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SCIENCE AND TECHNOLOGY BY OTHER MEANS, Exploring collectives, spaces and futures

Photo archive Petenes Nature Reserve,

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An exploration of more comprehensive forms of engagement with the Mayan culture in the coproduction of public policies to mitigate the impact of climate change in the Yucatan Peninsula, Mexico

Case Study: the beekeeping strategies of the Pat family, an example of contemporary employment of ancient adaptive social-environmental management approaches, Tankuche, Petenes Nature Reserve.

Abstract

There is growing recognition that responses to climate change need to go beyond technological and policy initiatives to include local and indigenous knowledges and practices which not only harbour information concerning the impact of climate change on particular socio-ecosystems but also constitute a vital medium which needs to adapt and evolve to strengthen ecosystem resilience. In south east Mexico, there is a local general awareness of changing rain patterns, increased extremes in seasonal temperatures and reduced soil quality.

A source of more specialised environmental knowledge resides in the Mayan communities whose culture is still largely organized around the agricultural calendar according to the periodicity of wet and dry seasons which in turn temporalizes the related religious offerings, thereby sustaining in differing degrees the Mayan pre-colonial world view. Public policy engagement with Mayan communities has, nevertheless, to date been mainly limited to restricting sustenance hunting and ancient practices of slash and burn land clearance, although since 1997 an option for participating in environmental management units (UMAs) was established; likewise environmental education programmes remain basic, apparently aimed at an urbanised population.

Preliminary results from a study of indigenous knowledge of climate change in the Yucatan Peninsula show Mayan environmental knowledge as fundamentally holistic and hence ecological, proffering complex relational observations regarding minute local changes in flora and fauna due to climate change, thus indicating transdisciplinary opportunities and challenges (Klenk and Meehan 2015) for engagement with the Mayan communities in the coproduction of public policies to mitigate the impact of climate change.

Wild Flowers , , Photo archive Petenes Nature Reserve

Initial Heuristic Approach and aim of the study

There is growing recognition that responses to climate change need to go beyond technological and policy initiatives to include local and indigenous knowledges and practices which not only harbour information concerning the impact of climate change on particular socio-ecosystems but also constitute a vital medium which needs to adapt and evolve to strengthen ecosystem resilience.

Maya indigenous knowledge and practices in south east Mexico integrate a complex knowledge of local ecosystems which potentially could serve as a valuable component in the design of public sustainable development policy, but which have to date been largely ignored or disqualified as not “scientific”.

Hence, the aim of the case study was to problematize the notion of indigenous knowledge as “other” and gather information on contemporary Maya environmental knowledge and practices to discern the degree of commensurability with current ecological thinking on socio-ecosystems.

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Ontological politics

Whilst in agreement with Klenk and Meehan's (Klenk & Meehan, 2015) critique of the integration model in transdisciplinary science and their preference to value differences between knowledge systems, we propose an alternative view as to where ontological differences lie, based upon our reading of Descola, Code and Latour .

Descola argues that all worldviews and cosmologies are based on 4 basic ontological schema which are all variants of a more elementary system of contrasts between interiority and physicality. They are, therefore, inherently commensurable. What´s more, despite the current hegemony of the West´s naturalist ontology, it is based on a nature-society dualism which is not a homogenous or unquestioned "scientific knowledge system" (Descola, 2013).

In the same vein of thought, for Code, ecological thinking is not equivalent to the domain of the work of the naturalist, the environmentalist or wildlife scientist, instead, ecological thinking is a critique of western knowledge's discourse of mastery:

> Suspicion is directed, principally, at the excesses of scientism, reductionism, and the instrumental-utilitarian moral and political theories that sustain an ethos of dominance and mastery, where a dislocated knower-as-spectator seeks to predict, manipulate, and control the behaviour of the material world and of other "less enlightened" people. (Code, 2006, p.8)

Latour takes such a view one step further, he insists that there is no "nature" to return to (Latour, 2014), instead, the task is to delimit the contours of this "new site" of ecological thinking through a gradual process of composition (Latour, 2010).

Consequently, following Descola, Code and Latour we argue that:

> ***Ontological differences do not necessarily lie in the distinction between "indigenous/local" and "scientific" knowledge systems but between "ecological" and "non-ecological" ontological schema.***

Petate Design, Martha Tzeek, Nunkini

Key concepts in ecological thinking

The following are key concepts in ecological thinking relevant to this case study:

- **The local as the site of the 'political'**

For Code ecological thinking in its attention to the local in its diversity and its interconnectedness of "lives and events across the human and the non-human world", the local is the site of the political.

- **Indigenous governance**

Indigenous peoples are concerned about protecting their own internal capacity to cultivate, transmit, remember, and exercise Indigenous knowledges. (Powys-Whyte, 2015, pág. 22)

- **Adaptive capacity as key to resilience**

Adaptive capacity in ecological systems is related to genetic diversity, biological diversity, and the heterogeneity of landscape mosaics. In social systems, the existence of institutions and networks that learn and store knowledge and experience, create flexibility in problem solving and balance power among interest groups, play an important role in adaptive capacity. .(Resilience alliance 2016)

Social-ecological systems

Social-ecological systems are are complex, integrated systems in which humans are part of nature (Berkes & Folke 1998). .(Resilience alliance 2016)

Photo archive Petenes Nature Reserve,

Mayan cosmology, environmental knowledge and land management

Recent studies show that contemporary Maya maintain a complex knowledge of local ecosystems which depends on the vibrancy of their cultural systems.

Secular dimension Barrera and Toledo show that Yucatec Maya land management strategy seeks “the optimal combinations of all available landscape units (mature forests, house-garden, fallow, shifting cultivation and intensive agriculture” (Barrera-Bassols&Toledo,2005,p 22).

They argue that it is in this sense “Yucatec Maya practice a modality of what has been called “**adaptive management**”, based on the multiple use of species and landscape units, resource rotation, landscape-patch and succession management… it represents a secular mode of **resilience.** ”. ”. (Barrera-Bassols & Toledo, 2005, p 22)

The Sacred dimension is also present, according to Barrera and Toledo in Ycateca Maya land management. **Land**, “Luúm” in Maya signifies **domain, soil and spirit**. The sacred dimension of resilience lies in the Mayan understanding of the land as a living being

> Land health is linked to …..a higher discourse that connects health and well-being of plants, animals and men …. This principle of interconnection is used to explain the food chain: ***“If plants, animals and soils are healthy, then men should be healthy”*** (Vogt, 1979)) (Barrera-Bassols & Toledo, 2005, p 22)

The Maya understanding of the inter-relatedness of the health of humans and the land appears similar to what ecologists refer to as the concept of socio-ecosystems.

Milpa cultivation, Nunkini, Petenes, personal archive.

Mayan cosmology and the practice of beekeeping

Since the ancient Mayas, the native melipona bee without sting (*Melipona becheii*) has been cultivated in the Mayan house-gardens.

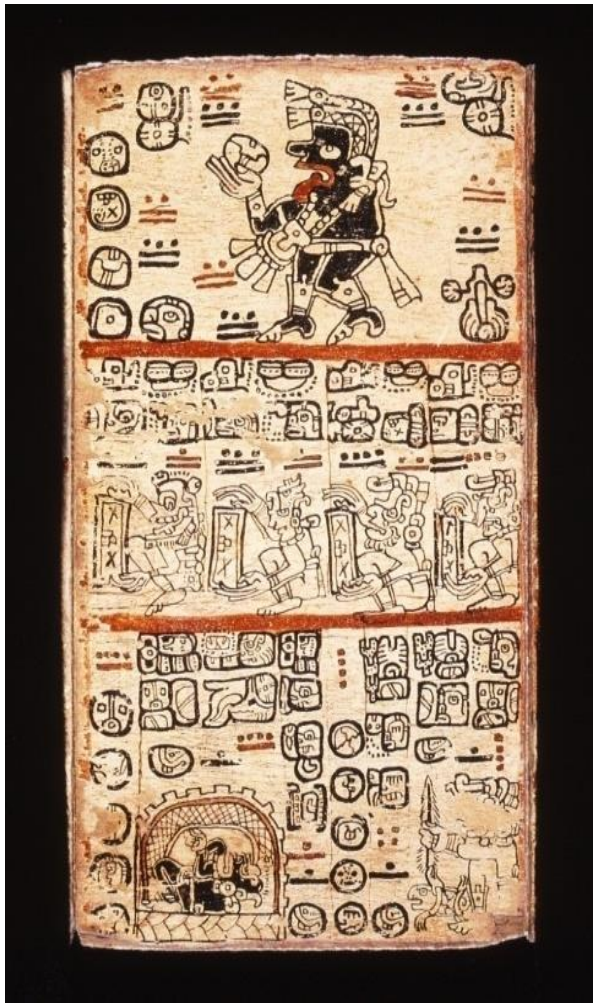
Their cultural significance can be appreciated from the Mayan Codices dating from 1300 A.D. , (Dr Laura Sotelo, UNAM).

Their sacred and ecological importance is also revealed through recent linguistic analysis:" **the word for bee in Maya is *kaab* which is also the Mayan name for honey and for the planet earth".** (Chuc, 2016).

The commercial cultivation of the "American" bee [(*Apis mellifra mellifera)*- introduced into the peninsula at the beginning of the 20th century - and the European bee (*Apis mellifera ligustica*) - mid century - (Güemez Ricalde, 2003, p.120)], currently forms an important part of the multiple strategy resource management providing family income. (Toledo & Martínez-Alier, 2007, p. 8).

The melipona honey is mainly for personal consumption due to its low levels of production (1 litre of honey as compared to 7 litres of the *Apis* bee), although it has recently acquired a commercial value due to both its alimentary and medicinal properties. (Chuc C. Russell L., 2016)

Both the melipona and other native wild bees, together with the *introduced* varieties, play an important role in the pollination of the local and agricultural ecosystems.



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Methodology

The study of the Pat family, beekeepers from Tankuche in the nature reserve of the Petenes, was chosen as a case study.

On the basis of prior acquaintance with the family the team considered that the family's activities indicated a potentially high level of knowledge of their practice, they are highly trusted within the community and by local institutions, and have a collaborative disposition to share their experience and knowledge.

A semi-structured interview took place at the home of the Pat family in May 2016 and posthumous communication was maintained with the son and daughter via Facebook.

Pat Family, and Pat Honey, Expo, National Commission of Indigenous Communities CDI

Geographical Context, Yucatan Peninsula

The **northern Maya Lowlands** ”are characterised by a lack of rivers and surface water, low rain-fall, low elevation and level terrain, and low forest canopy” (Barrera-Bassols & Toledo, 2005, pág. 7- 9) Water seeps into limestone base and flows underground to the sea.

Soils: shallow and stony best suited to shifting milpa cultivation. **Climate**: Humid tropical climate, dry (Nov-April) and wet (May-Oct) seasons; frequent climatic and meteorological disturbances.

Climate Vulnerability: exists in coastal areas from rising see levels, including mangrove forests; falling rainfall and rising temperatures.

Political context: environmental policies

In Mexico, the beginnings of environmental policy for the protection of natural areas of high ecological value go back to the beginning of the 20th century. However, it was not until after 1992 when the "Earth Summit" was held, that Mexico acquired various environmental commitments and elaborated all the Instrumentation needed to meet environmental protection objectives. In 2000, CONANP was created as a decentralized body of SEMARNAT, which reinforces the institutional presence in environmental matters (CONANP, 2016)..

Toledo considers that regional public policy has historically been designed with a complete lack of ecological cultural and productive contextualization regarding the Mayan communities. (Toledo & Martínez-Alier, 2007)

However, programs such as the "Environmental Management Units" or the "Conservation Program for Sustainable Development" (PROCODES) reflect the progress of conservation concepts for institutions. The participation of civil society is now seen as crucial for the development and effective implementation of public policies.

Jaguar, Hampolol Ejido, 2015, Photo archive Petenes Nature Reserve,

The Petenes Biosphere Reserve

Petén is a Mayan word which means flat small coastal island fields.

The “Petenes” Nature Reserve was created in May 1996 with a total extension of 282,857 hectares, including the coastal mangrove swamps and 12,000 nautical miles of territorial waters, and covering the 4 municipalities of Calkiní, Hecelchakán, Tenabo and Campeche. In 1999 it was upgraded to a Biosphere Reserve and its management programme “Petenes Ecosystems” was officially approved in 2006.

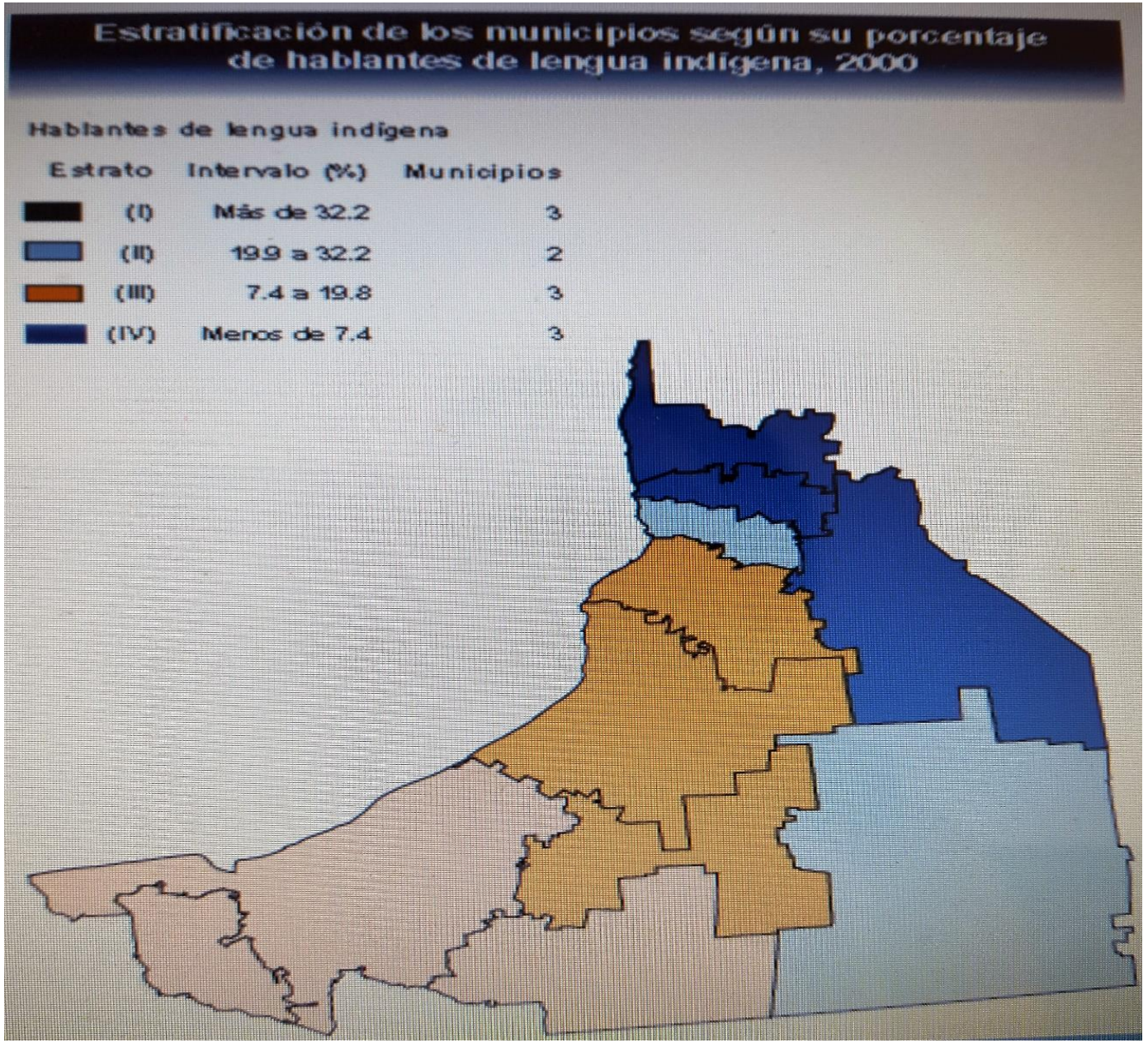
The reserve is administered by the National Commission for the Protection of Natural Areas (CONANP).

Mangrove Swamps, Photo archive Petenes Nature Reserve,

Demographics

Campeche is one of the least populated states in Mexico with a little less than 900,000 inhabitants

The highest concentration of Indigenous language speakers live in the north of the state in the municipalities of Calkini, Hecelchakan and Hopelchen, where more than 32% of population are Mayan speakers.



INEGI 2000

Case Study Results

Mrs and Mr Pat and their young adult children Josefa y Rogaciano live in Tankuché, a small village in the north of the Peténes Nature Reserve. Mr Pat's has land and forest where he keeps free roaming cattle and hives, previously a farmer, a fisherman, and as a married man a carpenter, his main occupation is now beekeeping .

His wife Maria has an extensive medicinal herb garden. Both Mr and Mrs Pat are respected members of the local community and very active in the conservation of the chapel and its calendar of activities many of which are related to the agricultural cycle within the eclectic tradition of the rural catholic church in Mexico.

Tankuche is a village in the Petenes that before the Mexican revolution was a hacienda. The villagers have preserved the wing of hacienda which houses the chapel.

Beekeeping

Mr Pat has been a beekeeper since he was a child and since 2000 he also started cultivating the melipona bee..

Mr Pat received CONANP funding for the construction of a honey collection centre for organic honey (*Apis mellifera*). It is currently used by 30 families which Mr Pat has instructed in organic production techniques.

They get a slightly better price per litre for organic honey but his aim is to bottle the honey himself and sell it directly to cut out the middle man and get a fair trade deal as producer.

He has also received grants from the National Comissión for the development of indigenous villages, (CDI) to develop his product.

He is pleased that 3 younger men (30, 35 and 40) asked to be incorporated into the honey production business, at the end of 2015.

Creative strategies

Mr Pat unloads and stores the honey separately according to the area where the hives are kept and thus the type of flower according to the season. He bottles the honey according to flower with their distinct colours, scents and tastes. He is the only beekeeper in the region that produces and sells single flower honey.

He explained that can only sell these locally as artisan products, for in order to sell his product nationally and internationally, he needs to complete a long and detailed process of registering his brand and also a legally constituted cooperative with the Mexican Inland Revenue.

Josefa and Rogaciano Pat, CDI artesan fair

The challenges Mr Pat identifies

Social challenges: He observed that the village in general has lost its knowledge of a balanced management of the environment aggravated by high levels of migration due to youth unemployment.

Mr Pat explains that previously, when an hacienda, the cattle kept the grass short, or the grass was cut for fodder, but now it is often burnt by young people who do not realise that they are burning the trees where the bees feed, sometimes the hives at the edge of the forest and also the mangrove forests at the edge of the fields. Mr Pat observed that the village showed more interest in environmental matters when they began to lose their fruit tree production from their gardens in the village due to the lack of pollination.

Climate change challenges: On the subject of climate change Mr Pat said that they have noticed changes in the last 8 or 9 years, but this year has been the worst. Temperatures have increased, rainfall is low and the marked change of seasons has been lost. Agriculture is badly affected and the trees are drying out whilst in the mangrove swamps rising sea levels means there has been no dry summer period for the last three years, which means that people cannot get in to harvest the jipi palm. Also the extremes of heat and cold kill off the flowers from which the bees collect the pollen. They have lost 40 of their 60 hives.

Elaboration of hats from jipi palm in caves in Becal

Mr Pat´s strategies regarding climate change

Mr. Pat and his son develop stronger bee varieties, crossing either the queen bees or the larva of the apis mellifera, a technique which they learnt from researchers from the Veterinary department of the University of Yucatan. They have also crossed the African bee with the apis, both to placate the African bee and to strengthen the American and European apis.

To protect the hives from the heat and from hurricanes they clean between the trees at the edge of the forest and position the hives under the trees.

Mr Pat has reforested a 400 hectares area following the extraction of rock in the 1980´s for a highway construction, and a small lake also formed during the last hurricane. The area has become a wild life refuge.

Despite the objections of the PNUD, he also introduced cattle which help to keep the grass low, and because they wander freely, they transport and plant seeds of the fruits they eat, so reproducing the forest.

Hives at the edge of a clearing, Tankuche, Calkini, RB “Los Petenes”

Water hole and wild-life refuge and reforestation by Mr Pat

Mr Pat´s vision for the sustainable development

Mr Pat believes that to retain knowledge and interest in the health of the local environment requires active local small land holders. He believes that more young people will stay in the village if they can earn a decent income.

The strategy he envisions is one by which increasing the income to be obtained from the commercialisation of honey products, more young people will stay in the village. By training these young men in the cultivation of beehives they will take an increased interest in the conservation of their local environment.

In short, his project revolves around the idea **“many producers** (of honey), means **many protectors”** (of the forest). He believes that to increase the earnings from honey production requires selling his own brand of organic honey directly over the Internet and developing specialised products such as honey selected for flower.

The current challenges he faces are resources to train the young recruits and difficulties in registering as a self-employed contributor with the Inland Revenue, a basic requirement to register his brand. He is also seeking an alternative options to using plastic containers.

“jobones” of the melipona bee in Mr Pat´s house garden

Discussion

- Mr. Pat's work with bees implies that he observes climate change closely and its impact on ecosystems. From his past experience working with veterinary scientists specialized in beekeeping, he has applied and adapted the knowledge acquired. He is also open to sharing his own knowledge and experience.
- With his theme of **"many producers** (of honey) **many protectors** (of the forest), Mr Pat shows a complex understanding of the interconnectedness of social and ecological systems, **relating human well-being to environmental integrity.** This theme also has distinct echoes of the concept of linking land health to human health, which Vogt's suggest is an ancient Mayan environmental understanding that ***"If plants, animals and soils are healthy, then men should be healthy".***
- Nevertheless, Mr Pat shows the ability of **adaptive management,** to understand and change a system in the face of new challenges, a capacity **key to resilience,** in identifying as a contemporary leverage point the need for new opportunities for young people at a local level based on the relation of economic well-being with the local environmental sustainability. For this reason **he proposes that engendering economic viability in traditional eco-friendly practices of bee-keeping can help restore local ecosystems.**

Mr Jose Vidal Pat Colli , Tankuche, Calkini, Reserva de los Petenes

Institutions like CONANP, the Commission for Indigenous Development (CDI) and some regional NGO´s have provided substantial support to Mr Pat’s project of organic honey production, yet attention needs to be drawn to the fact that this project, like others in the area, faces serious delays due to the bureaucracy of the procedures involved in registering with the Inland Revenue, a situation that indicates the need for more research regarding production and marketing chains of artisan and indigenous products and gaps in support policies and programmes.

This fact is related to another: that there seem to be no integrated policies to support the Mayan communities in Campeche. Mr Pat can benefit from support from CONANP because Tankuché is in the Peténes; he can also take advantage of support from CDI and via CONANP has been advised and put in communication with NGOs that work in the region and that have supported it in different aspects of the marketing of its product (for example, advice from the NGO "Ninth Wave Mexico). However it is Mr. Pat's vision that has played a key role in integrating these various options of support for his project.

Further research is also necessary to tailor the PNUD guidelines to local needs and to what works as sustainable land management in distinct ecosystems. This point is related to the issues of self-governance and the importance for inter-generational relations.

Mr Jose Vidal Pat Colli , Tankuche, Calkini, Reserva de los Petenes

Concluding remarks

- The case study of the Pat family honey production and commercialisation project shows clear evidence of traditional Maya understanding of the complex interconnectedness of socio-ecosystems and adaptive management capacities.
- The case study thus indicates that the thinking of local indigenous communities is commensurable with ecological thinking as proposed at the beginning of this study.
- There are clear opportunities for researchers from both the social and natural sciences to be incorporated in support roles to assist in the development of Mr Pat´s project and similar artisan projects.
- The study also underlines the view of Toledo and Powys concerning the importance of “land-based practices and vibrant cultures” in order to maintain collective capacities and successful forms of indigenous governance and thus continue to adapt to change. (Powys-Whyte, 2015, p. 15)

Photo archive Petenes Nature Reserve

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