that it is something about planning. Planning is defined as setting goals.
Requirements for an effective Production Planning and Control In an organization, PPC system can be effective only if the following aspects are given due considerations before implementation:

- Appropriate organization structure with sufficient delegation of authority and responsibility at various levels of manpower.
- Right person should be deputed at right place for right job.
- Maximum level of standardization of inventory, tooling, manpower, job, workmanship, equipment, etc.
- Appropriate management decision for production schedule, materials controls, inventory and manpower turnover and product mix.
- Flexible production system to adjust any changes in demand, any problem in production or availability of materials maintenance requirements, etc
- Estimation of accurate leads times for both manufacturing and purchase.
- Management information system should be reliable, efficient and supporting.
- Capacity to produce should be sufficient to meet the demand.
- The facility should be responsive enough to produce new products change of products mix and be able to change the production rates.

Self-Check – 6	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions (10 points)

2. Explain the use and meaning of carbonization planning?

Note: **Satisfactory rating – 10 points** **Unsatisfactory - below 10 points**

You can ask you teacher for the copy of the correct answers.

LG #6	LO#2. Produce semi-processed bamboo materials

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics:

- Selecting appropriate tools and equipment.
- Conforming size of semi-process bamboo materials.
- Trimming and splitting bamboo culms.
- Carping split bamboo

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, **you will be able to**:

- Select appropriate tools and equipment.
- Conform size of semi-process bamboo materials.
- Trim and splitt bamboo culms.
- Carp split bamboo

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If you earned a satisfactory evaluation proceed to “Operation sheets
7. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
8. If your performance is satisfactory proceed to the next learning guide,

Information Sheet 1- Selecting appropriate tools and equipment.

1.1 Introduction

Selecting appropriate tools and equipment used to produce bamboo culms or to trim and split culms and to carp to get bamboo timber wuhich is required to every production process to maximize output and minimize wastage

1.2 Tools and equipment required

a) Twin rip saw
b) Manual splitter
c) Splitting machine
d) Carbonize chamber
e) Whickering machine
f) Four side planner machine
g) Doweling gadget
h) Pole cutter
i) Hand saw
j) Knife
k) Machete/bolo

Self-Check – 1	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions (10)

1. Least down tools and equipment's used to produce bamboo culms?

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**

You can ask you teacher for the copy of the correct answers.

Information Sheet 2-Conforming size of semi-process bamboo materials

2.1 Introduction

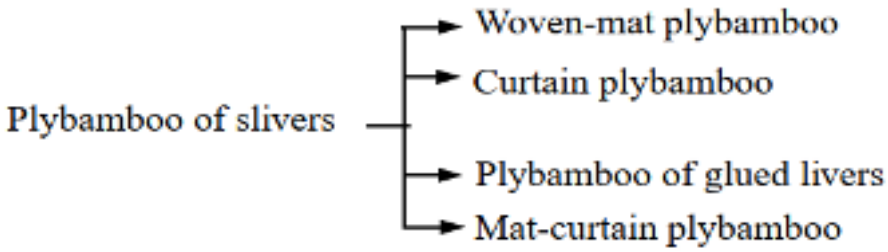
Goods produced from bamboo are the result of different processes. Making of slats, Slivers, Wickers, Skewers are the outcome of semi-processed materials and the size of materials should be confirmed to job specifications

a) Slats size and making procedures

- Select bamboo/raw bamboo
- Adjust the machine
- Cut the culm to the required/given length
- Split the cut culm
- Knot removing, width setting, thickness setting by four sider planning

b) Slivers

Plybamboo of slivers is a kind of bamboo-based panels, which contains the most diversified and most popular products of bamboo industry. All this kind of products is made of thin chips. They can be divided into following forms



✓ The operation to **Making slivers** consists of the following steps

- Cross cutting
- Remove joints and split sections.
- Making slivers

c) Skewers

Bamboo skewers are great for grilling, though sometimes they're a bit of a pain, what with bamboo being combustible and all. If you've ever thrown some kebabs or satay on the grill, there's a good chance you've lost part of a bamboo skewer to the flames.

d) Making skewers

- Sawed bamboo tree into 1.5 ~ 2.0 m long on the machine. Usually, select the middle body of the bamboo tree. And remove the head and root. Because that's bamboo joint is too serried. It's not good to produce skewers.
- Split the bamboo into a bamboo chip on the dissection machine.
- Fixed thickness and width of the bamboo sticks on the slicer machine.
- Processing bamboo filament on the shaping machine
- Stewing and sterilized bamboo filament. And the bamboo filament will release sugar during stewing. The stewing water will be a yellow color. Then these skewers will have a longer shelf life.
- Drying these bamboo filaments.
- Set bamboo filament size on the set-size machine. 200 mm skewers usually set 201~202 mm. Because sharp points will have a loss.
- Drying and polishing these skewers
- Sharpen point on these skewers
- Pick up crooked, broken and other faulty skewers. These skewers are waste.
- Packing the skewers in plastic bag. Laser counting device will help us to confirm the quantity. And the error was strictly controlled under 1%.

