



Bong tree plantation area (Jimmy Luangphithuck)

## Plantation of Yangbong (*Persea kurzii*) Trees on Slopes (Lao People's Democratic Republic)

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### DESCRIPTION

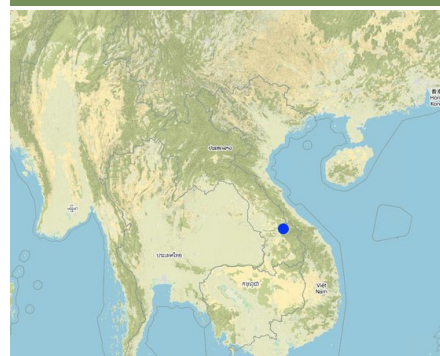
**Bong tree (*Persea kurzii*) plantation in slope area to increase forest canopy and to utilize the plantation areas for animal grazing such as cows and poultry.**

Bong tree (*Persea kurzii*), is a native tree species found in different regions in Lao PDR. In the past, farmers collected Bong barks from natural forest, as it contains gum and aromatic oils for the internationally very requested production of joss sticks. But the availability of wild Bong trees has been declining significantly. In order to keep this important source of income for farmers, Bong tree cultivation can be seen as valuable alternative to maintain the local livelihood whilst ensuring the preservation of the natural forests. The idea of commercial Bong tree plantation came from a Vietnamese trader (in 2000) who introduced Bong tree through a trial plantation. In 2006 land users who were experienced in the highly costly and labor-intensive coffee and pepper cultivation shifted to Bong tree cultivation. And in 2010, land users who gained lessons on seedling production and Bong tree cultivation from Vietnam established first trial cultivations on their farms. Later an IFAD Project in collaboration with the Samouey District Agriculture and Forestry Office promoted Bong tree plantation by providing organic fertilizer and advisory support to model households of the Samouey District. Due to the easy handling and the potential benefits a number of farmers have been interested to participate. Bong trees are perennial and fast growing plants (first harvest of bark or log 6-7 years after planting) preferring humid climate and can be easily planted also on sloping terrain. Currently, Bong tree covers approximately 38 ha of land with an average increase of 1-2 ha/year. This land belongs to Mr. Sailava at Samouey district. The detailed method of Bong tree plantation is following:

- 1) Land preparation: first, it requires land clearance by removing weeds and bushes, along with hole digging in advance of rainy season (July to September);
- 2) Spacing: the appropriate spacing between the tree plants should measure about 2.5 x 2.5 meters. Staking is required throughout the plantation area before the holes can be dug. The planting holes are 25 cm x 25cm. The excavated topsoil should be stockpiled around the holes for refilling them later;
- 3) Planting and applying fertilizers: Bong seedlings need organic fertilizer (0.5kg/tree) that is mixed with soil and then filled in the holes. Finally the seedlings are gently placed in the holes by filling up with further topsoil. If the seedlings are tall, staking is required.
- 4) Maintenance: 2-3 months after planting – only in case it is needed – additional fertilizer will be added and/or weeding is carried out. The plant residues from weeding are used to cover the ground around the seedlings to keep soil moisture, and once decomposed, to provide natural organic matters to the soil. In conditions of dry climate and hard soil, watering is required to prevent soil cracking which is a cause of breaking tree's roots and subsequently trees will die.

The advantages of planting Bong trees include direct income generation for households as well as increased forest canopy. It minimize the carbon emissions of slash-and-burn land use. The falling Bong tree leaves provide organic matters to soils, help retaining soil moisture and subsequently increase soil fertility. Under-story vegetation includes lianas and grasses that provide fodder for livestock. Three years after plantation, the land users

### LOCATION



**Location:** Lavatai village, Samou y district, Salavan province, Lao People's Democratic Republic

**No. of Technology sites analysed:** 2-10 sites

**Geo-reference of selected sites**

- 106.5228, 16.1753

**Spread of the Technology:** evenly spread over an area (approx. 0.1-1 km<sup>2</sup>)

**In a permanently protected area?:**

**Date of implementation:** 2010; less than 10 years ago (recently)

**Type of introduction**

- ☐ through land users' innovation
- ☐ as part of a traditional system (> 50 years)
- ☐ during experiments/ research
- ☒ through projects/ external interventions



can utilize the area for animal grazing such as cows and poultry. In fact, poultry can find earthworms around Bong trees which provide rich nutrition for animals. However, some disadvantages of planting Bong trees have to be mentioned as well: Some plantations may become shrubs where weeding is not conducted regularly. Poor maintenance provokes invasion of snakes, bees, and mosquitos.



