The Abril family opening a stingless bee nest for honey collection. (Natalia Roa)

Sustainable traditional native bee (Melipona favosa) keeping (Colombia)

Cría de abeja mancita

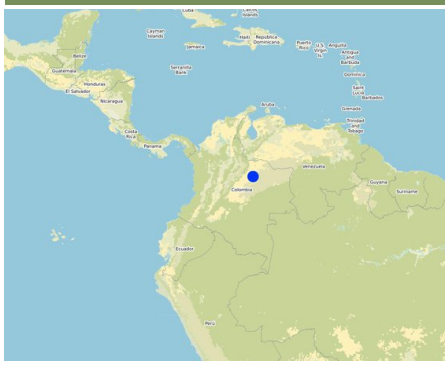
DESCRIPTION

Native stingless bee keeping (Melipona favosa) protects bees and plants found in forest and savannah ecosystems to produce honey. In contrast to current destructive wild bee honey harvesting, members of the Abril family keep the traditional practice of capturing/rescuing wild nests, and adapt them so that honey can be extracted from the same nest for many years (up to 30 y) without killing the bees.

Native bee honey production in the floodable savannahs of the eastern Colombian Llanos (Orinoco River Basin), relies on stingless bees of the species Melipona favosa. These bees nest inside tree trunks. The main characteristics of the native bee keeping, as currently performed by three generations of the Abril Family, is that it is sustainable, promotes de conservation of native ecosystems, and as far as we know, constitutes the only sustainable and profitable direct use of local biodiversity in the floodable savannahs of the eastern Llanos in Colombia. Its sustainability is due to the adaptations and management of the nests, so that honey can be extracted without damaging the bees. On one hand, they know how to retrieve wild nests, either by rescuing them from rotten trees or the ground, or by cutting the branch with the nest, and then keeping its natural position at all times. Once at their houses, they will study the outside of the nest and listen to the bees inside the nest, with this information they will cut out a part of the tree trunk to create a window. Once opened, they verify the location of the honey and pollen pots and the broods. Then, they will reattach the cut part on to the trunk by using metal wire and sealing the edges with mud. The nest will be hanged with wire in the position it was originally found. Once on site they will check every day for the presence of the sentinel bee and bee activity. Furthermore, they only extract honey during the end of the dry season when bees have enough food reserves. For the extraction, they will reopen the previously cut window, and extract the honey and pollen pots, making sure enough are left behind so that bees can have access to food as well. The mean honey production from each nest is around the 750 ml- 1000 ml. Honey is kept for their own use and sold to some people for a fairly high price (30 dollars per 750 ml). The honey is mainly consumed as a medicinal product, and its low quantity makes it highly sought after. If someone requests it for sight issues, Héctor will extract the honey with a syringe so that it is as clear as possible.

The native bee keeping contributes to protect native bees, as the management of nests can keep them functional for up to 30 years. The Abril family members are well aware of the dependency between honey production and presence of native plants from where bees forage for nectar and pollen. Therefore, they avoid forest clearing and selectively keep shrubs in the grasslands to guarantee food supply for their bees. Also, they plant fruit trees such as guayaba (Psidium guajava) and arazá (Eugenia stipitata), that benefit the bees, which at the same time benefit pollination. Fruit production is mainly used for home use and very seldom they are sold. They also witness the negative impacts that agrochemical airborne dispersion from rice production in the neighbouring farms, have on wild bee populations. So far, their main concern is that they do not know how to multiply the nests.

LOCATION



Location: Municipality: Trinidad, Vereda: Los Chochos, Casanare, Colombia

No. of Technology sites analysed: 2-10 sites

Geo-reference of selected sites

- -71.46278, 5.43194
- -71.45306, 5.43472
- -71.45639, 5.42639
- -71.46234, 5.44203
- -71.46903, 5.43549

Spread of the Technology: applied at specific points/ concentrated on a small area

In a permanently protected area?: No

Date of implementation: 10-50 years ago

Type of introduction

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

Boncieth Abril Listening to the bees to know how the nest is organized inside the tree trunk prior to honey collection (Natalia Roa)

Cleaning the mud off from the window before opening it so that it does not fall on the honey pots (Natalia Roa)

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: No

Grazing land

- Ranching

Animal type: cattle - non-dairy beef
Is integrated crop-livestock management practiced? No
Products and services: meat

Species	Count
cattle - non-dairy beef	150
beekeeping, apiculture	80

Forest/ woodlands

- (Semi-)natural forests/ woodlands: tropical moist deciduous forest natural vegetation, tropical shrubland natural vegetation, Natural strips of gallery forest along savannah's rivers. Management: Selective felling, Non-wood forest use

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

soil erosion by water - Wt: loss of topsoil/ surface erosion

soil erosion by wind - Et: loss of topsoil

physical soil deterioration - Pc: compaction

biological degradation - Bh: loss of habitats, Bs: quality and species composition/ diversity decline

SLM group

- beekeeping, aquaculture, poultry, rabbit farming, silkworm farming, etc.