e) Some additional semi-processed bamboo items

Table 1 semi processed items

Item	Dimensions	Image
Chip	10 to 30 mm wide, 1 to 3 mm thick, 30 to 50 mm long	

Culm	10 to 250 mm wide, 5 to 30 mm thick, variable length	
Half-Split Culm	10 to 250 mm wide, 5 to 30 mm thick, variable length	
Curtain	Variable width, 3 to 5 mm thick, variable length	
Fiber	15 to 20 µm wide and thick, 1.5 mm long	
Fiber Bundles	10 to 20 mm wide, 1 to 10 mm thick, variable length	
Flattened Bamboo	30 mm wide, <15 mm thick, 2.5 m long	
Particle	1 to 5 mm wide and thick, 1 to 20 mm long	

Sliver	5 to 30 mm wide, 0.5 to 3.5 mm thick, variable length	
Split	15 to 30 mm wide, 10 to 30 mm thick, 2 to 4 m long	
Strand	10 to 50 mm wide, 0.5 to 1 mm thick, 100 to 180 mm long	
Strip	10 to 30 mm wide, 3 to 10 mm thick, 0.5 to 3 m long	
Veneer	Variable width, 0.6 to 1 mm thick, variable Length	
Woven Mat	Variable width, 3 to 10 mm thick, variable length	

Self-Check – 2	**Written test**

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions (5 points)

1. Explain the difference between slats and slivers?
2. Mention and describe the steps to make slivers?
3. List down at least five skewers making procedures?

Note: **Satisfactory rating - 15 points** **Unsatisfactory - below 5 points**

Information Sheet 3-Trimming and splitting bamboo culms

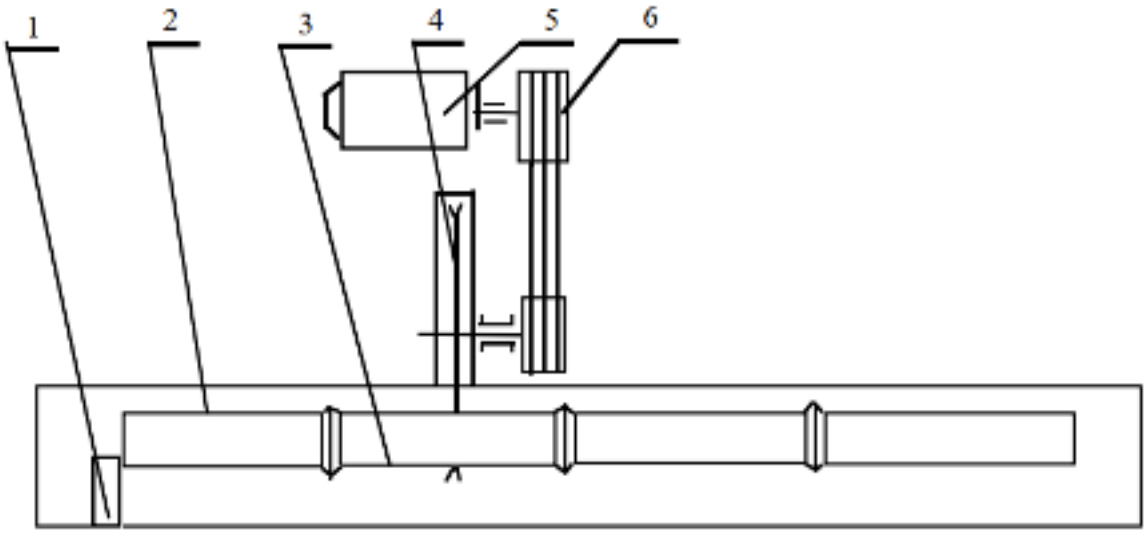
3.1 Introduction

Preparing bamboo culm to the required job specification is necessary. To prepare the cut culm for specific purpose trimming and splitting activities are performed sequentially with their procedures.

- Cutting

The raw material for plybamboo production is transported to mills in the form of raw

bamboo. It is crosscut according to the size of products. The equipment for cutting is shown in fig. -----. The purpose of crosscutting operation is to divide the raw bamboo into sections of certain length in accordance with the size of final products, to utilize the raw material rationally and economically, taking into consideration its crookedness and obliqueness.



