

APFT

Working Paper

**The ecological impact of the Wawoi
Guavi Company's logging exploitation
on the territory and society of the
Kasua people**

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Introduction

This report is based on observations made during the month of January 1997, at one of the logging sites of the **Wawoi Guavi Timber** company, on land that belongs to the **Netane** clan of the **Kasua** tribe.

The site is approximately located between the latitudes, S 7 04' and 7 08'52", and the longitudes, E 142 51' and E 142 55'25". (Bloc II)

The Netane clan chief, **Sakapeso Anono**, asked us to personally accompany him through his land so that we could witness, as well as scientifically measure, the extent of damage and the depredation of sacred clan ground resulting from the logging activities.

With our camera and our GPS we arrived at the location.

The first few days were spent at Kamusi, which is the base camp of the company. During one night at Kamusi an unknown person damaged my GPS. From Kamusi, we then traveled up the Guavi River in a powered canoe and after nine hours of travel we arrived at a place pronounced "Sualio" which is settled on top of a prominent river, pronounced "Bamo" in the Kasua language. Sualio became our base camp.

Report Presentation

This report is divided into four parts. The first part will describe the impact of logging on the local flora; the second will look at the fauna; the third part land and water; finally the forth part will measure the amplitude of consequences which logging has brought to the Kasua population.

Objective

This report has been created with the aim to incite the opening of a judicial inquiry or to provoke a counter study to challenge the cogency of our observations.

I. THE IMPACT OF LOGGING ON LOCAL FLORA

Method

After having determined by airplane the immense scope of the logging area, we realized that we needed to choose a methodology appropriate for our situation of being solitary and on foot. Our first few days consisted of taking long walks, of several dozen kilometers, along the logging "highway" giving us a concrete idea of the situation. Thereafter, we were involved in interviewing a number of people and employees of the company.

From our first observations we made an exhaustive detailed account of the land bordering both sides along the highway route. A distance from one side to the other measuring approximately 10 kilometers.

Our methodology choice was appropriate from the simple fact that: quantitatively there was too much damage to particularize and enter into the books, and qualitatively the damage was grossly identical along the several dozen kilometers covered.

This method also had the advantage of demonstrating that:

No matter where we found ourselves in the logging area, we always witnessed the same damage. This tends to prove that it is clearly the practiced logging technique that is causing the damage.

The examples which we provide, are not exceptions, and they can in fact be considered as paradigmatic examples. In other words, to have a complete picture of the existing damage in the logging area, it is sufficient to multiply the numbers giving in the examples by the number of Km² logged.

The Facts

1.1. Site A

1.1.1. Abandoned Tree Logs

We discovered several logs measuring at times up to two meters long and more than 80 cm in diameter! Much of this high quality wood was left in the ditches.

Nine specimens are presented below.

Keil (335)
Soloba (258)
Sasu(11)
Ulaba (355)
Nakene (90)
Okolo (414)
Bokolowa (205)
Monobei (593)
Samota (102)



When we add up the totals this represents several unaccounted m³ logs resulting in non-payment to those who are rightfully owed.

1 The numbers corresponds to the collection numbers of the author. All specimens have been transmitted to the University of Papua new Guinea Biology Department for scientific identification

1.1.2. The Clearing of the Forest: Ecological Effects

From December until the end of February a cyclone wind had been hitting the region regularly. In the heart of the forest, the forest density creates a solid protection, which brakes the blowing wind and protects the weaker trees.

However, once large areas up to 20 meters open up the forest, the trees are made fragile by their exposure to gusty winds.

The forest no longer plays the role of fortress; the solidarity of the forest environment no longer exists.



This delicate state is accented when the most robust trees, those trees which play a barricade role, are the main objects of felling; then the weaker trees, and primarily the very young, are left bare.

The results are that it is enough for a gust or a torrential rain to ripe or break tree trunks in two.

It is a hecatomb!

It is no longer a few trees which die, as justified by natural selection, but dozens upon dozens, equivalent to the impact of logging.

1.1.3. Clearing and Felling (Continuation)

On one lot of land measuring approximately 60m by 30m, we counted close to fifty abandoned dead trees as a result of a felling.

The trees counted consisted of a variety of species:

- 1 Bosunu (141)
- 2 Kena (34)
- 1 Kena Sifonu()
- 1 Honono (74)
- 2 Sibilate (38)
- 2 Batamo (115)
- 1 Samosama (234)
- 2 Kale (8)
- 1 Hehamano (179)
- 1 Kiwe (407)
- 1 Kabokapi (240)
- 2 Okolopa (12; 375)

2 Oyapo (294) - 2 Solobo (258)
- 3 Ima (42) - 1 Feletame (157)
- 1 Meyamino (259) 1 Wahin (390)
 1 Kosuasi (463)
 1 Matalo (269)
 2 Seyu (231)
 1 Toka (123)
3 Sao (91) **TOTAL: : 47 trees TAL : 47 trees**
- 4 Yebe (181)
- 1 Kube i (428)
 1 Sisiya (134)
 5 Kalekale (217)



The company destroyed forty-seven trees representing 28 different species and these trees were never accounted for.

1.1.4. Logs Left in Ditches Due to Professional Negligence

The tree represented in the photo below is an Olofele (249).

This particular tree is regularly infested with ants. None the less it is an important tree which contributes to the maintenance of forest bio-diversity.



people can distinguish and recognize important trees, which inside the hollow contain useful contents (for instance, the highly valued grub).

It would appear that the company technicians are unable to make a selective distinction between tree species, as they possess no qualified knowledge in botany or forest management.

They cut, then they choose

Dozen upon dozen trees are therefore cut and then abandoned on the sides of a clearing.

There were logs measuring up to more than 15 meters! And the company did not account for any of these logs.

1.1.5. Sacrificed Trees

Once a tree is selected for collection, the technicians must then transport the log to a loading location where a bulldozer will pick it up. The cut log will be dragged to this specified location. In the process, this tree will drag across dozens of other trees, which will break under its weight.

The following photograph (Photo 5) provides an example.

We have identified among the 46 broken trees a variety of twenty different species.