SLM measures

vegetative measures - V1: Tree and shrub cover

management measures - M1: Change of land use type

TECHNICAL DRAWING

Technical specifications
This is too complex to draw, so we presented the sequence of extracting honey in a nest that has been modified so that the nest can live up to 30 years.

Author: Natalia Roa y Beatriz Ramírez

This is the housing for the nests. These nests have been collected or rescued from field. The youngest has 3 years the oldest has around 30 years. It is very important to keep the nests in the position they were originally found. The housing is to prevent direct sunshine and rainfall exposition.

Author: Natalia Roa

ESTABLISHMENT AND MAINTENANCE: ACTIVITIES, INPUTS AND COSTS

Calculation of inputs and costs
- Costs are calculated: per Technology unit (unit: **bee nest**)
- Currency used for cost calculation: **USD**
- Exchange rate (to USD): 1 USD = n.a
- Average wage cost of hired labour per day: $ 15

Most important factors affecting the costs
The way they manage the bee productive system is fairly cheap and most materials are already accessible within the farms.

Establishment activities
1. Wild nest recue or extraction and transport to the house (Timing/ frequency: Depends on the finding, but it is preferred in the dry season where more floral resources are available)
2. Opening of a window in the nest (Timing/ frequency: A couple of days after being collected/recued)
3. Locating the nest under housing (Timing/ frequency: Just after the window opening)

Establishment inputs and costs (per bee nest)

Specify input	Unit	Quantity	Costs per Unit (USD)	Total costs per input (USD)	% of costs borne by land users
Labour					
Two people for wild nest recue or extraction and transport to the house	day	2.0	15.0	30.0	100.0
Opening of a window in the nest	day	0.5	15.0	7.5	100.0
Housing construction (two people)	day	2.0	15.0	30.0	100.0
					100.0
Equipment					
Saw	unit	1.0	20.0	20.0	100.0
Chissel	unit	1.0	10.0	10.0	100.0
hammer	unit	1.0	8.0	8.0	100.0
Metal wire	kilo	0.5	11.0	5.5	100.0
Ax	unit	1.0	20.0	20.0	100.0
Construction material					
boles minimum 15 cm diamater and 2 m of height	boles	4.0	8.0	32.0	100.0
wood support 4 m long	unit	4.0	6.0	24.0	100.0
Roof laminas (3 m)	laminas	3.0	18.0	54.0	100.0
Nails	box	2.0	9.0	18.0	100.0
Total costs for establishment of the Technology				**259.0**	
Total costs for establishment of the Technology in USD				*259.0*	

Maintenance activities

1. Checking the bee nests (Timing/ frequency: daily)
2. Harvesting honey (Timing/ frequency: yearly)
3. Seedling collection (Timing/ frequency: monthly)
4. tree nursery care (Timing/ frequency: daily)
5. planting trees (Timing/ frequency: monthly)

Maintenance inputs and costs (per bee nest)

Specify input	Unit	Quantity	Costs per Unit (USD)	Total costs per input (USD)	% of costs borne by land users
Labour					
Daily check per bee nest	day	0.005	15.0	0.07	100.0
honey harvest per bee nest (2 people)	day	1.0	15.0	15.0	100.0
Seedling collection	month	2.0	15.0	30.0	100.0
Planting of fruitting trees	month	2.0	15.0	30.0	100.0
Equipment					
Chissel	unit	1.0	10.0	10.0	100.0
Broom	unit	1.0	3.0	3.0	100.0
Hammer	unit	1.0	8.0	8.0	100.0
Syringe	unit	1.0	0.2	0.2	100.0
Empty glass bottles (750 ml)	unit	70.0	0.4	28.0	100.0
Table	unit	1.0	30.0	30.0	100.0
shovel	unit	1.0	20.0	20.0	100.0
Plant material					
Bags x 50 units	bag	1.0	5.0	5.0	100.0
Soil	sack	4.0	6.0	24.0	100.0
Total costs for maintenance of the Technology				**203.27**	
Total costs for maintenance of the Technology in USD				*203.27*	

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

Average annual rainfall in mm: 1938.0
highly monomodal seasonal rainfall with 4 months without rainfall (< 60 mm/ month), and 8 months with rainfall (>100 mm/ month) with June as the month with highest rainfall (> 300 mm)
Name of the meteorological station: Estación pluviométrica de Trinidad (IDEAM)
The highly seasonal rainfall, implies four months of extreme drought and at least 6 months of flooded areas. Both severely limit crop growth.