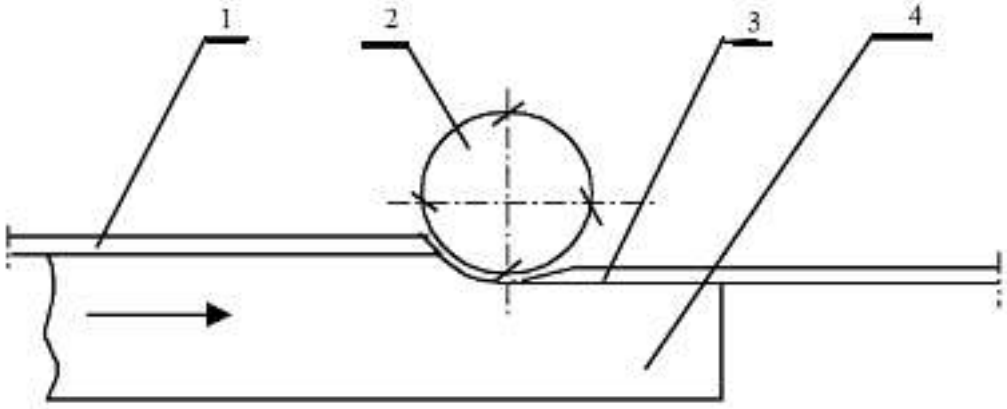
1. Retaining block. 2. Working table. 3. Raw bamboo. 4. Saw. 5. Electro-motor. 6. Belt pulley.

Figure 1 culm cutting

- Trimming

Because of the cracks happened during splitting operation and the uneven shrinkage in the drying process of veneers, two sides of cross-cut are uneven. In order to make the joints on plybamboo surface tight these sides are to be trimmed. Trimming operation is

carried out on a trimming machine (Fig. ===) . But if the sides are crooked, they must be treated several times.

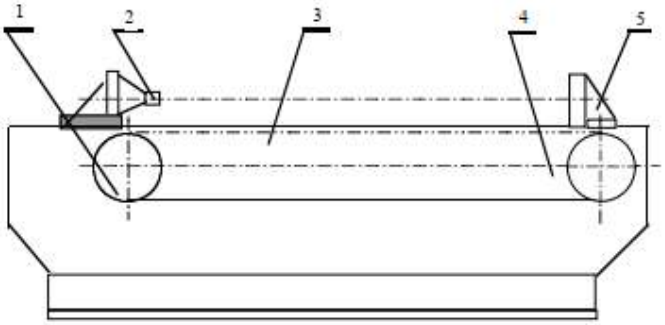


1. Front guiding ruler. 2. Trimming cutter. 3. Back guiding ruler. 4.Bamboo veneer.

Figure 2 culm trimming

- Splitting

In order to produce bamboo veneer the bamboo sections must be split into two or three fragments. Bamboo sections are split with a splitting machine. (Fig.3). The vascular bundles of culm wall are collocated in parallel order and the linkage between them is loose. The splitting operation is easy and labor saving.



1. Chain wheel. 2. Splitting knife. 3. Chain. 4. Driving chain wheel. 5. Driving block.

Figure 3 splitting culm

Self-Check – 3	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions (10)

1. **Why you split culm?**
2. **How to strip culm?**

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**

You can ask you teacher for the copy of the correct answers.

Information Sheet 4- Carping split bamboo

4.1 **Introduction**

After precise shaving, the strips must be checked and sorted one by one. First of all is to select the strips for surface layer. During the selection of strips for surface layer, the following point should be taken into consideration:

- **Good-looking colour and tidy fiber;**
- **Without insect holes, mould traces, black spots and lines.**
- **Precise dimensions, without cracks, chips, residual green and yellow matter. The selected strips for surface layer are to be piled separately, the rest are to be used for core and bottom layers.**

Self-Check – 4	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions (10)

3. **What are the points considered to chuck the split strips?**

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**

You can ask you teacher for the copy of the correct answers.

Operation Sheet 1– trim and split bamboo culm

2.1 Tools and equipment's

I. Cutting machine
II. Trimming machine
III. Splitting machine

2.2 Procedures/steps/techniques

I. Cut the bamboo culm according to the size given by using bamboo cutting machine
II. Trim both side of the cut culm by using trimming machine to prevent cracks during splitting
III. Split the trimmed bamboo culm by using splitting machine to produce bamboo veneer

LAP TEST 1	trim and split bamboo culm

Name……. ID……..

Date…….

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within **1** hour. The project is expected from each student to do it.

Task-1 trim and split bamboo culm?

LG #7	LO #3- produce stick

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics:

- Selecting and cutting materials.
- Conforming size and shape of sticks.

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, **upon completion of this learning guide, you will be able to**:

- Selecting and cutting materials.
- Conforming size and shape of sticks.