The trees counted include the following variety of species:

- Sasueli (166)
- Onane ()
- Onini (419)
- Holopa (388)
- Suki (4)
- Fako (267)
- Sobulehin (138)
- Toka (123)
- Abonamo (223)
- Soasoe (125)
- Feletame (157)
- Awalo (7)
- Tekamo (499)
- Wahin (390)
- Isobulu (189)
- Igusia (159)
- Yebe (181)
- Weyapo (490)
- Kena (34)
- Sekene (149)
- Sao (91)



- Masu (65)
- Bobolobo (1)

1.2. Site B

1.2.1. More Logs !

At Site B we found several logs, some measuring 0,80cm and others up to 1,20m long. However, at this site much was hidden by ground foliage. The abandoned timber, like that at site A, was of very high quality.

In this photograph we can identify:

- 1 Onini (419)
- 1 Bagali (39)
- 1 Sasu (11)
- 1 Nakene (90)



1.2.2. The Effects of an Unbalanced Ecology

In the depths of a valley located at Site B, the effects of an unbalanced ecology caused by the clearing and felling is astounding.

At one particular area, 100 meters long by 100 meters large, we counted 133 fallen or broken trees, from which 115 of those trees were immature.

Among the trees we were only able² to identify 25 different species:

Toka (123) Namei (19) Wale (238) Kale (542) Fetame (157)

Kite (368) tfi "

Kena (34) Sasu (11) P
(141) Yebe (181) Was
Samota (102)

Masu (65) Bolo (356)

Onane ()

Minibi (322)

Kouwakea (320)

Seyu (231)

Gi (30) Atenayan

(47) Ikale (128)

Mata i (9) Nakene

(90;364)



Site B

Conclusion: Some Totals

Based on our findings at sites A and B, it is possible to calculate (in an approximate manner), by 10,000 m² of logged forest, the average number of trees wasted and not remunerated to the Kasua.

Example A:

In our first example we counted **102** wasted trees representing **57** different plant species;

Example B:

In this example we were able to identify 58 different arborescent species among the **137** trees counted.

An average of **119** trees or **57.5** different tree species wasted every 10 000 m².

However, this number only includes trees !

In other words, these figures do not take into consideration the damage caused to the liana, the ferns, the herbage, and other non-arboreal plant species, which are all essential to bio-diversity regeneration.

² Some trees were too young to make a conclusive identification

II. THE IMPACT OF LOGGING ON LOCAL FAUNA

2.1. The Ecological Relationship Flora-Fauna

The photographs demonstrate the damage caused to the ligneous flora. We can conclude that this harm is no different from that experienced by the fauna. Damage to flora does not occur in isolation.

In deed, the tree like all living organisms contributes to the great food chain of life. A complex nutritional dependency relationship links trees to other living organisms.

The disappearance of the forest can cause the disappearance of all animals and other living organisms dependent on the forest for their survival.

The tree in conjunction with other animal, plant and mineral species in the same environment. support an ecosystemic relationship. Together they create and reproduce an original and unique ecosystem. If one component of this system disappears or altered, it is the entire ecosystem as a whole, which can disappear or be forever changed. In addition. any change to the ecosystem will have an effect on all its components following the theory of "feed-back".

The examples below will illustrate these fundamental principles of modern ecology".

2.2. The hole in the forest canopy

The Kasua, in order to protect all the cohabitant populations living under the forest canopy (including mankind) have a traditional fable, which forbids people from disturbing the overhead canopy. It is believed that to do so would lead to destruction.

Today, reality gives true meaning to this myth

With the effects of logging. the protection and camouflage of the forest is no longer available for many animals:

The result is that numerous animals have been forced to flee the logged area or they have been forced to increase their efforts to escape predator attacks (birds of prey. men, and snakes). In fact. clearing and felling assists the predators. Not only can predators see better, but also and above all, predators adapt more easily under a cleared forest canopy.

The Avifauna is Also Under Threat

In the dense forest it is close to impossible to sight a bird with the naked eye. We have to content ourselves with the sounds and songs we hear. In order to observe a bird species and to eventually hunt one, a person must climb up a tree and hide or build a lookout at the foot of a fruit-bearing tree where the birds feed. Whatever the hunting strategy, one has to arm oneself with a great deal of patience. Presently, at the logging site, you need only to lift up your head to discover numerous birds, and even a few very rare ones.

The opening of the forest canopy has brought in new light, which actually agitates human and animal life inasmuch as plant life.

This new climate, particularly more hot. is unfortunately beating down upon the existing fauna and flora producing a variety of reactions. For instance, the flight of certain animal species. a change in the composition of the flora-fauna. and even more tragic, death.

³ The Kasua people have already practiced these fundamental principles of ecology for centuries

2.3. The Roads

Not only do roads contribute to the opening of the forest canopy but they also contribute to other real dangers !

These roads cause fragmentation of many insect populations, which reduces their demography, and therefore proportionately their chances of survival.

The daily passage of trucks and bulldozers compresses the earth and hinders, for example, the earthworm from pursuing its existence of feeding off the soil.

Birds, mammals, and reptiles all trustingly travel across the logging roads, which has led to many deaths. One evening on a small walk, we came upon 4 dead wallabies and several small dead nocturnal mammals.

The noise from logging machinery disturbs the means of communications for many animals and causes larger mammals to actually flee from the area. The Kasua have already complained that they now rarely come across wild pigs or cassowaries.

2.4. The Practices of Under Nourished Employees Causing Ecological Pressures

The natural defenses of an animal is fragile, for some animals a disturbance in their natural defenses means annihilation. Because of this delicate state, the predator activities practiced by men are worrisome. These practices create a certain and measurable threat on the reproduction of the lower land fauna.

2.4.1. Hunting by Employees

At the "Pacific" company logging camp situated in the middle of the forest, we learned from our interviews with company employees, that several workers go hunting at night and on weekends, and that many use guns.

We were told that this situation exists because the majority of workers who are Papuan and Asiatic, strangers to the region, face financial difficulties. These workers work 10 hours a day earn 40 Toa to 2 Kina per hour for hard work and they are not "fed" by the company.

