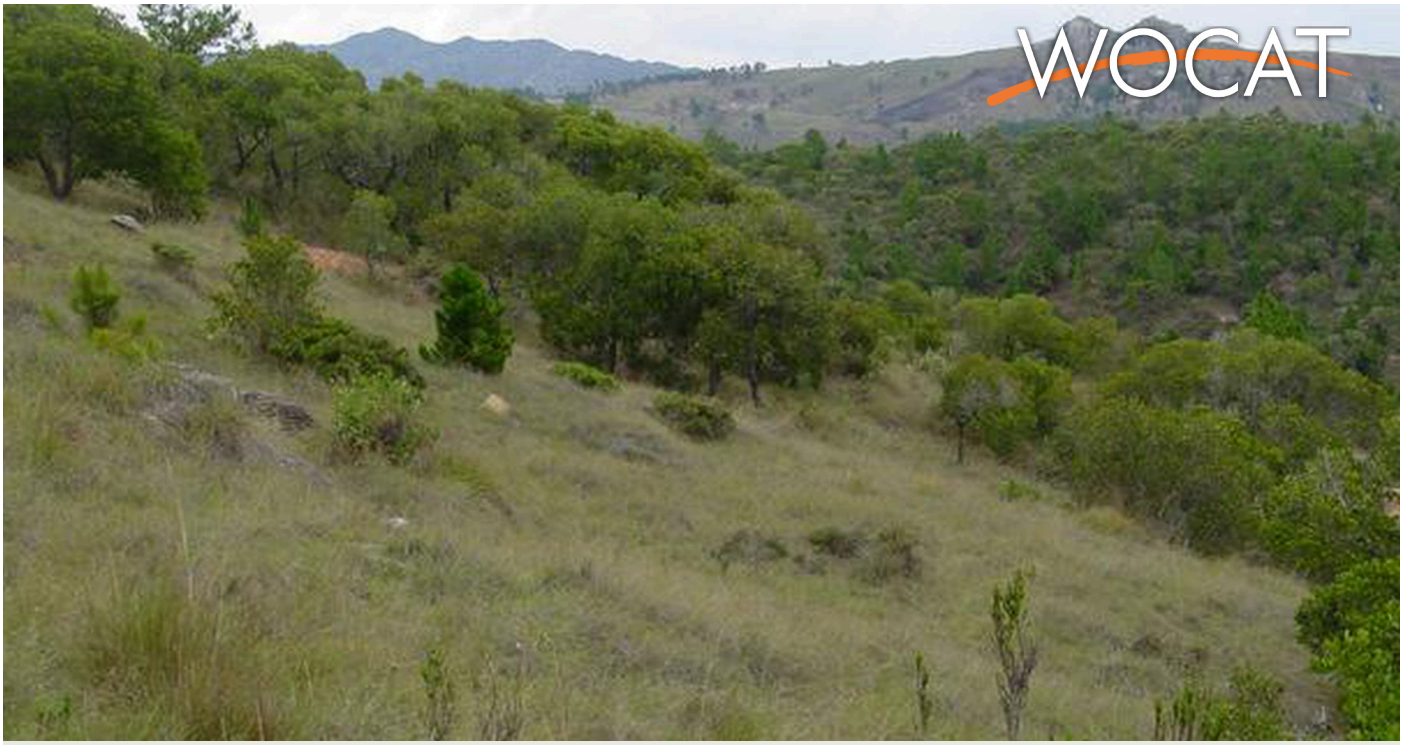


Typical tapia woodland south of Antsirana (Christian Kull)

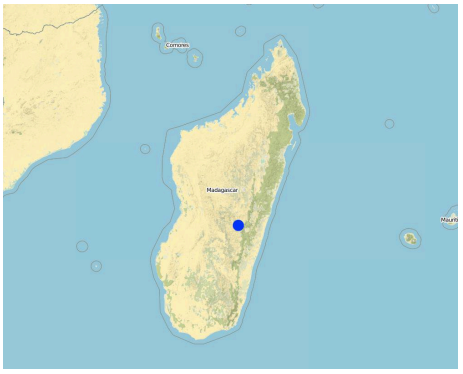
Indigenous Management of Tapia Woodlands (Madagascar)

DESCRIPTION

For centuries, the population of the highlands of central and south-western Madagascar has sustainably managed and conserved the local tapia woodlands.