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6. If you earned a satisfactory evaluation proceed to “Operation sheets
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8. If your performance is satisfactory proceed to the next learning guide,

Information Sheet 1- Selecting and cutting materials

1.1 Introduction

Bamboo stick production is the way of making raw bamboo and reusable wastages to different type and size of sticks which are used for different services like Fine Chopsticks / Disposal Chopsticks, Skewers / Sticks, Sharp Toothpicks, VIP Toothpicks etc.

- Selecting materials

  Bamboo sticks must be made of bamboo material which fulfilling the following criteria's

  - ✓ Bamboo culms without knots,
  - ✓ Bamboo culms not diseased or damaged,
  - ✓ Bamboo culm proper length and
  - ✓ Thickness of culm wall about 10 mm.

- **Cutting materials**

  Bamboo can be cut precisely using a cutting machine according to these requirements

- **The main phases of the production process for bamboo sticks are as follows:**
  - ✓ Bamboo Sawing/cutting the culm in to fixed length
  - ✓ Bamboo Splitting.

    Bamboo sections are to be split into two semicircular fragments. It is suggested to split the section from the end where the culm wall is thinner, thus the split operation will be easier. While the length between knots is larger than the required length, it is better to take the upper part to avoid the groove-like defects
  - ✓ Slate planer/Side cutting

    Bamboo fragments are to be cut, on a special side-cutting machine, into pieces with green and yellow matter removed.
  - ✓ Filament Size Set Machine (All kinds of sticks)

    In this process lathe the bamboo slats in to round long sticks with fixed diameter of the same diameter of finished diameter and a flat slat will be lathed in to 3 to 4 round sticks depending on width of bamboo slats and diameter of sticks.
  - ✓ Polishing Machine.

    In this step the hairs of round bamboo stick will be removed and makes the stick smooth.
  - ✓ Length Size Cutting.

    Cutting of round sticks in to required length of finished products, mostly chopsticks, barbecue sticks, mat sticks
  - ✓ Round Chopstick/Stick Head Sharpener.

    The stick head sharpener will saw heads of round fixed length sticks to produce chopstick and barbecue sticks
  - ✓ Stick Length Cut Multi-Knifes Machine (6.5 cm)

    Cutting of long sticks in to fixed length toothpicks/sticks with multi knifes
  - ✓ Round Stick Polishing

Especially designed to polish tooth picks

- ✓ One/Two Head Stick Sharpener

  To lath one or two head of toothpicks
- ✓ Toothpick/Stick Classification

  To make heads of toothpick smoother
- ✓ Toothpick/Stick Classification or arrangement

  To arranging toothpicks and facilitate packing
- ✓ Packing

  Packing of out puts with categories

Table1. The main stages in typical production process of bamboo sticks

<table>
<tr><td colspan="2">1. Bamboo Sawing</td></tr>
<tr><td colspan="2">2. Bamboo Splitting</td></tr>
<tr><td colspan="2">3. Slats Planning (2 to 5 slats)</td></tr>
<tr><td colspan="2">4. Round Stick Filament Size Setting (All kinds of sticks)</td></tr>
<tr><td colspan="2">5. Polishing</td></tr>
<tr><td colspan="2">6. Length Size Cutting</td></tr>
<tr><td rowspan="4">7. Round Chopstick / Stick Head Sharpening</td><td>8. Stick Length Cut Multi-Knifes Machine (6.5 cm)</td></tr>
<tr><td>9. Round Stick Polishing</td></tr>
<tr><td>10. One/Two Head Stick Sharpener</td></tr>
<tr><td>11. One/Two Head Stick Polishing</td></tr>
<tr><td colspan="2">12. Toothpick/Stick Classification and Arrangement</td></tr>
<tr><td colspan="2">13. Packing</td></tr>
<tr><td>Output:
Chopsticks / Skewers / Incense Sticks / Mat Sticks</td><td>Output:
Sharp Toothpick / Thin Sticks / Toothpick VIP</td></tr>
</table>