These workers don't have much choice. Either they spend all their hard earned salary on food which they purchase at exorbitant prices in the company stores (usually buying rice and tin meat which offers low calorie energy), or they go into the bush and serve themselves, as we would in a supermarket. Hunting has the advantage of easy access (especially since logging roads has opened up the forest) and above all fresh and free food produce.

2.4.2. Fishing by Employees

Our interviews also revealed a widespread practice of fishing among company employees and their families. There is a common practice for employees to bring their wives to the logging camp and then send them fish along the rivers. According to our sources, many women will spend an entire day fishing with the hope of selling their surplus fish for money in the evening.

A further study would be useful to communicate the exact number of animals and fish caught per employee per week.

It is necessary to remember that this fauna is on land that does not belong to the company. Consequently, the company employees have no right to hunt on this land.

Conclusion

All persons familiar with the forestry environment are capable of observing these fundamental changes and they would come to the same conclusion: The forest no longer protects the animals.

However, our observations only have an indicative value. For this reason it is urgent that we call upon biology experts to further evaluate the extent of damage that the fauna has undergone in order to avoid what is irreversible.

III. THE IMPACT ON LOCAL LAND AND WATER

3.1. Sacrilege of Sacred Ground

Sacred Kasua ground is situated 200m from route RD 56, which is close to the Akilo and Wasalo springs.

Despite notifying the company of the existence of this sacred ground, the company, regardless, opened up a prospecting Line passing right through this land, which is forbidden to strangers.

This sacred ground surrounds the anthroponym called "Wili's Head", which appears in the form of a large oval stone, 25 cm wide and 20 cm high with a cavity inside (See photo below).

The cavity is usually always filled with rainwater, which for the Kasua contains protective virtues.

The myth will explain.

A Netane warrior named Will went ahead of his Clan in search of the trail of their enemy, the Kubiai. Wili after being reassured that the enemy was not near began his journey home. As dusk approached, Will stopped to rest close to the Akilo spring and he fell asleep exhausted.

During Will's sleep he become extremely thirsty, so in order to quench his thirst he cut off his head which rolled to the edge of the water and drank.

His body decomposed immediately, but his head become petrified.

Since that time, whenever the Kasua are at war and are pursued by their enemy, they go to Wili's Head. There they cut a leaf to create a receptacle and with this cup they withdraw a little rain from the head. Then suddenly the rain would fall and erase their trail, protecting them from their enemy.



Comments from Sakapeso, who is also a descendant of Wili:

"Since the company has made the prospecting routes, there is no longer any water inside Wili's Head. I asked the company to make the road elsewhere, and above all not to touch the sacred stone. But, the company did not hear nor listen. Nevertheless the prospecting line passes just above Wili's head. For the grand route, the company has told me that there is no problem since they will simply move the stone a little further from the route.

The company does not understand nor respect our ancestors.

We must stop them."

3.2. The Deterioration of Useful Land by Pollution

Along the roads, since no drainage system was planned or constructed, the falling of tropical rains has dug out ditches along the roadside. The depth of these ditches is created by the intensity of the rains.

In the two photos (See photos below), we see the sons of Sakapeso sitting in a gutter where erosion has caused exposure to ground which is useful and sacred to the Kasua.

The fact that this soil is exposed to the open air can remove some of its unique qualities. For instance, when the earth is washed out by water, the soil loses intrinsic quality or/and the dust and dirt from passing trucks causes the soil to gather exterior pollution.

Alie and the White Earth, *Kabe*

This soil has many usages:

It serves as a ritual and ceremonial white colored body paint.

The women use it to dye the thread for string bags.

And above all it possesses medicinal properties against diarrhea.



Omalie. Sakapeso and the red earth, *Bimi*



This red soil is the most valued soil of the Kasua culture.

It has multiple purposes. Like the *Kabe* earth, the *Bimi* is used as red body paint for initiation and war rituals.

It has numerous medicinal purposes, which the Kasua keep secret.

Indeed, the red color of *Bimi* is considered the symbolic substitute for blood, that is, the substitute of life.

3.3. Waterway Obstructions

During a six-hour walk, we found it impossible to quench our thirst, since all the streams and waterways were obstructed by pieces of wood, plastic and iron.

Clusters of waste products blocked the waterways, resulting in an insufficient flow of water to permit us to drink.

What happens to the animals?

We found tree stumps already in the process of decomposing in the water; therefore, it was difficult for us to identify the species. Species information is vital as several trees have a poisonous sap. If leaked into the water it can be poisonous to fish and other animals, including humans.

Do the company employees know this?



IV. THE CONSEQUENCES FOR THE KASUA POPULATION

We have so far referred to the environmental damage experienced as a result of the logging activities; we now will explain what this damage represents for the Kasua Netane society.

To do this we must first of all understand the nature of the supporting relationship that the Kasua share with the forest environment. Only then can we genuinely measure the true extent of damage.

4.1. The Kasua and the Forest

The Kasua...

The Kasua are a population of more than 600 people distributed into 25 different clan groups. They speak the Kasua language, a non-austonesian language, which is classified within the linguistic family "Bosavi". This linguistic family includes five other tribes of the Grand Plateau (Kaluli, Etolo, Bedamuni, Gebusi, and Onabasulu) with whom the Kasua also share numerous cultural traits.

Nevertheless, the Kasua have an original society. Their geographical location marked by a transition between the Highlands, by way of the Grand Plateau, and the Lower Lands⁴ have lead them to adopt distinct cultural traits, such as the co-initiation of men and women, from neighboring southern societies.

This population, as of late, lives primarily in three villages. The introduction of these villages is the result of missionary activities organized under the authority of the Evangelical Church of Papua New Guinea.

Of the two villages involved in the Wawoi logging contract, only Musula has an actual landing strip. Otherwise, the means of transportation is limited to forest footpaths and water navigation. The three villages are separated by a seven-hour to three-day walking distance.

A Semi-Nomadic Forest Society

Despite the influence of the missionaries, the Kasua continue to live a traditional lifestyle. They live a nomadic lifestyle based on an economy dependent on sago cultivation and hunting and gathering.