These woodlands play an important economic role as a source of non-timber forest products (NTFP) such as wild silk, fruit, mushrooms, edible insects, and herbal medicines. Tapia trees (Uapaca bojeri) comprise up to 90% of all trees in these woodlands, bear an edible fruit, and their leaves nourish an endemic silkworm (landibe). Landibe silk is used to produce ritual burial shrouds throughout the highlands. Trading silk products and tapia fruits is a crucial source of cash income for the local communities. The tapia woodlands are maintained by the local villagers through burning and selective cutting. Burning favours the dominance of pyrophytic (fire-tolerant) tapia trees and protects silkworms from parasites. Selective cutting of non-tapia species and pruning of dead branches also favours tapia dominance and perhaps growth. Other common species include the endemic Sarcolaena eriophora and the invasive Pinus patula/khasya. The Tapia woodland is clearly an anthropogenically shaped forest. However, the creation and maintenance of the woodlands should be seen as positive transformation rather than a form of degradation.
Local and state-imposed regulations protect the woodlands from overexploitation. The Forest Service has placed restrictions on forest cutting and burning while allowing for traditional use rights. The collection of forest products is regulated through a type of common-property regime. For example, fuelwood collection is limited to dead trees or fallen branches. It is forbidden to break off large branches to access cocoons. Thanks to these protective regulations, forest boundaries are mostly stable, and woodland density has increased in several cases.

LOCATION



Location: Antsirabe and Ambositra, Col des Tapia, Madagascar

No. of Technology sites analysed:

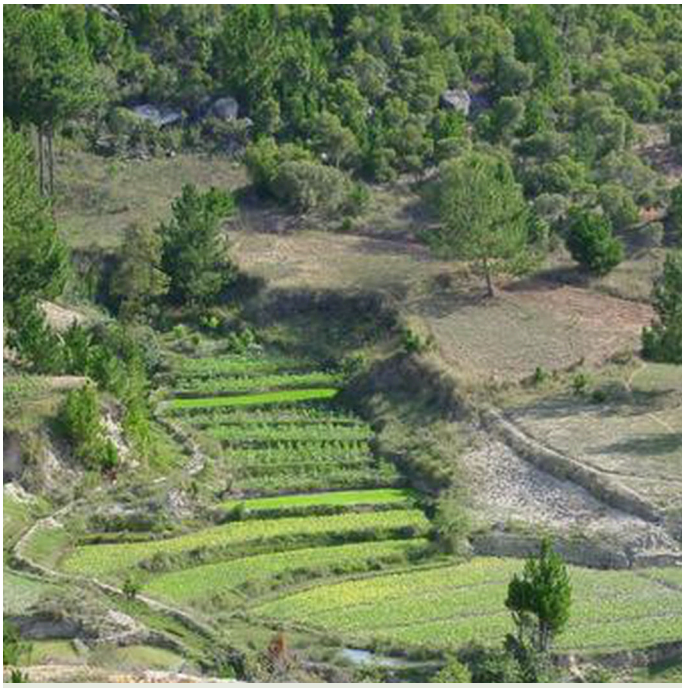
Geo-reference of selected sites
- 47.23, -20.53

Spread of the Technology: evenly spread over an area (2600.0 km²)

In a permanently protected area?:

Date of implementation: more than 50 years ago (traditional)

Type of introduction
- [ ] through land users' innovation
- [x] as part of a traditional system (> 50 years)
- [ ] during experiments/ research
- [ ] through projects/ external interventions



Tapia woodland with some invasive pine trees bordering highland rice fields (Christian Kull)

Small late wet season fire in a tapia woodland (Christian Kull)

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

Land use

Land use mixed within the same land unit: Yes - Silvo-pastoralism

Grazing land

Forest/ woodlands

- (Semi-)natural forests/ woodlands. Management: Selective felling
- Sustainable forest management

Products and services: Timber, Fuelwood, Fruits and nuts, Other forest products, Grazing/ browsing

Water supply

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

Purpose related to land degradation

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

Degradation addressed

biological degradation - Bc: reduction of vegetation cover, Bq: quantity/ biomass decline

SLM group

- natural and semi-natural forest management
- beekeeping, aquaculture, poultry, rabbit farming, silkworm farming, etc.

SLM measures

management measures - M2: Change of management/ intensity level

TECHNICAL DRAWING

Technical specifications

ESTABLISHMENT AND MAINTENANCE: ACTIVITIES, INPUTS AND COSTS

Calculation of inputs and costs

- Costs are calculated:
- Currency used for cost calculation: **USD**
- Exchange rate (to USD): 1 USD = n.a
- Average wage cost of hired labour per day: n.a

Most important factors affecting the costs

The estimation of costs is difficult - fruit are gathered over a two month period by school children going out for an hour in the early morning each day; the silkworms are collected by individuals (usually experienced collectors) on free days. In some areas, projects exist that run silkworm nurseries, establish firebreaks in the woodlands, grow and plant tapia seedlings, and finance the purchase of silk looms. These projects obviously require much larger budgets.