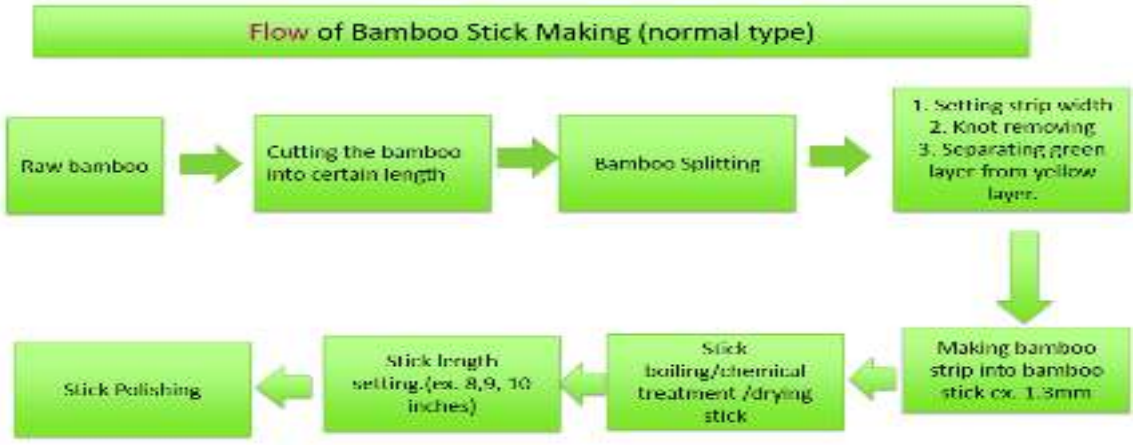


Figure 1 production flow of bamboo stick

Self-Check – 1	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Choose the best answer

1. **What are the criteria's considered to select bamboo materials?**
2. **Mention steps to produce bamboo stick?**

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

You can ask you teacher for the copy of the correct answers.

Information Sheet 2- Conforming size and shape of sticks.

2.1 Introduction

To use bamboo sticks after producing we should confirm the shape and size of sticks based on the standards or job specification given to produce the sticks.

To confirm this we have to chuck

- **The length of sticks**

Figure 1 length of stick

- **Shape of stick**

Figure 2. Shape of stick

- **Thickness of the stick**

Figure 3 thickness of stick

- **Strength of the stick**

Figure 4. Strength of stick

Self-Check – 2	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Choose the best answer

1. **What criteria's you follow to confirm bamboo stick ?**

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

You can ask you teacher for the copy of the correct answers.

Bamboo Sticks From China (Orice).mp4

Operation Sheet 1– produce tooth stick

2.1 Tools and equipment's

I. Cutting machine
II. Trimming machine
III. Splitting machine

2.2 Procedures/steps/techniques

- Cut bamboo into certain size The original bamboo (1)
- Splitting bamboo (2)
- Cut bamboo into bamboo sticks (3)
- Drying cut bamboo (4)
- Cut into bamboo sticks with certain length (5)
- Polishing the stick (6)
- Tidying (7)
- Sharpening (8)
- Packing (9)
- Storage (factory)

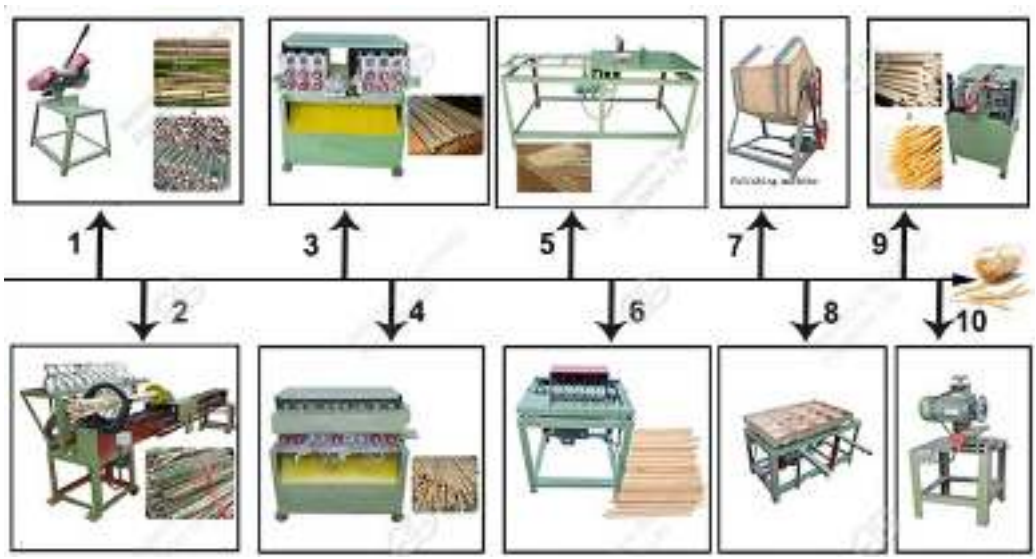


Figure 1 production process of tooth stick

Operation Sheet 2– produce chop stick

2.1 Tools and equipment's

I. Cutting machine
II. splitting machine
III. four side slicer machine
IV. sharping machine
V. smoothing machine
VI. packing machine

2.2 Procedures/steps/techniques

I. Cut bamboo into certain size The original bamboo (1)
II. Splitting bamboo (2)
III. Cut bamboo into bamboo sticks (3)
IV. Drying cut bamboo (4)
V. Polishing the stick (5)
VI. Sharpening the stick (6)
VII. Control quality (7)
VIII. Packing (8)
IX. Storage (factory)

Figure 2 production process of chop stick

LAP TEST 1	Produce tooth stick

Name……. ID……..