Daily the natural resources of the forest provide the Kasua with all the essentials for their means of existence. This includes food (90% of their daily intake of protein is derived from wild products), building materials, pirogue canoes, medicinal remedies, and ceremonial decorations.

In brief, the well-being of the Kasua depends fundamentally on the forests' ecosystem.

Their semi-nomadic lifestyle revolves around the forest. Although the Kasua are today more sedentary, they still regularly leave the village for at least three out of five weeks, to go to their clan land, which is an area ranging from 300 km² to more than 900 km². It is here that sago cultivation takes place. When several metroxylum sago in a swamp area are ripe for cultivation, the Kasua set up camp at the location and settle for a few weeks. Their daily activities are then organized from this camp. The men may leave the camp to hunt and fish in areas located several kilometers away. Whereas the women rotate their day between sago palm cultivation and the collecting of fruit, greens, grubs, and small mammals and reptiles, which contributes to their nutritional needs indispensable to their daily diet. This collection of food also causes the women to travel to particular areas that are frequently located a long way from the camp.

Once the sago cultivation is finished, they abandon the camp and re-settle at another swamp location.

Further adding to their flowing human movement is their practice of garden rotation. The Kasua clear land of various dimensions, but rarely greater than one hectare, using the "slash and mulch" technique. This consists of cutting trees on top of a garden that is already planted with bananas, sugar cane, pit-pit, and pandanus. This method of clearing has the advantage of being adapted to the ecological and climatic constraints of this environment. For instance, on the one hand the trunks once fallen prevent torrential rains from carrying off young plants and on the other hand, their natural decomposition produces organic material that continually enriches the garden soil.

After two years of cultivation, an up rooted clearing is abandoned and the forest is then rapidly restored. This type of fallow practice is an established Kasua rule and it forces the men and women of this society to walk several kilometers in order to open a new garden.

The territory required sustaining a Kasua family couldn't be reduced to an area that only contains a few sago marshes and a few garden clearings. Their spatial distribution needs also requires, as has already been discussed, the requirement for land outside the cultivation area for hunting, fishing, and for miscellaneous gathering.

Also found within their clan territory are multiple sacred locations and landmarks. We identified more than 160 sacred spot localised on only 12 clan's territories! These sacred geography composed by toponymy and anthroponymy, assume a diversity of characteristics, for instance a tree, a water source, a river, a swamp, a rock and even a grotto. It is in these chosen locations and objects that the different spirits live creating the Kasua cosmology⁵.

The Kasua and the Forest: Co-Evolution

The Kasua in the course of their transhumance, they carry nothing with them except for a hatchet, machete, and their piglets. This is a remarkable fact.

This practice unquestionably demonstrates that they are certain of finding at their new forest location, all the necessary items to sustain their existence.

This sense of comfort and security is based on the fact that their subsistence techniques allow the forest ecosystem to reproduce itself in nearly an identical manner at all locations. In other words, the Kasua pertinently know that their system of forest management is a system of auto-regeneration, and that if they respect this system (and pass it on) as their ancestors have done over numerous generations, they will continue to reproduce their society, and their environment.

According to this principle, we can therefore confirm with the leading ethnobiologist, Roy Ellen, "*that forest as presently constituted is the outcome of co-evolutionary processes of which humans themselves are an integral part*". In: Civilisations; Vol.XLIV-No.1-2, p 176, 1997. Brussels.

⁵ The spirits known as the "Isanese" appear to the visible world in the form of an animal, and their meaning is interpreted by a shaman. The Isanese are not the true masters over the game that they embody. However, the spirit does exercise a certain control over the relationship between humans and fauna, since they themselves appear in the real world in the form of an animal. The Isanese to protect themselves have decreed a hunting code of ethics. If humans break this code (for example if a hunter kills too much game or if someone simultaneously eats a pig and a cassowary) penalties will ensue which can be deadly for a hunter and his or her family. The real masters over big game are the spirits known as "Sosu". The Kasua fear these spirits and these spirits live in the mountaintops. It is these spirits which decide whether or not to give the hunter his prey. In thanks, a hunter must present to the Sosu an offering of meat. To abuse hunting will lead to death. There are also the spirits of death. Gulu Hon, which embody the form of a bird known as the Nene, which inhabits particular trees in the forest. These spirits love to share meat with the living, which they do through smoke.

All these spirits play a fundamental role in conserving bio-diversity and this has a dual function. On the one hand, by limiting human intervention these spirits secure protection for numerous biomes of the forest ecosystem, and on the other hand, by making humans respect symbolic ecology ethics it protects fauna reproduction.

Knowledge and Recognition of Biodiversity

The Kasua's precocious care and durable management of the forests natural resources has resulted not only in appropriation methods which exercise control and restraint, but also to the development of a profound system of ecological knowledge.

Their extensive knowledge has in fact developed from several centuries of experience, which is a feat of remarkable acuity. Their knowledge includes animal, vegetable, and mineral types and species, the inter-relationships (parasitic, zoological, nutritional, etc.), and their implications for the reproduction of the forest ecosystem.

The accumulation of their knowledge has resulted in a holistic vision of the sylvan environment. According to which the forest represents a coherent whole where each living species, including humans, is a necessary component in a close inter dependent relationship with each other for their respective reproduction.

Elimination of one species would consequently provoke the system to collapse, including the continuation of humanity within the system.

Today it is clear, that it is this objective and symbolic knowledge that has permitted the preservation of this one of a kind bio-diversity.

Moreover, it is this knowledge and recognition of bio-diversity that we must take into consideration in calculating the most equitable value of the logging damages caused by the Wawoi Guavi Company and the loss of opportunity which this forested territory represented for Kasua society.

4.2. Value Table

In order to clearly demonstrate the complex criterion needed for our evaluation, we have in the first table below successively listed plant species and identified the usage ascribed by the Kasua, the cultural importance, and the ecological importance.

In the last rubric entitled "ecological relations with:" we have set out a list of all the animal species that come into a permanent relationship with the plant listed. This information is also derived from the knowledge of a Kasua Naturalist.

Later, we have presented a second table that will re-examine the list of animals, and describe their cultural and ecological importance.

