Non-Timber Forest Products – Indigenous ethnobotanical knowledge and livelihood security in West Suriname.

by

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Abstract

Suriname is highly forested and inhabited by Indigenous peoples who are dependent on a diverse range of Non-Timber Forest Products (NTFPs) for their subsistence and income. Traditional knowledge about NTFPs tends to decrease due to fragmented knowledge transmission. The NTFP-containing forests are also of interest to multinational extractive companies. Without well co-managed governance and given the lack of tenure security, livelihoods and biodiversity can become jeopardized. This thesis focuses on two ethnically distinct, Indigenous communities that vary in forest-dependency and length of exposure to acculturation and urbanisation. Children’s ethnobotanical knowledge is compared to determine the causes of ethnobotanical knowledge losses. In addition, land tenure regimes are assessed and ecological impacts from NTFP harvests are determined.

Voucher specimens were collected and ethnobotanical data were obtained from informants. Questionnaires were used to elicit and record children’s ethnobotanical knowledge and that of NTFP gatherers to define important NTFP species. Market surveys were held to determine commercial NTFPs.

It was shown that school attendance and the limited time spent in forests, disrupt the acquisition of ethnobotanical knowledge by children. At the same time acculturation can lead to cross-cultural knowledge exchange, strengthening the communities’ knowledge about NTFPs. The research further demonstrated that the uses of commercial and food NTFPs were known prior to the acquisition of knowledge of plant names, confirming that ethnobotanical knowledge acquisition at a young age happens through observation.

Ecological risks from overharvesting seeds from vegetal NTFPs included trophic cascades: population declines of targeted species and animals that feed on them. For the commercially most traded animals, a decrease in abundancy was noticed as a result of increased local and non-local demands. Because of a sudden high global demand for Potamotrygon boesemani, stocks of this endemic stingray are imperilled. NTFP gathering largely happened outside the communities’ communal forest on State lands under active or proposed logging concessions.
Traditional NTFP practices should be safeguarded by protecting gathering sites and targeted species. Strengthening of Indigenous with government co-management is needed for effective forest governance. Moreover, long-term research is desirable on current NTFP stocks and the impacts of NTFP harvesting on target species and their ecosystem. An immediate moratorium on *P. boesemani* is required to prevent this species from further collapse or potential extinction.
Lay abstract

Communities inhabiting forests often depend on surrounding natural resources for food and income. Due to globalisation forest are cut down and traditional forest knowledge disappears. This study covers two Indigenous communities in Suriname, South America. It compares their wild plant knowledge and determines on which forest products they rely most for economic welfare. The study found that most wild plant knowledge is lost in the first 15 years of exposure to urbanisation but that peer-to-peer exchanges can strengthen plant knowledge. Overharvesting of seeds from wild plants causes a decrease in population size of the plants and animals that feed on them. The populations of commercially traded wild animals were in decline, especially a stingray that only occurs in this river basin. Many of the wild plants and animals were collected from lands that do not belong to the communities. Recommendations are given to improve livelihood security and preserve biodiversity.
Preface

This dissertation is an original intellectual product of the author, Tim van den Boog, except for chapter 4 which was co-authored by Dr. Janette Bulkan and Prof. Dr. Tinde van Andel, who have both supervised me throughout this research. Chapter 4 is currently under revision for publication in the journal Economic Botany. The contents of chapter 3 will be published after graduation. Chapter 3 is not co-authored.

The fieldwork for this research was conducted by the author between January and April 2016 and covered by UBC ethics certificate number H15-02527.
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List of Abbreviations