The land user shows how to prepare the hole before planting the Bong tree seedling. (Pasalath Khounsy)



Bong tree plantation area (5 years old) (jimmy Luangphithuck)

## CLASSIFICATION OF THE TECHNOLOGY

### Main purpose

- ☐ improve production
- ☒ reduce, prevent, restore land degradation
- ☐ conserve ecosystem
- ☐ protect a watershed/ downstream areas – in combination with other Technologies
- ☐ preserve/ improve biodiversity
- ☐ reduce risk of disasters
- ☐ adapt to climate change/ extremes and its impacts
- ☐ mitigate climate change and its impacts
- ☒ create beneficial economic impact
- ☐ create beneficial social impact

### Purpose related to land degradation

- ☒ prevent land degradation
- ☒ reduce land degradation
- ☐ restore/ rehabilitate severely degraded land
- ☐ adapt to land degradation
- ☐ not applicable

### SLM group

- agroforestry
- pastoralism and grazing land management
- integrated soil fertility management

### Land use



#### Forest/ woodlands

- (Semi-)natural forests/ woodlands. Management: Shifting cultivation
  - Tree plantation, afforestation. Varieties: Monoculture local variety
- Products and services: Grazing/ browsing, construction material (house, fence and furniture)

### Water supply

- ☒ rainfed
- ☐ mixed rainfed-irrigated
- ☐ full irrigation

### Degradation addressed



**soil erosion by water** - Wg: gully erosion/ gully



**biological degradation** - Bc: reduction of vegetation cover, Bq: quantity/ biomass decline, Bf: detrimental effects of fires

### SLM measures



**management measures** - M1: Change of land use type

## TECHNICAL DRAWING

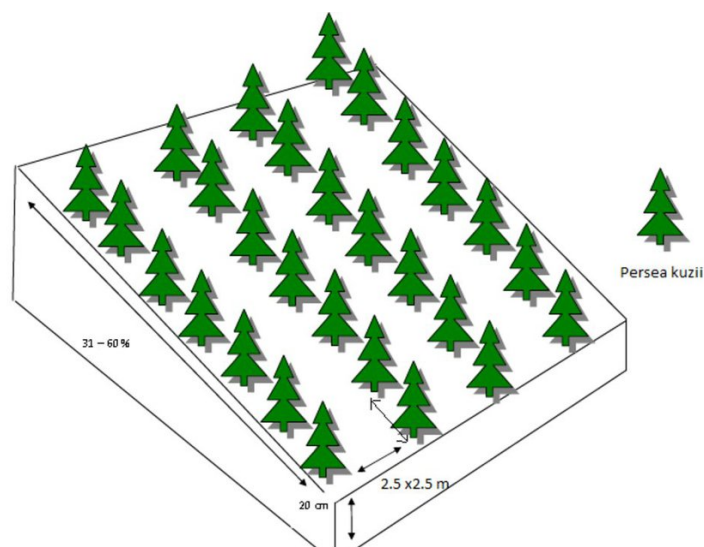
### Technical specifications

The holes for Bong tree seedlings are 20 cm in depth, 25 cm in width and 25 cm in length

The space between plants is 2.5 x 2.5 m

Slope angle in that area is between 16 - 30 %

Density of plants is about 1600 plants/ha



Author: Jimmy Luangphithuck

## ESTABLISHMENT AND MAINTENANCE: ACTIVITIES, INPUTS AND COSTS

### Calculation of inputs and costs

- Costs are calculated: per Technology area (size and area unit: 1 ha)
- Currency used for cost calculation: kip
- Exchange rate (to USD): 1 USD = 8000.0 kip
- Average wage cost of hired labour per day: 30,000

### Most important factors affecting the costs

Labour is an important factor especially for larger plantation areas that require more labour for maintenance

### Establishment activities

- Bong tree nursery (Timing/ frequency: November-February)
- Land preparation (Timing/ frequency: January-February)
- Dig the hole (Timing/ frequency: July-August)
- Use bio fertilizer (Timing/ frequency: August-September)
- Planting (Timing/ frequency: August-September)
- Weeding in first 3 years (Timing/ frequency: August-September and January-February)
- Weeding after year 4-6 (Timing/ frequency: August-September)

### Establishment inputs and costs (per 1 ha)

Specify input	Unit	Quantity	Costs per Unit (kip)	Total costs per input (kip)	% of costs borne by land users
<b>Labour</b>					
labor for hole digging	hole	1600.0	500.0	800000.0	100.0
labor for planting	hole	1600.0	1000.0	1600000.0	100.0
labor for cleaning	person-day	60.0	30000.0	1800000.0	100.0
<b>Equipment</b>					
knife	piece	20.0	20000.0	400000.0	100.0
hoe	piece	20.0	35000.0	700000.0	100.0
shovel	piece	20.0	35000.0	700000.0	100.0
<b>Plant material</b>					
Bong tree seedlings	tree	1600.0	1000.0	1600000.0	100.0
<b>Total costs for establishment of the Technology</b>				<b>7'600'000.0</b>	
<i>Total costs for establishment of the Technology in USD</i>				<i>950.0</i>	