TREE TABLE

Kasua name + Collection nO	Scientific Name	Usage	Cultural Importance	Ecological Relations With:
Abonamo (223)		<ul style="list-style-type: none"> - To make covering protection from pounding the bark, called "Sao". - Firewood 		Pig; Keba; Cassowary
Atenayan (47)		<ul style="list-style-type: none"> - To build houses: framework and floor. 	"very solid"	Cassowary; Birds: Tumu; Kibiato; Misini
Awalo (7)		<ul style="list-style-type: none"> - To make sago bags, called "elale" - Building material: framework - ceremonial decoration: "Yulusu" 		Pig; Kabeya; Cassowary; Birds: Kibiato;Tumu
Bagali (39)		<ul style="list-style-type: none"> - Firewood - Building material: framework, walls - Canoe: paddles 		Cassowary; Birds:Okape
Batamo (115)		<ul style="list-style-type: none"> - Firewood - Garden: Barrier - Hunting: Ground and treetop lookout - Construction: framework and floor - Construction: Bark for floor and walls - Medicine: sap used against tropical ulcers - Body decoration: sap is like red paint 	Clan name	Cassowary; Birds: Obei; ICibiato; Tumu ; Okapolo
Bobobobo (1)		<ul style="list-style-type: none"> - Construction: pillars - Garden: barriers - Net fishing: pounded bark - Hunting: Ground lookout - Hunting ritual: to reinforce the stomach of hunting dogs (bark mixed with meat) - Practical life: dried wood serves as a torch - Child's game: scratch bristle 	<ul style="list-style-type: none"> - "one of the most solid" - Cassowary tree 	Rat; Cassowary
Bokolowa (205)		<ul style="list-style-type: none"> - Construction: framework and floor - Navigation: canoe - Medicine: sap applied on skin disease 		Cassowary; Bird: Misini;Tumu; Obei; Fish: Tawan-omo; Teliye; Elibane; Kopolo Teliye; Solu Ewalo; Fele Bata
Bolo (356)		<ul style="list-style-type: none"> - Construction: pillars, framework and floors 	Often referre to in songs	Peyo; Kabiya; Wekisa — Birds: Cassowary; Misini
Bosunu (141, 92)		<ul style="list-style-type: none"> - Construction: pillars, framework and floors - Medicine: ingestion of pounded bark against coughs 	"It is a good tree"	Humankind; Cassowary; Birds: Tumu; Kibiato;Misini Hi;

		<ul style="list-style-type: none"> - Hunting: ground lookout - Food: fruits - Practical life: dried wood as a torch 		Bulutiya: Hine; Olosene; Faon
Fako (227)		<ul style="list-style-type: none"> - Construction: pillars, framework, floors - Practical life: resin used as a lamp - food: collect grub which develop during decomposition 		Cassowary; Grubs: Fako Tewoin (168)
Feletame (157)		<ul style="list-style-type: none"> - Construction: framework and floor - Firewood - Hunting: tree lookout 		Birds: Obei; Kibiato Hi
Fetolo (330)				
Gi (30)		<ul style="list-style-type: none"> - Construction: framework and floor - Food: fruits consumed 		Humankind; Bats; Birds: Cassowary; Kotin
Hehamano		<ul style="list-style-type: none"> - Construction: pillars, framework and floors 		Birds: Muni;Yakati; Hi; Kibiato; Tatelasie
Holopa (388)		<ul style="list-style-type: none"> - Construction: seats and chairs - To make large masculine belts, called "matubulu". - This material is used to make fire the traditional way 	for fire-making. Referred in myths on fire origin.	Pig; Bird: Tumu; Kibiato; Yakati
Honono (74)		<ul style="list-style-type: none"> - Construction: framework and floor - Medicine: kleaves heated and rubbed on the head against migraines 		
Igusia (159)		<ul style="list-style-type: none"> - Spirit Tree: An angry tree because it is so small. Parents with children cannot approach this tree. The tree will get angry and throw a spell on the child, preventing the child from growing. 	"It is human! We cannot cut it"	
!kale (128; 8)		<ul style="list-style-type: none"> - Construction: pillars, framework and floors - Garden: digging stick - Sago: Ermine shaft, "hotu" - Food: fruit - Medicine: "fabolo" used against inflammation of the testicles, called "yatolu" 		Topone; Soagele; Cassowary; Bird: Okape
Ima (42)		<ul style="list-style-type: none"> - Sap for lamps - Construction: framework and floors 	"Its' our light"	Cassowary; Bird: Kotin
Isobulu (189)		<ul style="list-style-type: none"> - Construction: framework and floors - Decoration: black body paint derived from the bark - Ritual: Women wash their bodies with the sap to mark the end of a morning period - Cooking: bark used as a container - Medicine: sap applied on the skin to relieve a "baby" rash 		Cassowary; Birds: Tumu; Obei; Grubs: Isobulu Tewoin (164)

		- Food: collect grubs from decomposing tree		
Kabokapi (240)		- Construction: framework and floor - Food: Grubs - Decoration: white facial paint		
Kake (542)		- Construction: pillars, framework, floor		Cassowary; Birds: Muni; Susu; Kibiato
Kalekale (217)		- Construction: framework and floor	"Strong Tree"	Butterflies
Kei (335)		- Construction: framework and floor - Hunting: ground lookout - Food: collection of the mushroom Kelo from rotting trees		Cassowary; Birds: Tumu; Kibiato; Obei; Kelo
Kena (34)		- Garden: a clearing is opened where there is a large Kena, as it functions as a natural barrier - Initiation rituals: in front of the Kena	Sacred tree: it is the home of the most powerful spirit the Isanese, masters over game	Pig; Cassowary; Birds: Mata; Misini; Hi; Obei; Tumu; Bokapi; Hine; Kibiato Tatekasie; Fish: Tawanomo; Teliye; Kopolo Teliye: Solu; Ewalo: Fele Bota; Kenekene: Sabuti- bane; Ewalo Tubulu; Koabea Grubs: Tewoin(1 65)
Kena Sifonu	Kena Variety	- Hunting: ground lookout	Sacred tree	Peyo; Cassowary; Bird: Mata; Kelebo; Aoka
Kite (368)		- Construction: framework and floor	Sacred tree	Bird: Mata; Obei; Hi; Kelebo; Kotin; Tayan: Hayan; the Pasiaba sleeps at the top
Kiwe (407)		- Construction: framework and floor - Food: fruit eaten cooked like pandanus; collection of grubs - Practical life: sap for lighting	It is also used as a mans name	Pig; Humankind Birds: Blackpalm Cacatoes; Tumu; Kibiato; Tokome Grubs
Kouwakea (320)		- Construction: floor, framework, barricade - Hunting: ground lookout	Signifies ancestors, "kouwa" used to mark old gardens	Pig; Birds: Misini
Kosuasi (463)		- Construction: framework and floor - Hunting: ground lookout	"eye of the cassowary"	Cassowary

			to make a hunting look-out - Home of the Isanese	Fish: Tawanomo; Yane; Telie; Elibane; Tubuna; Sa butibane
Namei (19)		- Construction: framework, floor, shelters - Firewood - Food: grub collection		Cassowary Bird: Tumu; Kibiato; Hine; Tayan; hi; Misini Fish: Elibane Grub
Okolo (414)		- Water navigation: canoe	.	Birds: Obei; Tumu; Usu; Keba
Okolopa (12, 375)		- Construction: pillars, framework, floors - Hunting ritual: the sap is given to dogs to improve their sense of scent - Medicine: bark grated over tropical ulcers		Birds: Muni; Heyasele; Kibiato Ants live as a parasite on it
Onane 0?		- Construction: bark used as a ground and diaper lining	The best bark	
Onini (419)		- Construction: pillars, framework, floors		Bird: Muni; Kibiato; Heyasele
Oyapo (294)		- Construction: framework and floors - Firewood		Pig; Humankind
Sabe I (14)		- Construction: framework and floor - Construction: bark for the ground and walls - Food: grub collection		Cassowary Birds: Okape; Obei Hi; Tumu; Kibiato; Muni; Hobo; Wasakea; Grubs
Samosama (234)		- Construction: framework and floor - Firewood		Cassowary
Samota (102)		- Construction: framework - Food: fruits — nuts consumed	Taboo to youths: they will not grow strong	Humankind; Rat (Soakele) Cassowary
Sao (91)		- For making covers - Medicine: sap is applied on tropical ulcers - Food: grub collection	Name: generic term for covers	Pig; Peyo; Kiba; Keba; Cassowary -The fruit is not eaten by birds Grubs
Sasu (11)		- Water navigation: canoe - Construction: pillar, framework, floor, walls, squares - Practical life: latex used as a glue to create arrows and fill in canoe cracks - Medicine: latex on tropical ulcers	"excellent tree"	Pig; Humankind Cassowary; Birds: Okape; Misini; Faon; Kabalio; Tumu Kibiato

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		<ul style="list-style-type: none"> - Cooking: barks used as container - Hunting: ground lookout 		Grubs: Sasu Tewoin (171)
Sasueli (166, 515)		<ul style="list-style-type: none"> - Construction: framework and floor - Firewood —Food: fruits eaten and grub collection —Practical life: resin used for lighting —Ritual to communicate with the spirits, master over big game: Bark is burned and its' strong odor rises to the spirits 	The odor is substituted for the odor of meat offered to the spirits	Mankind; Soakele; Cassowary; Bird: Tumu
Seyu (231)		<ul style="list-style-type: none"> - Construction: framework - Garden: when it is old, the base of this tree has a large cavity. They burn it and then plant in the ashes tabbaco and "Kewato" used to make alcohol - Hunting: ground lookout 	<ul style="list-style-type: none"> - "No I." - Woman bear the same name 	Rat Cassowary
Sibiluate (38)		<ul style="list-style-type: none"> - Construction: framework - Hunting: lookout on the ground and in the tree 		Birds: Tokome; Hi; Kibiato; Obei; Tumu; Okape
Sekene (149)		<ul style="list-style-type: none"> - Initiation ritual: the wood is used to produce a phallic symbol - Marriage: the couple is presented, the fruit which represents a vagina and a carved penis 	<ul style="list-style-type: none"> - Tree is the spirit of a woman - Practice of incantations called "Fabolo" 	Fish: Hemesa Et Swikea; Insects: Sekene (140) which lives in the hollow of the tree-
Sisiya (134)		<ul style="list-style-type: none"> - Construction: pillars, framework, floors and walls 		Bird: Muni; Heyasele; Hi; Okape; Kibiato
Soasoe (125, 100)		<ul style="list-style-type: none"> - Construction: pillars, framework and floors - Practical life: resin used for lights - Food: when starved they eat the leaves - Medicine: for ear aches, heat up a twig and sink it into the ear for only a second and it relieves the pain 	"No. 1."	Topone; Soakele; Keba; Cassowary; Birds: Tumu; Kibiato; Okape
Sobulehin (138, 20)		<ul style="list-style-type: none"> - Construction: frame and floor - Garden and domestication: barriers and pigpen - Firewood - Food: fruits and grubs - Hunting: itumu hobia 		Topone; Cassowary; Birds: Obei; Tumu; Okape; Kibiato; Yakati; Mata
Solobo (258)		<ul style="list-style-type: none"> - Construction: frame and floor, barriers - Food: collection of grubs 		Grub
Suki (4)		<ul style="list-style-type: none"> - Construction: pillars and frame 		
Toka (123)		<ul style="list-style-type: none"> - Construction: frame and floors - Water navigation: canoe - Firewood - Net fishing: bark 		Mankind; Pigs; Rats Hesa (turtle) Fish: Teliye

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		- Food: fruits		
Ulaba (355)		- Construction: frame and floors		Nesting tree for birds Obei, Tayan and Anena Wakalo. (Lizard) makes its nest in the roots
Wasopea (221)		- Construction: frame and floors - Firewood - Water navigation: paddles - Food: grub collection		Pig: Kabeya; Keba Cassowary Birds: Tumu; Kibiato: Obei; Hi; Misini Grubs
Wale (238)		- Construction: frame and floor - Firewood - Food: grub collection		Topone; Bird: Hayan Grubs
Weyapo (490)		- Construction: frame and roof of forest shelters - Practical life: palm used for diapers - Hunting: aneme solola	Planted by humans	Pig Birds: Kibiato; Misini; Tumu
Wena		Hunting: the leaves are used to make a snare. called, "abele walo tea" - (Stairway to descend the spirit of hunted animals); also those snared and trapped - Hunting ritual practiced on young boys for their first hunt or on dogs to improve their sense of scent	Flame to the Sosu spirit, master over game	
Wahin (390)		- Construction: frame and floor - Hunting: ground lookout		Cassowary Birds: Tumu; Kibiato
Yebe (181, 97)		- Construction: frame and floor - Food: leaves raw or cooked - Medicine: bark, called "Ikapo toabolo, used to cure infant anemia - The fibers are used to make string bags and skirts for women - Ceremony: bark for "Bisesagola" worn on the head - Weapons: to attach the rope to the bow - Domestication: rope to tie pigs	"No. 1. For women"	Kabiya; Wekisa Cassowary Birds: Okape; Tumu; Hi; Misini Kibiato Obei; Yeni Kabalio Fish: Elibane; Fasa; Motu; Tupuna; Telie; Kalokalo Tawanomo; Elibane; Sabutibane
Yubu (220)		- Food: fruit — nuts - Water navigation: canoe - Cooking: bark used to contain food	Highly appreciated fruits	Topone; Soakele Cassowary

ANIMAL TABLE

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Kasua Name	Scientific Name	Ecological Relations	Usages	Cultural importance
MAMALS				
Soakele Hanosi	Hydromys Chrysogaster	Monobei Yubu Iwa Takase Isaba Walu Tobalo Walekasi Samota Kobokapo Mane Nakene	- food ; - taboo: for young boys; - hunted: dogs; arrows; traps; - weapon-tool: teeth used as a knife	Myth on sharing the forest resources between humans and animals
Tali	Microperoryctes Longicauda	Pandanus; Hakene Tele; grubs; ants; fish; earth worms, bees	- food; - hunted by arrows and traps	- spirit of the dead
Kopolo	Pore sus scrofea	Kemineme Tobalo Weyapo Oyanekane Seyu Takasi Kena (see note 6 bottom of page) Nakene Toka Yase Onini Tekapo Yebemei + excrements of humans, cassowary and carrion of other animals (Humans included) + eggs + Lizard Usuna Piseni, Kalabe	food; taboo: prohibited to pregnant women, young mothers and young children; semi-domesticated: castrated & ears cut hunted: by arrow & snare; exchanges: for marriage, death & compensation exchanges	- Mythological animal in the myth regarding the creation of animals - <i>Sosu</i> spirit; <i>Isanese</i> spirit; <i>Sele</i> sorcery spirit; - represents and symbolic substitute of man (myth on initiation sacrifices)
Kabeya	Dorcopsis veterum	Leaves: Koama Hakolo Tekamo Ba Ulubuate Nasumona	food; taboo: dangerous for mothers and young children will not be able to walk; hunted: with dogs and arrows weapon: nail used as point of the arrow, Kabeya keabale; decoration: the fur is used to make Abulu; bracelets, Kabeya tubi kapo; ceremony: often referred to in songs and especially in the Yagola; daily: fur used as a cover and mattress; exchanges: marriage	<i>Sele</i> sorcery spirit
Mugupeyo	Spilocus maculatus	Nasemina Safo Ubiane Sokasina Yalo Kume Gi	food taboo: dangerous to mothers & young children believed to provoke anemia; hunted: dogs and arrows; medicine: hip bone disease; this cure can also be applied to dogs, pigs & for anemia; decoration: fur is worn <i>Anabulu</i> ceremony: testicles used as a love charm; exchanges: marriage	<i>Isanese</i> spirit; <i>Sele</i> sorcery spirit; - animal said to be yellow, said to be the sun
Peyo Okopo	Spilocus macu. subspecies	Iwatekane Walekasi Nakene		
Peyo Bobona	Spilocus maculatus goldiei			

6 The names in bold refer to the name of plant species identified and described in the preceding table. We only identified 65 from over 400 species named and identified by the Kasua

Wekisa	Dendrolagus goodfellowi	Babateme Yebe; Kumei Nakene Yebe Mei Kobaletene Ba Kabe Koama	<ul style="list-style-type: none"> - food; - hunted: dogs and arrows; - weapons: tibia bone to make pig traps, Maltase Subala & Kane; - medicine: 1) infant fatigue, the bones are burned and the face is covered with the ashes; 2) anemia, the practice of Ikapo toabolo, a cure which consists of mixing the bones with plant bark, to lie the ill person on top of the mixture and then to cover with lots of bark. After the patient is taken to the river to cover with cold water. - ceremony: referred in Gisalo song; - exchanges: marriage 	<ul style="list-style-type: none"> - <i>Isanese</i> spirit - <i>Sele</i> sorcery spirit - A bone from a Wekisa is essential to an initiation ritual, in fact success depends on it; the animal is then called, Waneka and it is presented to the initiated to become a man. It is with the bone of this animal that the initiated will eat red pandanus for the first time. - master of the cascade <i>Ibila sagulu</i>
Abeloluwe	Pseudocheirops	Kawana Kube Wabe Kena Arnenakasia Boboteme	<ul style="list-style-type: none"> food: for everyone; - hunted: arrow and stone - medicine: cure practiced on skinny children; it consists of burning the animals fur and to cover the child's face with the ashes; - exchanges: marriage 	
Sokope	Zaglossus hruijni	Kawana Wabe Nakene Mane earth worms and Hakenanu	<ul style="list-style-type: none"> - food; - taboo: dangerous to youths who will be unable to walk - daily: the skull is used as a spoon; - magic: to domesticate a captured pig to a specific location they bury pig hairs and skull bones at the location and the pig will not leave 	<i>Sosu</i> spirit of pigs
Pitekini Yakono	Petaurus breviceps	Kalu Kube Kawana Pandanus Mane Hakane Grubs and earth worms	<ul style="list-style-type: none"> - food: rare; - not hunted because too small; - hunt taboo: forbidden to give as food to the dogs or to call it by its name or the hunter will no longer be successful in killing game 	
Kiba	Strigocuscus gymnotis	Hakolo Salo Nakene Kumei	<ul style="list-style-type: none"> food; - taboo: young children will be unable to walk; - hunted: traps and dogs (if it is strong); - decoration: fur used to make the headdress <i>Abulubu</i>; - exchanges: marriage 	<ul style="list-style-type: none"> - <i>Isanese</i> spirit - <i>Ilan holosene</i> spirit who steals children's spirits by blocking their path with a kina shell
Keba	Pteropus neo- hibernicus	.Associated with all fruit trees	<ul style="list-style-type: none"> - food; - taboo: for young children; 	<ul style="list-style-type: none"> - <i>Isanese</i> spirit - <i>Sosu</i> spirit