Date…….

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within **2** hour. The project is expected from each student to do it.

Task-1 produce tooth stick?

Task-2 produce chopstick?

LG #8	LO#4- Carbonize bamboo materials

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Visual assessment of bamboo materials
- Operate Carbonize machine
- Loading Carbonize and reporting
- Adjusting ccarbonize control settings and checking to site schedules
- Checking bamboo materials Carbonization.
- Directing and moving bamboo materials to storage or processing.
- Rejecting and disposing sub-standard material.

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Visual assessment of bamboo materials
- Operate Carbonize machine
- Load Carbonize and reporting
- Adjust ccarbonize control settings and checking to site schedules
- Check bamboo materials Carbonization.
- Direct and move bamboo materials to storage or processing.
- Reject and dispose sub-standard material.

Learning Instructions:

7. Read the specific objectives of this Learning Guide.
8. Follow the instructions described below.
9. Read the information written in the information Sheets
10. Accomplish the Self-checks
11. Perform Operation Sheets
12. Do the “LAP test”

Information Sheet 1- Visuall assessment of bamboo materials

1.1 Introduction

1.1 Before carbonization process we have to assess drying characteristics and adjusted to meet site requirements of bamboo materials. knowing the physical properties such as moisture content, density, and shrinkage is important to overcome defects due to cracks when bamboo is used. Bamboo processing must be performed when the bamboo has low moisture content and high density, so that it does not undergo any dimensional change due to high shrinkage. Bamboo is a hygroscopic material, that is, it has an affinity for water and is able to absorb and remove water depending on the temperature and humidity

Figure 1 bamboo material/culm

Self-check 1	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Choose the best answer (5 point)

1. What are the physical properties of bamboo to be considered when assessing visually?
2. When bamboo processing can perform?

You can ask you teacher for the copy of the correct answers.

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**

Information Sheet 2- Operate Carbonize machine

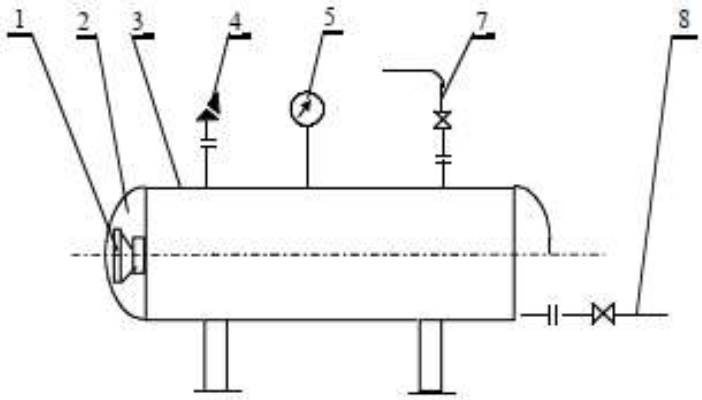
2.1 Introduction

Bamboo carbonizing machine is a type of machine which can change the color of bamboo product in to brown by decompose the organic matter, such as carbohydrate, starch and protein, cut off insect and fungi's nourishment and kill the ova and fungi. Under the conditions of high temperature, high humidity and high pressure

2.2 Work procedures

The carbonizing operation is to load roughly shaved strips into special carbonizer and fill it with steam to keep proper pressure (see Fig. 2). First of all, put bamboo strips into a metal basket, move it along a rail into to the furnace

.



1.Hand wheel. 2. Draft of furnace. 3. Furnace body.
4. Pressure meter. 5. Steam filling pipe. 6. Steam releasing pipe

Figure 2- carbonize machine

Self-check 2	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Choose the best answer (5 point)

1. Which one of the following is the part of carbonize machine?

   B. Handle B. draft of furnace C. pressure meter D. all

Teas II**: Short answer**

1. Mention and describe work procedure of carbonization process?

You can ask you teacher for the copy of the correct answers.

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**

Information Sheet 3- Loading Carbonize and reporting

3.1 loading carbonize is the process of loading bamboo materials or slats in to carbonize machine to perform carbonization process by using loading procedures, tools and equipment's and resources with limited time.

3.2 Report the loading activity

Reporting loading activities to appropriate person using reporting formats which includes the quality of loading procedures, proper utilization of resources, time taken to accomplish loading activity, the amount and size of slats loaded, machine operation techniques, and weight of slats

Figure 3- loading slats to carbonize

Self-check 3	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. How to perform loading bamboo materials to the carbonize?