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	poor ✓	good
education	poor ✓	good
technical assistance	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

Comments

These farms are in fairly remote area with poor access roads, there is a rural school but for the other services people have to travel for at least 2 hours by car to the closest urban center.

IMPACTS

Socio-economic impacts

non-wood forest production	decreased ✓	increased
farm income	decreased ✓	increased
diversity of income sources	decreased ✓	increased

Honey harvesting from collected bee nests

Honey harvesting contributes with about 10% of farm income

Honey harvesting is an additional income source from cattle ranching

Socio-cultural impacts

food security/ self-sufficiency	reduced ✓	improved

Part of the honey and most of the fruits harvested are consumed by the land user theirself.

Ecological impacts

beneficial species (predators, earthworms, pollinators) — decreased / increased: ✓ (increased)

habitat diversity — decreased / increased: ✓ (increased)

The preservation of bee nests increases pollinator presence, whilst the conservation of gallery forests preserves habitats for wild bee populations.

allowing for fallows to regenerate for providing bees with resources (nectar, pollen, resins and seeds) increase habitat diversity.

Off-site impacts

buffering/ filtering capacity (by soil, vegetation, wetlands) — reduced / improved: ✓ (improved)

Riparian forest conservation contributed to water regulation

COST-BENEFIT ANALYSIS

Benefits compared with establishment costs

Short-term returns — very negative / very positive: ✓ (very positive)

Long-term returns — very negative / very positive: ✓ (very positive)

Benefits compared with maintenance costs

Short-term returns — very negative / very positive: ✓ (very positive)

Long-term returns — very negative / very positive: ✓ (very positive)

Honey harvesting is only possible once per year so for the short term it takes some time before retrieving income. However, once the nests are re-established at home the maintenance is fairly easy. The rareness and uniqueness of the product sells well in the local market. The external markets are not aware of such a product.

CLIMATE CHANGE

Climate-related extremes (disasters)

epidemic diseases — 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%

Number of households and/ or area covered

5

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

- The medicinal properties attributed to the product make it highly sought after.
- Having the nests at home, and passing on the traditional practice to new generations is very important, because they find very interesting to know about bee behaviour and pollination function for fruitting trees.
- Costs are fairly low, and despite production is synchronized the demand of the product is higher that the production, so it is a welcome income to the family household assets.

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

- Their practice is non destructive and bee population is enhanced in the houses, it is very likely that bees will find new wild nesting sites. In this regard bee nests at houses are a source of individuals for wild populations, given that there are trees and forests nearby.
- This practice and their knwoledge on bee behaviour and biology motivates people to conserve forests and trees and allow for fallows surrounding their houses.
- Negative effects on their bee populations derived from land use change int heir surroundings and application of agrochemicals by neighboring rice crops serve as an indicator

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

- Despite the long term survival of captured wil bee nests, they still rely on collecting wild nests. Which in time they feel are more scarcee → For them it is crucial to learn how to split their "domesticated" nests so they can increase production without depending on wild nests.
- The expansion of rice crops in the area is a major threat → Public policy and law inforcement in aerial agrochemical application is urgent. Also, the transition from usual rice crop management to a more enrionmental management is required.
- New generations are less likely to adopt traditional practices, endengering the persistence of this knowledge in time → The recognition of this traditional productive system is fundamental.

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

- A one time per year harvesting of the product could potentially be increased to expand this sustainable practice → Restoration of key dietary elements surrounding their houses and an increase in connectivity with remaingin forest

for them to know if those practices are deteriorating their environment.

patches could potentially increase honey production
- We agree that the loss of this practice is inminent if it is not protected as a cultural heritage → Knwoledge transfer to new generations and the recovery of this productive system, once "domesticated" bee nest can be divided or multiplied.

REFERENCES

Compiler
Beatriz Ramirez

Reviewer
Hanspeter Liniger

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Resource persons
Héctor Abril - land user
Héctor Frugo Abril - land user
Damaris Abril - land user
Boncieth Abril - land user
Héctor Daniel Abril - land user

Full description in the WOCAT database
https://qcat.wocat.net/en/wocat/technologies/view/technologies_5797/

Linked SLM data
n.a.

Documentation was faciliated by
Institution
- Centro de Estudios Ambientales de la Orinoquia- Asociación de Becarios de Casanare (ABC) - Colombia

Project
- n.a.

Links to relevant information which is available online
- Diversidad de abejas sin aguijón (Hymenoptera: Meliponini) utilizadas en meliponicultura en Colombia. Nates-Parra, G. and Rosso-Londoño, J.M. (2013).: https://www.redalyc.org/pdf/3190/319029232001.pdf