			<ul style="list-style-type: none"> - hunted: by arrows lighted by a torch; - decoration: wing bone used as an earring; - exchanges: marriage 	
<u>FISH</u>				
Tawanomo	Sooty Grunter Hephaestus fuliginus	Kena Kawana Nakene Yebe Weso Teyin Tatea Yane Sokola	<ul style="list-style-type: none"> - food: fished by spear; by net; - taboo: eggs are dangerous for children they will develop melancholy; - ritual: fishbone used during initiation ritual. The initiated use the bone to taste the sacred red pandanus 	- The tawanomo is the reincarnation of a mythical woman
Teliye	Northern rivers catfish Arius utarus	Kena Wabe Kalu Kasoba Bokolowa Nasumina Name Koyane Kube Wabele Koakoa Semenea (145) Weso Mabalo (148)	- food: fished by net and spear	- participates in the myth regarding the geographical origins of fresh water fish
Kopolo teliye	Broad-snouted catfish Arius latirostris	“ Teliye	- food: fished by net	- This fish has the particular ability to emit a sound above and below water similar to pigs
Soiu ewalo	Comb-spined catfish Arius nox	”” Teliye	- food: fished by net	

4.3. Lost Opportunity

According to the recapitulated tables, we can positively state that of the 65 wood plant species identified:

41.5%	have a nutritional usage,
89.23%	used as building material,
15.38%	have a medicinal usage,
55.3%	used in daily practical life,
24.6%	used in hunting and fishing activities, and
21.5%	have a ritual or sacred function.

Some examples:

- To build a post foundation house to lodge an extended family, 10 meters by 10 meters, the following materials are required.

15 pillars of various dimensions, but rarely under 5 meters long and a diameter of approximately 25 centimeters,
 100 young tree trunks of more than 14 meters long for the floor,
 100 young trunks of more than 12 meters long for the framework,
 10 trunks-bark more than 10 meters long for the floor,
 5 to 6 trunks-bark of 2 to 10 meters long for the walls,

- 15 palm trees of approximately 10 meters long for the platform, and 12 tree trunks of 35 centimeters in diameter and 10 meters long for the platform. - For firewood, one family consumes at least 1/2 m³ of cut wood per day.

- 80% of non-season hunting takes place in lookouts at the foot of a tree where fruits and nuts are consumed by animals.
- To make sago bags, the fibres of one tree are needed to make 3 large sacks.
- One family will consume several hundred grams of resin each month for lighting.
- During the fruit season at the end of one day of gathering, approximately one kilogram of nuts can be collected. The fruits of the forest are greatly appreciated and during the season long walks are traveled for the exclusive purpose of collecting fruit, ex: the Samota or the Yubu.
- "Grub" trees are regularly examined. In fact, the Kasua practice a form of semi-domestication on the various grub tree types, by agitating these trees for grubs to develop. Grubs are considered a nutritional first choice, especially for children, as grubs are associated with the nutrient qualities of mother's milk.

According to the recapitulated tables, of the 74 animal species closely linked to the wood plant species identified:

97%	have a nutritional usage,
39%	have a ceremonial usage,
20%	are used for medicinal and ritual purposes,
- 15%	are used in community exchanges,
13.5% •	used in daily practical life, and
51.3%	represent spirits.

Some Examples:

On average a man will hunt 1 to 3 cassowaries each year and a woman each year will capture one baby cassowary for domestication.

It is exclusively the wild pigs in the forest, which maintains the population of the semi-domestic pigs, and today to get married an average of four domesticated pigs **are required**.

From a "good" net fishing catch more than 300 fish can be caught and distributed to more than 10 different families.

More than 500 bats can be killed for food from a collective hunt.

The regular exchange of wild meat between in-laws strengthens marriage ties and guarantees good relationships. For instance, a young husband must offer his in-laws with several wild animals (i.e. three Kabeya, four Wekisa and Kiba, several Peyo and Tali), after which his in-laws will then offer the young husband wild game.

As demonstrated by the table and the percentages, it is evident that the value of a plant species, like the tree, can not be limited to its market value. The market value is based on a criteria which does not take into consideration the natural and cultural context from which a tree belongs.

Furthermore, to exclusively provide a theoretical scientific value would also be an error.

Today, we must newly define the criteria of valuing a plant species, like the tree, by taking into consideration the ecological and cultural reality of a plant species

CONCLUSION

It appears that the company's felling techniques are less than selective. For one single tree selected and accounted for, no less than 45 trees fell!

We saw numerous trunks and stumps abandoned and unaccounted, which means without remuneration to those owed. The Kasua cannot recover the abandoned wood for firewood or other usage, as their habitation is too far away. However, the company employees benefit! The protection of essential biomes like clear water should be assured through a constant control. A lot of people complain that they were sick after eating fishes; some mothers said that their children got too often diarrhoea.

Because the little river are obstructed by trunks, they constitute additional mosquito's broods.

What's about the Kasua social regeneration? We never saw development activities. On the contrary. We discovered the introduction of drugs and prostitution around their social environment

The report has shown the amount of waste resulting from the company's logging techniques. Their practices in a more general manner demonstrate the company's contempt towards Papuan territory and its' inhabitants.

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