You can ask you teacher for the copy of the correct answers.

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**

Information Sheet 4- Adjusting carbonize control settings and checking to site schedules

4.1 Adjusting carbonize

To perform carbonization process after loading of slats to the carbonize adjustment of carbonize control setting is mandatory and should be performed to the optimum condition of machine setup.

The chemical composition of bamboo is basically the same as that of wood, mainly cellulose, hemicellulose, lignin and extraction substances. However, bamboo contains more protein, sugar, starch, fat and wax than wood, and is susceptible to erosion by insects and fungi under the condition of appropriate temperature and humidity.

Therefore, bamboo strips should be subjected to cooking treatment (natural color) or high temperature and high humidity carbonization treatment (brown) after rough planning to remove some extractives such as sugar and starch, and insect repellent and preservative should be added during treatment to prevent the growth of insects and fungi.

Adjusted temperature which is proper to the type of slats loaded to treatment. and chucking of carbonization process when the adjusted time is up.

Figure 4- adjust carbonize machine

Self-check 4	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. Why you carbonize bamboo materials?
2. What is the color of carbonized bamboo?

You can ask you teacher for the copy of the correct answers.

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**

Information Sheet 5- Checking bamboo materials Carbonization.

5.1 After carbonization process proceeds according to the adjusted temperature you have to open the carbonize and unload the carbonized slats then chuck the materials are carbonized under work order specifications. To chuck this color of slats, moisture content of slats, should be considered.

The moisture content of the steamed bamboo chips exceeds 80%, reaching a saturated state. The moisture content of bamboo directly affects the size and shape stability of finished bamboo products. In order to ensure the quality of bamboo floor products, the bamboo raw materials used for processing need to be fully dried before gluing.

The moisture content of bamboo should be controlled according to the local climate and use environment. Under normal circumstances should be controlled at 5-9%.

Figure 5 chucking carbonized materials

Self-check 5	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions? (5 points)

1. How to chuck carbonize bamboo materials?
2. What are the conditions considered to confirm the carbonized materials?

You can ask you teacher for the copy of the correct answers.

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**

Information Sheet 6- Directing and moving bamboo materials to storage or processing.

6.1 Storage and processing of bamboo materials

Carbonized bamboo materials or semi-processed slats must be moved to the storage or other processing steps (operations) under site requirements.

To store carbonized materials storage area should be prepared before storage according to the standards to protect the bamboo from damage, shape disorder due to moisture and irregular storage, transportation error, and suitable for production line.

In other way carbonized materials can flow to other processing operations due to this the bamboo materials dry well and sorting of bamboo string in to different grades before processing.

Figure 6 Storing carbonized slats slats

figure 7 processing carbonized

Bamboo farm and processing.mp4

Self-check 6	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions? (5 points)

1. How to remove carbonize bamboo materials to the store?
2. How to proceed carbonized materials to next processing?

You can ask you teacher for the copy of the correct answers.

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**

Operation Sheet 1– load bamboo materials to carbonize

2.1 Tools and equipment's

I. Rope to tight the slats together
II. Loading equipment to carry slats
III. Carbonize machine

2.2 Procedures/steps/techniques

I. Prepare the slats which is suitable to carbonize
II. Tight slats together by rope
III. Put tighten slats to the loader
IV. Open the carbonize
V. Load slats to the carbonize
VI. Close the carbonize

LG #9	LO #5- clean up

Instruction sheet
This learning guide is developed to provide you the necessary information regarding the following content coverage and topics: • Collecting and storing reusable materials. • Removing waste and scrap. • Accomplishing necessary documentation. This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to: • Collect and store reusable materials. • Remove waste and scrap. • Accomplish necessary documentation.
Learning Instructions:
1. Read the specific objectives of this Learning Guide. 2. Follow the instructions described below. 3. Read the information written in the information Sheets 4. Accomplish the Self-checks 5. Perform Operation Sheets 6. Do the “LAP test”

Information Sheet 1- collecting and storing reusable materials

1.1 Introduction

Recycling

Our rework operations also allow us to process devices that are usually considered waste, allowing an increased return for clients and partners based on providing a value for units that are currently treated as scrap

These units fall under the following conditions:

- Unit is non-saleable
- Handset is Missing Main Parts (Board, LCD)
- Handset in Pieces
- Handset / Main Board is Bent
- Handset has not been Data Cleansed

The best form of recycling is re-use, and our processes not only involve maximizing salvage units for resale, but also processing parts, accessories and boxes, enabling us to reduce the amount of recycled materials and stress on the environmental and landfill locations.