Establishment activities

1. (Timing/ frequency: N)

Maintenance activities

1. Selective cutting of non-tapia species, especially invasive pines (Timing/ frequency: None)
2. Pruning of dead branches (Timing/ frequency: None)
3. Controlled burning mainly through understory fires after the rainy season (Timing/ frequency: Jan-May)
4. Collection of non-wood forest products such as fruits, medicinal plants, mushrooms, berries, insects, and hunting of mammals etc (Timing/ frequency: Sept.-Dec)
5. Collection of landibe silkworm twice a year. The cocoons are cooked, spun and woven into silk fabric (Timing/ frequency: Nov-Dec and May-June)

Maintenance inputs and costs

Specify input	Unit	Quantity	Costs per Unit (USD)	Total costs per input (USD)	% of costs borne by land users
Labour					
Labour	ha	1.0	20.0	20.0	100.0
Total costs for maintenance of the Technology				**20.0**	
Total costs for maintenance of the Technology in USD				*20.0*	

NATURAL ENVIRONMENT

Average annual rainfall

- [ ] < 250 mm
- [ ] 251-500 mm
- [ ] 501-750 mm
- [ ] 751-1,000 mm
- [x] 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
- [x] sub-humid
- [ ] semi-arid
- [ ] arid

Specifications on climate

7 months of dry season
Thermal climate class: tropics

Slope

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

Landforms

- [ ] plateau/plains
- [ ] ridges
- [ ] mountain slopes
- [x] 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.
- [x] 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)

- [x] 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%)
- [x] 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

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

- [x] subsistence (self-supply)
- [x] 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

Gender

- [ ] women
- [ ] men

Age

- [ ] children
- [ ] youth
- [ ] middle-aged
- [ ] elderly

- [ ] employee (company, government)

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
- [x] small-scale
- [ ] medium-scale
- [ ] large-scale

Land ownership
- [x] state
- [ ] company
- [ ] communal/ village
- [ ] group
- [ ] individual, not titled
- [ ] individual, titled

Land use rights
- [ ] open access (unorganized)
- [x] communal (organized)
- [ ] leased
- [ ] individual

Water use rights
- [ ] open access (unorganized)
- [ ] communal (organized)
- [ ] leased
- [ ] individual

Access to services and infrastructure

IMPACTS

Socio-economic impacts

wood production	decreased	increased	Stable supply of fuelwood
farm income	decreased	increased	Through selling silk-fabrics and other NTFP
Production of NTFP as important dietary supplements	decreased	increased	
Provision of medicinal plants	decreased	increased	

Socio-cultural impacts

food security/ self-sufficiency	reduced	improved	Thorugh the forest products
cultural opportunities (eg spiritual, aesthetic, others)	reduced	improved	Sacred forest

Ecological impacts

soil cover	reduced	improved	
soil loss	increased	decreased	
biomass/ above ground C	decreased	increased	
plant diversity	decreased	increased	Endemic biodiversity

Off-site impacts

COST-BENEFIT ANALYSIS

Benefits compared with establishment costs

Benefits compared with maintenance costs

Short-term returns	very negative	very positive
Long-term returns	very negative	very positive

The larger rainy season silk harvest provides crucial cash income during the meagre months before the rice harvest. In 1998 the price of 200 cocoons was between US$ 0.10-0.15. For a basket of Tapia fruits villagers earned between 0.02-0.06 US$/ kg. During

CLIMATE CHANGE

-

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?

- climatic change/ extremes
- changing markets
- labour availability (e.g. due to migration)

CONCLUSIONS AND LESSONS LEARNT

Strengths: land user's view

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

- Thanks to these protective regulations, forest boundaries are mostly stable, and woodland density has increased in several cases
- La vente des produits en soie et des fruits de Tapia est une source de revenus capitale pour les communautés locales

Weaknesses/ disadvantages/ risks: land user's viewhow to overcome

Weaknesses/ disadvantages/ risks: compiler's or other key resource person's viewhow to overcome

- Partly individual indiscriminate cutting and/or strong use of fires leads to overuse of the forest resources needs clear regulations, guidelines and observation of the rules by the local authorities as well as awareness raising about the multiple benefits of the forests. As long as the communities continue to be interested in the forests and its products, they will protect it from destructive cutting.
- Invasion of exotic tree species such as pine and eucalyptus from private and village woodlots the forest service has rightly been encouraging communities to cut these trees from the tapia forests without the need for complicated permits.
- Insecure land use rights in 1996 a new legislation opened the way to officially decentralize management of state-owned renewable natural resources to adjacent communities, which would aid woodland protection by increasing stakeholder involvement.
- In some areas, silkworm populations have been very low for decades recent projects seek to establish silk nurseries and reintroduce the worm

REFERENCES

Compiler
Unknown User

Editors

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Date of documentation: Nov. 15, 2010

Last update: May 27, 2019

Resource persons
Christian Kull - SLM specialist

Full description in the WOCAT database
https://qcat.wocat.net/en/wocat/technologies/view/technologies_1359/

Linked SLM data
n.a.

Documentation was faciliated by

Institution

- School of Geography and Environmental Science, Monash University - Australia

Project

- n.a.

Key references

- Kull CA (2002): The 'Degraded' Tapia Woodlands of Highland Madagascar: Rural Economy, Fire Ecology, and Forest Conservation. Journal of Cultural Geography Spring/ Summer 2002.: