Between development policies and narratives of origin: an exploratory approach of biodiversity in Ataúro (Timor-Leste)

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Introduction

A century apart, two documents discuss Ataúro island's future. In 1916, the infantry captain Antonio Leite de Magalhães published *A Ilha de Ataúro, Noticia sobre a ilha e seus habitantes seguida de vocabulário*, a 24-page opuscule printed in Macau. While acknowledging the limited scope of his observations, Magalhães did not hesitate to describe the fauna and flora as "extremely poor", except for the diversity of birds and fish. About thirty spontaneous or cultivated plant species of high economic value captured his attention and they were designed by their Portuguese name, and by their local denominations in Ratlungu or in Resuk. This was probably the first economic botany inventory in the island. Agricultural and artisanal practices were also briefly described. As future steps towards the island's development, he suggested to strengthen Portuguese infrastructures, to develop trade and agriculture based on coconut trees, areca, tobacco, various fruit species, and to encourage rice and corn production as food crops. As sources of wealth that would allow *capitalização*, he mentioned the sale of dried fish and pearls, as well as beeswax and swallow's nests, other high value products. With these measures in place, Ataúro would cease to be a null in the province's economic balance[1] (Magalhães, 1916: 24).

A century later, the island's population has grown from about 5,000 to 8,000 inhabitants, and its future is discussed in the *Plano de Ordenamento do Território da Ilha de Ataúro* approved in 2016 by the Council of Ministers (ZEEMS-TL, 2015). This plan focuses on tourism linked to biodiversity, whether marine - with diving and snorkeling - or terrestrial, with hiking activities and village stays. The planned infrastructures, today not yet implemented, respond to a wide range of tourist practices, from seaside resorts to eco-tourism. In addition to the marine diversity, the diversity of plants on the island provides the setting for a tourist scene that combines beauty and variety of landscapes with local emblematic productions, whether traditional or recent (wood carvings, basketry, fibre weaving or products appreciated by tourists such as coconuts) (Guillaud et al., 2017). A new *capitalização* is now

[1] "*... sêr um zero na balança económico da Província."* (Magalhães, 1916: 24).

being based on local biodiversity as an economic resource, although it only marginally considers its local meanings and values.

While the state of East Timor, by promoting handicrafts and emblematic places, invests significantly in heritage policies as a lever for tourism, biodiversity is still struggling to emerge as a cultural asset. In Ataúro, it remains primarily an object of conservation with protected areas such as the Manukoko Reserve (4,000 ha) or a source of raw materials for emblematic products such as *tais* and other weavings, with vegetable dyes and fibers, wooden sculptures, etc. However, the biodiversity of Ataúro and of other Timorese regions represents a heritage with both tangible (biological) and intangible (knowledge and other associated cultural references) components that cannot be dissociated.

Moreover, in a context of great ecological vulnerability and in front of a globalization that generates its own models of development, it is urgent to recognize the role of local populations which, through their practices and knowledge, contribute to the existence of a biodiversity embedded in the society and its territory (Diaz et al., 2019; Reyes, 2019). In that perspective, the objective of this paper is thus to show how the relationships that links society and biodiversity in Ataúro are an integral component of the island's intangible cultural heritage.

Studies on the relations between plants and societies are relatively few in Timor-Leste and, to our knowledge, absent on Ataúro, except for Hull's botanical linguistics work (2006) which mentions about twenty main cultivated plants, or for scattered data such as Magalhães'. The data presented here were collected between 2016 and 2018 during three fieldtrips of about ten days each in the region of Makadade[2], located in the south-central part of the island, near the sacred summit of Manukoko. They result from observations and short interviews carried out during different explorations of the surrounding areas and from more systematic surveys of cultivated species in the *to'os*. We gathered a corpus of data on about a hundred spontaneous or cultivated species, with their vernacular names, and they have been partly identified on the basis of photographs (but we did not collect any material). These data on the plants complement the extensive investigations carried out in Makadade and Makili about the origin narratives of the different social groups of Ataúro and about their territoriality.

From biodiversity to intangible cultural heritage

In Ataúro, four main reading keys can be primarily discerned to organize the material and immaterial components of vegetal biodiversity in their relationship to society: the theme of origins - whether the beginnings of the island or more recent history -, the treatment of spontaneous or cultivated plants, the treatment of plants as material and immaterial resources, and finally the social practices on which is based such management of plants. These are the key themes on which we have based our work,

[2] Makadade region is ratlungu-speaking. However, we indicate the name of plants in tetum in order to facilitate the reading. The few names in ratlungu are in bold type.

although relations between society and the vegetal realm is naturally more complex, and other interpretations are also possible.

Origins and temporality of plants

Plants are omnipresent in the narratives about the origin of the island and its cultural diversity, and they punctuate the stages of its material and social constitution. To make a quick summary, the ficus **muung** (*Ficus* cf. *variegata*) was the first tree of humankind on the very small island of Manukoko. A pig which ate its fruits metamorphosed into a woman and gave birth to three boys. One day they went out to fish with a fish trap was brought back filled with all kind of leaves and bamboo, thus signaling that space was no longer marine but terrestrial. These three brothers, at the origin of the linguistic diversity of the island, tested the magic of their arrows by shooting and killing the **muung** tree, before raising Ataúro from the sea. As they explored the island, they left a watermelon and a citrus in the localities of Bikeli and Doru, which turned into two women who married a man, resulting himself from the transformation of a sheath that the brothers also left on their way in Abak (Guillaud, 2019).

Several clan (or houses, lisan[3]) names refer to plants: the hae (**lari** - *Imperata cylindrica*) and the fafulu (**luli** - Bambusoideae) are respectively at the origin of Ruma Lari in Makadade and Luli in Makili. In other localities of the island, plant names such as ai-kfau or **haru** (*Hibiscus tiliaceus*), haas or **ah'ran** (*Mangifera* sp.), ai-sukaer or **ana'r** (*Tamarindus indicus*), hali or **muung** (*Ficus* cf. *variegata*) designate groups of descendants. Other phytonymes such as ai-dak or **i-leti** (*Schleicheria oleosa*) refer to places. Sacred *Ficus* are associated with emblematic places, springs, rock shelters etc. Individuals of other plant species as **i-mera** (n.i.[4]), **i-puti** (*Gyrocarpus americanus*), **laraho** (n.i.) also fall within this area of the sacred. In the past, the market in Makadade used to take place under a ficus before being moved to the center of the village of Anartutu. Both species and plant individuals are cultural and territorial markers.

The origin of the plants that are mentioned is an important element in their identity. There is a clear partition between cultivated plants from ancient and present times. Sorghum, batar-ain-naruk (*Sorghum bicolor*), millet or tora (*Setaria italica*) and tears of job, batar-fatuk (*Coix lacryma-jobi*), are ancient cultures but are still cultivated in some places. These cereals have been largely replaced by maize with varieties that are now considered as local, with the recent addition of so-called improved varieties. The geographical origin of the plants is frequently mentioned: a type of sinkomás (*Pachyrhizus* sp.) is considered to come from Australia; a bean (*Vigna umbellata*) was lost and then reintroduced from Indonesia; the anteriority of bitter cassava over sweet cassava (which would have

[3] It is not the purpose of this article to discuss the concept of "house" or "clan" to designate the lisan. For the sake of simplification, we will use the term "clan" to refer to lineage groups that recognize a common origin and territoriality, and to "houses" to designate the habitats that correspond to them.
[4] unidentified

been brought to Makadade from the village of Arlo) is affirmed; shade plants were introduced by the Portuguese, others by the Indonesians, etc. Invasive plants also have a meaningful origin: *Lantana camara* (**ilau karuk**) and *Chromolaena odorata* (**aper hatu**) are said to have originated from an ill-advised attempt by the United Nations to replace hae (*Imperata cylindrica*) in which rats swarmed, destroying the crops. This account is partly in line with the official history of these invasive species because even if their introduction was fortuitous, *C. odorata* does competes with *I. cylindrica* by rapidly overtopping it – and it is itself eliminated by another introduced and invasive species, the ai-kafé (*Leucaena leucocephala*) (McWillliam, 2000). Therefore, the plants' history in Ataúro draws from different registers, that of the narratives of origin, and that of the circulation of cultivated (and invasive) plants, which followed the settlement routes and is also part of the recent or current history of the island.

Cultivated and spontaneous plants

The report of a soldier published in the Boletim de Comércio, Agricultura e Fomento da Província de Timor of 1915-1916 mentions that in Ataúro *"... most of the indigenes didn't have* hortas. *Those on the coast lived on fish, palm juice, and some maize; they did not grow themselves maize but sailed to Dili to procure it in exchange for the fish that they caught. They told me that they didn't need* hortas *because the sea was their* horta - *it gave them fish to eat and to exchange for maize aplenty. But I made them open as many* hortas *as they could so that they have something to eat without having to go to other localities to acquire goods except in times of need."* (BCAeF, 1915-6: 738 *apud* Sheperd & Palmer, 2015, p. 294). This episode takes place at the beginning of the 20th century at a time when the cultivation of maize (introduced on the island of Timor around the end of the 17th century - Dampier, 1939 in Shepherd & Palmer, 2015), and of rice, were strongly encouraged, if not made compulsory by the central government. The quote highlights the importance of exchange networks with the main island, in ways that need to be clarified, and the invisibility, for the Portuguese, of local production systems, of their spatial organization and of cultivated species. This episode also suggests that in Ataúro the importance of maize has increased sharply over the course of the 20th century. Today, it represents the staple food in the island, along with pigeon pea, and it has supplanted sorghum and millet, two cereals that are now rarely cultivated and are considered as ancestral crops.

Today's agricultural model in the Makadade highlands is that of a slash-and-burn agriculture in small plots enclosed by stone walls. Each family has three to four of these to'os to ensure a food autonomy that is submitted to strong annual and interannual climatic variations, and is supplemented by selling and exchanging staples for fish mainly with Berau (a settlement on the coast). The diversity of cultivated plants is high, with several varieties of pigeon peas or tunis (*Cajanus cajan*), varieties of maize, beans of various species, sweet potato, yam-bean or sinkomás (*Pachyrhizus erosus*), etc. Various ligneous species, moringa, papaya or ai-dila, annone or ai-ata, tamarind tree, and others are

grown here for food, medicinal or technical purposes. Ai-lele (*Ceiba pentandra*) is cultivated for its young edible fruits and for its fiber; ai-kfau (*Hibiscus tiliaceus*), very common near the dwellings, provides fibers formerly used in the manufacture of loincloths; ai-dak (*Schleicheria oleosa*) is omnipresent for its edible oleaginous fruits. As an example, a plot of 400 to 500 m^2 near Makadade included 33 cultivated species, herbaceous or arboreous. Two main groups of plants are found there, the oldest ones, mainly banana, coconut, Araceae and Dioscoreaceae and some local trees as ai-dak, and those introduced since the sixteenth century (Erskine et al., 2016).

These cultivated species are but one aspect of the productive system that incorporates equally important non-cultivated resources. At the forefront of these is the palm *Borassus flabellifer*, the tua which provides the above-mentioned palm wine, actively consumed throughout the year and a central ingredient of local sociability. The fruits are consumed in May - June, the fibers from the leaves are an essential raw material for traditional basketry, and the petioles have many uses, for example to reinforce fences. Palm juice may have constituted an important resource to compensate for the lack of water on the island (Guillaud, 2019; Guillaud *et al.*, 2015). The tua-metan (*Arenga pinnata*), a palm from the humid forests, provides palm wine, but with lower yields and higher fermentation. The ai-tali's (*Corypha utan*) fiber is used for weaving the local tais **hrapin hirik** and also provided a starch, which later has been substituted by cassava.

Beans are another group that combines the spontaneous with the category koto moruk (bitter beans) and the cultivated with the fore. In fact, all of them are cultivated, at least in the situations we have observed, although the koto reseed on their own in the fields. The preparation of beans is very laborious: they have to be washed several times and require a long cooking time and therefore a lot of wood fuel. Both are mixed together when consumed.

Outside cultivated area, forest resources, considered as pertaining to ancient times, are used in periods of scarcity or conflict. Kumbili (*Dioscorea* cf. *esculenta*), a spontaneous but probably formerly cultivated plant in South-East Asia (Purseglove, 1968), yields large tubers sold on the local market. There are several species of mango trees, including haas (*Mangifera indica*) and wild mango (*Mangifera* spp.), probably once a food resource and now a territorial marker. The vine kaleik (*Entada* sp.) produces large flat seeds that must be boiled several times before eating. The trees eri (n.i.), elas (*Ficus* sp.), and meam (n.i.) provide edible fruits, that were traded in the past with the even more precarious people of Bikeli. The status of another group of species, used for food or others, is between protection and cultivation: ai-kiar, *Canarium* spp., ai-kamii, *Aleurites moluccana*, ai-hanek, *Alstonia scholaris*, ai-dila, *Aegle marmelos* among others. The hae (*Imperata cylindrica*), which invades fallow land, is also a key resource because it is used as thatch. The replacement of this biological material by zinc sheets results in the uncontrolled spreading of this herb, thus modifying the agricultural cycle in which a productive plot of land and a useful fallow land followed one another.

Therefore, the confrontation of spontaneous[5] *vs.* cultivated plants does not reflect the functioning of the food system, nor the way in which biodiversity resources were organized according to their uses. Such system was based on a singular arrangement of resources from the forest and from the to'os, as well as a frequent multifunctionality of resources; such a vision is opposed to that of the state which sees a compartmentalization between rights and rules, spaces and practices (McWilliam, 2017).

Plants and their uses

The various domains of material culture rely to a large extent on local plant resources, timber with hardwood species for house construction (ai-na, *Pterocarpus indicus*, ai-heu, *Garuga floribunda*, ai-besir, *Intsia bijuga*...), for the manufacture of dugout canoes (ai-lele, *Ceiba pentandra*), ai-sukaer (*Tamarindus indica*) for tool handles, ai-bubur (*Eucalyptus alba*) for the wood that fuels the forge, etc. One dye used for the ai-tali's *(Corypha utan*) fiber mats is given by ai-tururo (*Sesbania grandiflora*). The wooden plates of Makadade, a traditional exchange item within the island and today a commercialized craft product, are made from the wood of the already mentioned ai-hanek (*Alstonia scholaris*), a species frequent in the to'os. The fruit of ai-ua (*Barringtonia asiatica*) is ichtyotoxic, like the roots of a *Derris* (or *Tephrosia*?) which are sold locally.

Bamboo holds a distinctive place among spontaneous resources. The two species pretum (*Dendrocalamus asper*) and au (*Bambusa vulgaris*), which can reach more than 10 cm in diameter and about ten meters in height, have very versatile uses, as container, construction material, sewage .... They are sold 5 US$ per unit for a length of 4 m. Fafulu, another Bambusoideae, is much thinner and is mainly braided to make house walls. The list of used plants, cultivated or not, could be long. Many of them contribute to local people's autonomy and, a central point, to the local economy, either in monetary form on markets or through exchange. These productions and their economic values remain invisible to the public authorities, as the recent census shows (Timor-Leste, 2020), but they gradually enter the tourist market, locally and in Dili (Silva & Ramos de Oliveira, 2020).

Plants and social practices

Under this section, we will briefly discuss the social practices that contribute to the sustainability of biodiversity. An iconic example is given by the palm areca or bua (*Areca catechu*). Its fruits chewed with lime and betel, malus (*Piper betle*), have stimulating properties and their use is essential to social well-being. The areca palms are usually planted near the houses or, sometimes, in bunches in specific places, where they are individually owned. One also finds in the area of Makadade areca groves of a

[5]. By "spontaneous", we mean plants which presence in a determinate place is not induced by human action or only in an indirect way. Cultivated plants result of a direct intentionality of presence. However cultivated and spontaneous plants are only the two extremities of a gradient of plants management and relationships between a society and their resources.

few hectares, on relatively fertile land; they often combine areca and coconut trees, another important economic resource. Each grove is supervised by a guardian. Although the area is used collectively and belongs to a specific clan, each areca bears marks of its individual ownership. In the largest plantation, Abak Tede, every year in July people come from all over the island and also from Dili to take part in the major feast organized for the harvest. This harvest is strictly regulated and any collection of arec nuts before the formal authorization is punishable. On the given day, the guardian distributes grains of maize to the owners according to the number of trees they own. These grains materialize the number of arec nut infrutescences (they are around 10-12 per palm tree) that will have to be given to the guardian of the common grove (this contribution amounts generally to one tenth of the harvest). The guardian will then sell or exchange some of the nuts for tua or dried fish, and some will be kept to be used for the village's social events. The young people who climb the trees to collect the nuts will be paid with one or two of these infrutescences for their hard work. The rest of the production goes to the owner. What is interesting is that the ownership regime of this property combines different statuses depending on whether it refers to land -collective and clan-owned-, to palm trees -individually owned-, or to production that is used in part to remunerate guardians and climbers, in part the owners, and in part is intended for the community.

Another example of collective land status and of private ownership is provided by bamboos, au or pretum, which are not to be felled without permission. The tapping of tua-metan obeys this same pattern and paadu / tarabandu (prohibition mark) frequently mark their stipes. The felling of large trees for timber is submitted to collective authorization.

Honey harvesting is another example of natural resource management which combines collective and individual levels. On the slopes of Mount Tutunairana in the southwest of the island, the various clans of Makadade and Maker own customary lands whose resources benefit them alone, especially bani ben, ani eekn, honey from the giant Asian honeybee (*Apis dorsata*). In these small valleys, the largest trees host every year migrating bee swarms under their branches. These trees, such as nunu (*Ficus* spp.), are protected and maintained. Once the bee swarms settle, the development of the honeycombs is monitored until the harvest day, a major event where the different lineages of the village get together and meet with their family to cut the combs and share the honey equitably among the participants. This practice contrasts with the individual collection of bani latan, anglatan, which are honey trunks whose harvesting period is less constraint because it depends on the experience and goodwill of their owners (their location, however, should preferably be in a common area, unless they are willing to share the harvested honey with the landowner)[6]. Whether plant resources or honey, it is the articulation of individual and collective rights and responsibilities that contributes to the sustainability of natural resources. These resources are managed on a shared basis within the group according to rules that most likely intertwine customary and governmental norms.

[6] For similar examples of honey harvesting and management in the region, see Césard & Heri, 2015.

Conclusion

The biodiversity present in Ataúro appears to be firmly rooted in a set of technical and social practices according to configurations and dynamics which are not only specific to the island, but also to each group that identifies itself as different from others according to its language, social organization and environment. The approach that we chose focuses on species, ie local or scientific taxonomic entities, but without isolating them from their context; it underlines the diversity of status of these biological resources, from the 'simple use' of a plant, to species or groups of species which have a mythical or historical past, or which organize intra- or inter-group social relations according to customary norms. Therefore, the reference to the components of biodiversity is collective, affective, dynamic, inherent to the functioning of society and it constitutes a local heritage whose tangible and intangible components are intimately linked.

The tourism development project proposed by the government of East Timor is based on two main elements, biodiversity (marine or terrestrial) and the specificity of local production which integrates new channels of trade. The project *capitalizes*, as mentioned above, on the knowledge and pratices of local populations on biodiversity, with the risk of requiring them to meet exogenous management standards rather than making them full stakeholders in this project. These standards respond to visions that reduce their modes of action on nature that are part of a continuum to major contrasts such as wild vs. cultivated, forest vs. agricultural, conservation vs. use, laws vs. customary rights, etc., and risk erasing the prominent features that make up the richness of this local heritage and contribute to the material and social well-being of the inhabitants. At the same time, the project is an opportunity to improve livelihoods and to build resilience to climate change, issues that leave no room for nostalgia.

Scientific research can be part of this dynamic by developing collaborative approaches that would be more inclusive of young people and women. It could propose instruments, digital in particular, which would allow a multi-scalar approaches to the mosaic of territories that constitutes the island of Ataúro; it could strengthen collective and individual innovation capacities in this new context and propose avenues articulating cultural, environmental and agricultural policies.

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Lexicon of cited plants

ah'ran	*Mangifera* sp.
ai-ata	*Annona squamosa*
ai-besir	*Intsia bijuga*
ai-bubur	*Eucalyptus alba*
ai-dak	*Schleicheria oleosa*
ai-dila	*Aegle marmelos*
ai-dila	*Carica papaya*
ai-hanek	*Alstonia scholaris*
ai-heu	*Garuga floribunda*
ai-kafé	*Leucaena leucocephala*
ai-kamii	*Aleurites moluccana*
ai-kfau	*Hibiscus tiliaceus*
ai-kiar	*Canarium* spp
ai-lele	*Ceiba pentandra*
ai-na	*Pterocarpus indicus*
ai-sukaer	*Tamarindus indica*
ai-tali	*Corypha utan*
ai-tururo	*Sesbania grandiflora*
ai-ua	*Barringtonia asiatica*
ana'r	*Tamarindus indicus*
aper hatu	*Chromolaena odorata*
au	*Bambusa vulgaris*
batar-ain-naruk	*Sorghum bicolor*
batar-fatuk	*Coix lacryma-jobi*
bua	*Areca catechu*
elas	*Ficus* sp.
eri	n.i.
fafulu	Bambusoideae
fore	Phaseoleae
haas	*Mangifera indica* *Mangifera* spp.
hae	*Imperata cylindrica*
hali	*Ficus* spp.
haru	*Hibiscus tiliaceus*
ilau karuk	*Lantana camara*
i-leti	*Schleicheria oleosa*
i-mera	non identifié
i-puti	*Gyrocarpus americanus*
kaleik	*Entada* sp.
koto	Phaseoleae
kumbili	*Dioscorea* cf. *esculenta*
laraho	n.i.
lari	*Imperata cylindrica*
luli	Bambusoideae
malus	*Piper betle*
meam	n.i.
muung	*Ficus* cf. *variegata*
pretum	*Dendrocalamus asper*
sinkomás	*Pachyrhizus erosus*
sinkomás	*Pachyrhizus* sp.
tora	*Setaria italica*
tua	*Borassus flabellifer*
tua-metan	*Arenga pinnata*
tunis	*Cajanus cajan*
n.i.	*Derris* ou *Tephrosia* ?

Aegle marmelos	ai-dila
Aleurites moluccana	ai-kamii
Alstonia scholaris	ai-hanek
Annona squamosa	ai-ata
Areca catechu	bua
Arenga pinnata	tua-metan

Bambusa vulgaris	au	*Imperata cylindrica*	hae
Bambusoideae	fafulu	*Imperata cylindrica*	**lari**
Bambusoideae	**luli**	*Intsia bijuga*	ai-besir
Barringtonia asiatica	ai-ua	*Lantana camara*	**ilau karuk**
Borassus flabellifer	tua	*Leucaena leucocephala*	ai-kafé
Cajanus cajan	tunis	*Mangifera indica*	haas
Canarium spp	ai-kiar	*Mangifera* sp.	**ah'ran**
Carica papaya	ai-dila	n.i.	eri
Ceiba pentandra	ai-lele	n.i.	**laraho**
Chromolaena odorata	**aper hatu**	n.i.	meam
Coix lacryma-jobi	batar-fatuk	non identifié	**i-mera**
Corypha utan	ai-tali	*Pachyrhizus erosus*	sinkomás
Dendrocalamus asper	pretum	*Pachyrhizus* sp.	sinkomás
Derris ou *Tephrosia* ?	*xx*	Phaseoleae	fore
Dioscorea cf. *esculenta*	kumbili	Phaseoleae	koto
Entada sp.	kaleik	*Piper betle*	malus
Eucalyptus alba	ai-bubur	*Pterocarpus indicus*	ai-na
Ficus cf. *variegata*	**muung**	*Schleicheria oleosa*	ai-dak
Ficus sp.	elas	*Schleicheria oleosa*	**i-leti**
Ficus spp.	hali	*Sesbania grandiflora*	ai-tururo
Garuga floribunda	ai-heu	*Setaria italica*	tora
Gyrocarpus americanus	**i-puti**	*Sorghum bicolor*	batar-ain-naruk
Hibiscus tiliaceus	ai-kfau	*Tamarindus indica*	ai-sukaer
Hibiscus tiliaceus	**haru**	*Tamarindus indicus*	**ana'r**