By re-using as many materials as possible, we are able to further maximise revenues and salvage values for our clients. Handsets that qualify for recycling are done so under the strict guidelines of our environmental certifications and inline with our environmental policy. Our commitment to these guidelines and policies is at the core of our business practices, matching economic care with a duty of care to our environment and future generations.

Self-check 1	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions? (5 points)

1. List down bamboo waste happens?
2. How to recycle bamboo waste?

You can ask you teacher for the copy of the correct answers.

Information Sheet 2- Removing waste and scrap

2.1 Bamboo Waste Disposal

There are four different types of bamboo wastes, namely problem bamboo waste, used bamboo, scrap bamboo, and natural bamboo waste. Examples of problem bamboo waste are unwanted laminated board, bamboo waste with preservative agents, and a blend of problem bamboo waste with regular bamboo. Used bamboo waste comprises bamboo furniture, and bamboo waste from materials like color pallets. The third type is scrap bamboo waste, which is produced in workshops by carpenters and furniture. Natural bamboo waste constitutes of leftover sawdust and remaining bamboo pieces from logging activities.

Bamboo products are great to have because when their product life is over in your home, they can be disposed of easily. We'll go over how to safely dispose of bamboo products without harming the environment. With a few simple steps, you can make sure you're putting your bamboo product in the right place when disposing of it.

Most Bamboo Can Be Composted

If you compost your waste through your local municipal system, bamboo can simply be put in the compost bin. If you have a compost at home, bamboo is a great addition to your compost. It has high silica content, and when it breaks down, it'll release that silica in the soil. Silica can help plants be more resistant to drought and increase yields and overall crop quality.

Figure 1 bamboo waste

Self-check 2	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions? (5 points)

1. How to dispose waste bamboo materials?

You can ask you teacher for the copy of the correct answers.

Information Sheet 3- Accomplishing necessary documentation

To keep work station suitable for work it must be clean. Due to these irregularities of bamboo material during production process like scraps are collected and stored for further processing operations or for waste.

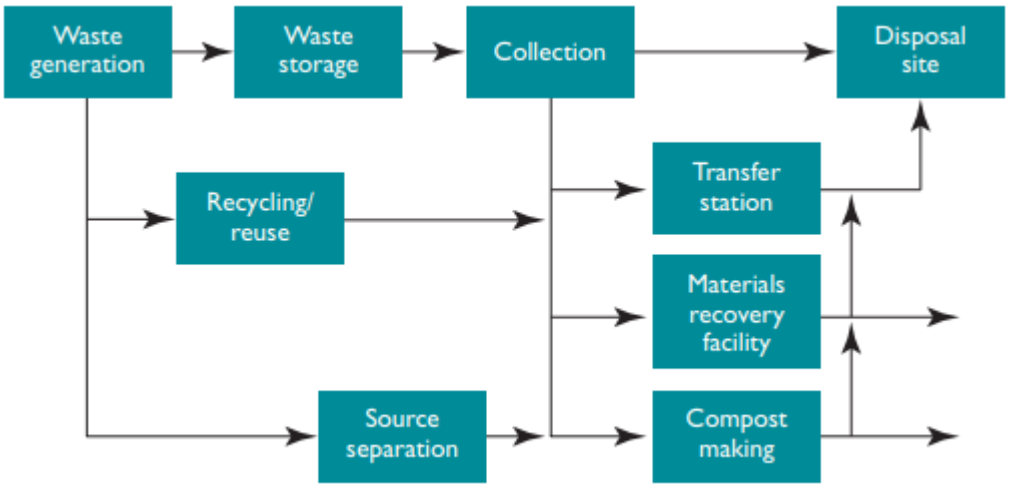


Figure 2 west management

Self-check 3	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions? (5 points)

1. Apply waste management procedures?

You can ask you teacher for the copy of the correct answers.

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AKNOWLEDGEMENT

We wish to extend thanks and appreciation to the many representatives of TVET instructors and respective industry experts who donated their time and expertise to the development of this Teaching, Training and Learning Materials (TTLM).

We would like also to express our appreciation to the TVET instructors and respective industry experts of Regional TVET barruues, TVET college/ Institutes, Oromia Water Works Construction Enterprises, Adama Town Water Supply and Sewerage Services Enterprise, Bushoftu Town Water Supply and Sewerage Services Enterprise, Nile Water Exploration and Drilling P.L.C., ADRA Ethiopia, Ethiopian Water Technology Institute and Federal Technical and Vocational Education and Training Agency (FTVET) who made the development of this Teaching, Training and Learning Materials (TTLM) with required standards and quality possible.

This Teaching, Training and Learning Materials (TTLM) was developed on April 2017 at Adama, Dire International Hotel.