### Maintenance activities

- maintenance (weeding) (Timing/ frequency: January and August each year)
- timber harvesting (Timing/ frequency: None)
- bark collection (Timing/ frequency: None)

### Maintenance inputs and costs (per 1 ha)

Specify input	Unit	Quantity	Costs per Unit (kip)	Total costs per input (kip)	% of costs borne by land users
<b>Labour</b>					
labor for weeding	person	60.0	30000.0	1800000.0	100.0
labor for timber harvesting	person				100.0
labor for bark collection	person				100.0
<b>Fertilizers and biocides</b>					
Bio fertilizers	bag	1000.0	15000.0	1500000.0	100.0
<b>Total costs for maintenance of the Technology</b>				<b>16'800'000.0</b>	
<i>Total costs for maintenance of the Technology in USD</i>				<i>2'100.0</i>	

## NATURAL ENVIRONMENT

### Average annual rainfall

- ☐ < 250 mm
- ☐ 251-500 mm
- ☐ 501-750 mm
- ☐ 751-1,000 mm
- ☐ 1,001-1,500 mm
- ☐ 1,501-2,000 mm
- ☒ 2,001-3,000 mm
- ☐ 3,001-4,000 mm
- ☐ > 4,000 mm

### Agro-climatic zone

- ☒ humid
- ☐ sub-humid
- ☐ semi-arid
- ☐ arid

### Specifications on climate

There is significant rainfall in most months of the year. The short dry season has little effect on the overall climate.

Name of the meteorological station: <https://en.climate-data.org/location/1063801/>

### Slope

- ☐ flat (0-2%)
- ☐ gentle (3-5%)
- ☐ moderate (6-10%)
- ☐ rolling (11-15%)
- ☒ hilly (16-30%)
- ☒ steep (31-60%)
- ☐ very steep (>60%)

### Landforms

- ☐ plateau/plains
- ☐ ridges
- ☒ mountain slopes
- ☒ hill slopes
- ☐ footslopes
- ☐ valley floors

### Altitude

- ☐ 0-100 m a.s.l.
- ☐ 101-500 m a.s.l.
- ☐ 501-1,000 m a.s.l.
- ☒ 1,001-1,500 m a.s.l.
- ☐ 1,501-2,000 m a.s.l.
- ☐ 2,001-2,500 m a.s.l.
- ☐ 2,501-3,000 m a.s.l.
- ☐ 3,001-4,000 m a.s.l.
- ☐ > 4,000 m a.s.l.

### Technology is applied in

- ☐ convex situations
- ☐ concave situations
- ☒ not relevant

### Soil depth

- ☐ very shallow (0-20 cm)
- ☒ shallow (21-50 cm)
- ☐ moderately deep (51-80 cm)
- ☐ deep (81-120 cm)
- ☐ very deep (> 120 cm)

### Soil texture (topsoil)

- ☐ coarse/ light (sandy)
- ☒ medium (loamy, silty)
- ☐ fine/ heavy (clay)

### Soil texture (> 20 cm below surface)

- ☐ coarse/ light (sandy)
- ☒ medium (loamy, silty)
- ☐ fine/ heavy (clay)

### Topsoil organic matter content

- ☐ high (>3%)
- ☒ medium (1-3%)
- ☐ low (<1%)

### Groundwater table

- ☐ on surface
- ☐ < 5 m
- ☒ 5-50 m
- ☐ > 50 m

### Availability of surface water

- ☐ excess
- ☒ good
- ☐ medium
- ☐ poor/ none

### Water quality (untreated)

- ☐ good drinking water
- ☐ poor drinking water (treatment required)
- ☐ for agricultural use only (irrigation)
- ☒ unusable

Water quality refers to:

### Is salinity a problem?

- ☐ Yes
- ☒ No

### Occurrence of flooding

- ☐ Yes
- ☒ No

### Species diversity

- ☐ high
- ☒ medium
- ☐ low

### Habitat diversity

- ☐ high
- ☒ medium
- ☐ low

## CHARACTERISTICS OF LAND USERS APPLYING THE TECHNOLOGY

### Market orientation

- ☐ subsistence (self-supply)
- ☒ mixed (subsistence/ commercial)
- ☐ commercial/ market

### Off-farm income

- ☐ less than 10% of all income
- ☒ 10-50% of all income
- ☐ > 50% of all income

### Relative level of wealth

- ☐ very poor
- ☐ poor
- ☒ average
- ☐ rich
- ☐ very rich

### Level of mechanization

- ☒ manual work
- ☐ animal traction
- ☒ mechanized/ motorized

### Sedentary or nomadic

- ☒ Sedentary
- ☐ Semi-nomadic
- ☐ Nomadic

### Individuals or groups

- ☒ individual/ household
- ☐ groups/ community
- ☐ cooperative
- ☐ employee (company, government)

### Gender

- ☒ women
- ☒ men

### Age

- ☐ children
- ☐ youth
- ☒ middle-aged
- ☒ elderly

### Area used per household

- ☐ < 0.5 ha
- ☐ 0.5-1 ha
- ☐ 1-2 ha
- ☐ 2-5 ha
- ☐ 5-15 ha
- ☒ 15-50 ha
- ☐ 50-100 ha
- ☐ 100-500 ha
- ☐ 500-1,000 ha
- ☐ 1,000-10,000 ha
- ☐ > 10,000 ha

### Scale

- ☐ small-scale
- ☐ medium-scale
- ☒ large-scale

### Land ownership

- ☐ state
- ☐ company
- ☐ communal/ village
- ☐ group
- ☐ individual, not titled
- ☒ individual, titled

### Land use rights

- ☐ open access (unorganized)
- ☐ communal (organized)
- ☐ leased
- ☒ individual

### Water use rights

- ☒ open access (unorganized)
- ☐ communal (organized)
- ☐ leased
- ☐ individual

### Access to services and infrastructure

health  
education  
technical assistance

poor ☒ good  
poor ☒ good  
poor ☒ good

employment (e.g. off-farm)	poor				good
markets	poor				good
energy	poor				good
roads and transport	poor				good
drinking water and sanitation	poor				good
financial services	poor				good

## IMPACTS

### Socio-economic impacts

animal production decreased increased

Before the husbandry area was very limited in the forest. After active expansion of the Bong tree area by the mean of plantation, livestock got an ideal area for grazing and thus, the land user was able to enlarge his herd.

workload increased decreased

Workload of the land user increased significantly due to the large area of bong tree plantation (38 ha).

### Socio-cultural impacts

conflict mitigation worsened improved

Because some people cut his trees and steal the wood.

### Ecological impacts

nutrient cycling/ recharge decreased increased

The grass growing naturally in the Bong tree area can be eaten by the livestock. The excrements of the animals mixed with the leaves of the Bong trees, serve as ideal manure for plants (Bong tree and grass ).

fire risk increased decreased

The land user transformed the land from shifting cultivation by traditional method of slash and burn to a stable plantation area. The method of shifting cultivation is the main cause for fires in the local forests.

### Off-site impacts

impact of greenhouse gases increased reduced

Reducing of shifting cultivation and subsequently less fires/improved forest cover and subsequently higher area for carbon sequestration

## COST-BENEFIT ANALYSIS

### Benefits compared with establishment costs

Short-term returns very negative very positive

Long-term returns very negative very positive

### Benefits compared with maintenance costs

Short-term returns very negative very positive

Long-term returns very negative very positive

## CLIMATE CHANGE

### Gradual climate change

annual rainfall increase not well at all very well

### Climate-related extremes (disasters)

landslide not well at all very well

## ADOPTION AND ADAPTATION

### Percentage of land users in the area who have adopted the Technology

single cases/ experimental  
 1-10%  
 11-50%  
 > 50%

### Of all those who have adopted the Technology, how many have done so without receiving material incentives?

0-10%  
 11-50%  
 51-90%  
 91-100%

### Has the Technology been modified recently to adapt to changing conditions?

Yes  
 No

### To which changing conditions?

## CONCLUSIONS AND LESSONS LEARNT

### Strengths: land user's view

- Acts as a counterbalance to slash and burn agriculture
- Once the trees have been planted it facilitates the raising of livestock such as cattle and poultry and therefore reduces the workload involved in such farming activities
- The plantation of bong trees further diversifies the sources of household income.

### Strengths: compiler's or other key resource person's view

- The Bong tree has an expansive root system that is effective in binding the soil on slopes, and this reduces and prevents soil erosion.
- It reduces the loss of top soil during prolonged precipitation.

### Weaknesses/ disadvantages/ risks: land user's view → how to overcome

- Due to the large area that is under the cultivation of Bong trees it makes it difficult to control and maintain the plantation.

### Weaknesses/ disadvantages/ risks: compiler's or other key resource person's view → how to overcome

## REFERENCES

### Compiler

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### Reviewer

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### Resource persons

Konterp Sailava - land user

### Full description in the WOCAT database

[https://qcat.wocat.net/en/wocat/technologies/view/technologies\\_2307/](https://qcat.wocat.net/en/wocat/technologies/view/technologies_2307/)

### Linked SLM data

n.a.

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