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<thead>
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<th>Full Form</th>
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<tr>
<td>ACT</td>
<td>Amazon Conservation Team</td>
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<tr>
<td>Ar</td>
<td>Arawak</td>
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<tr>
<td>Ca</td>
<td>Carib</td>
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<tr>
<td>CBD</td>
<td>Convention on Biological Diversity</td>
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<tr>
<td>CITES</td>
<td>Convention on the International Trade in Endangered Species of Wild Flora and Fauna</td>
</tr>
<tr>
<td>FPIC</td>
<td>Free, Prior and Informed Consent</td>
</tr>
<tr>
<td>FAO</td>
<td>Food and Agriculture Organization</td>
</tr>
<tr>
<td>FCPC</td>
<td>Forest Carbon Partnership Facility</td>
</tr>
<tr>
<td>FPP</td>
<td>Forest Peoples Programme</td>
</tr>
<tr>
<td>HFLD</td>
<td>High Forest Cover and Low Deforestation</td>
</tr>
<tr>
<td>HKV</td>
<td>Houtkapvergunning (logging permit)</td>
</tr>
<tr>
<td>IACHR</td>
<td>Inter-American Court for Human Rights</td>
</tr>
<tr>
<td>ICCWC</td>
<td>International Consortium on Combating Wildlife Crime</td>
</tr>
<tr>
<td>ICCPR</td>
<td>International Covenant on Civil and Political Rights</td>
</tr>
<tr>
<td>ICESCR</td>
<td>International Covenant on Economic, Social and Cultural Rights</td>
</tr>
<tr>
<td>ICRMW</td>
<td>International Convention on the Protection of the Rights of All Migrant Workers and Members of Their Families</td>
</tr>
<tr>
<td>IPO</td>
<td>Indigenous People Organization</td>
</tr>
<tr>
<td>CAT</td>
<td>Convention against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment</td>
</tr>
<tr>
<td>CEDAW</td>
<td>Convention on the Elimination of All Forms of Discrimination against Women</td>
</tr>
<tr>
<td>CPED</td>
<td>International Convention for the Protection of All Persons from Enforced Disappearance</td>
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<tr>
<td>CRC</td>
<td>Convention on the Rights of the Child</td>
</tr>
<tr>
<td>CRPD</td>
<td>Convention on the Rights of Persons with Disabilities</td>
</tr>
<tr>
<td>IACHR</td>
<td>Inter American Court for Human Rights</td>
</tr>
<tr>
<td>IUCN</td>
<td>The International Union for Conservation of Nature</td>
</tr>
<tr>
<td>IP</td>
<td>Indigenous People</td>
</tr>
<tr>
<td>ITP</td>
<td>Indigenous and Tribal People</td>
</tr>
<tr>
<td>NB</td>
<td>Natuurbeheer</td>
</tr>
<tr>
<td>NTFP</td>
<td>Non-Timber Forest Product</td>
</tr>
<tr>
<td>REDD+</td>
<td>Reducing Emissions from Deforestation and forest Degradation</td>
</tr>
<tr>
<td>SBB</td>
<td>Stichting voor Bosbeheer en Bostoezicht</td>
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<td>Sr</td>
<td>Sranantongo</td>
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<tr>
<td>Tr</td>
<td>Trio</td>
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<tr>
<td>UN</td>
<td>United Nations</td>
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<tr>
<td>UNCERD</td>
<td>United Nations Convention on the Elimination of All Forms of</td>
</tr>
<tr>
<td>Acronym</td>
<td>Description</td>
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<tr>
<td>UNDRIP</td>
<td>United Nations Declaration on the Rights of Indigenous Peoples</td>
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<tr>
<td>VIDS</td>
<td>Vereniging van Inheemse Dorpshoofden in Suriname // Association of Indigenous Village Leaders in Suriname</td>
</tr>
<tr>
<td>VSG</td>
<td>Vereniging van Saramakaanse Gezagsdragers // Association of Saamaka Traditional Authorities</td>
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Acknowledgments

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West-Suriname yu abi mi ati. De mensen, de planten, de dieren, het eten, de dansen, de grote grijnzen, de kashiri en de Corantijn rivier die een paar meter hoger is komen te staan door de tranen bij het afscheid. Mi wan tak a ala sama fu west Sranangkondre: gran gran tangi fu sor anga ler mi someni sani. Mi wensi mi kon baka esi, wan lobi!
Cyril Henry

Meneer King

Dani Simons
(1987 – 2016, adyosi mi mati)

Mevrouw Kaiwade

Mevrouw Alarama

‘Piki’ Denju Djeneninpe

Mati Ali
Chapter 1: Introduction

This chapter presents background information on Suriname to contextualize the livelihoods of Surinamese Indigenous and Tribal peoples (ITPs). The rich tropical ecosystem has made it possible for many Indigenous communities to exist and build up an extensive amount of ecological knowledge over the past 8,000 years or more. The country’s turbulent colonial history had displaced many of the Indigenous communities and introduced Maroons; descendants of escaped slaves who formed Tribal communities in the interior. Since independence in 1975, the inhabitants in both urban and interior areas have experienced politically and economically unstable times that last until today. The natural resources located on and under the customary lands that the Indigenous and Tribal communities depend on are also of great interest to the country’s economy and international extractive companies. This chapter concludes with the research objectives.

1.1 Biogeography

Suriname is located on the northern coast of South America and is bordered by Guyana in the west, French Guiana in the east and Brazil in the south. Suriname has a forest cover of 94.7% \(^1\). The larger (forest) ecosystem is formed with French Guiana and Guyana, collectively known as the Guianas. With a part of eastern Venezuela, southeastern Columbia and northern Brazil, the Guianas are located on an ancient Precambrian geological shield, known as the Guiana Shield (Figure 1.1) \(^2,3\). The Shield ecosystem is highly forested with mainly mesophytic humid forests. It contains great biodiversity and is home to 47 larger sized rivers that make up almost a quarter of South America’s freshwater flows to the Atlantic ocean \(^2,4,5\). An estimated 40% of the biodiversity in the Guiana Shield is endemic, meaning that 40% of the species solely occur in this region \(^4\). In Suriname, between the edge of the Guiana Shield and the ocean, lies a savanna belt and a stretch of swampy coastal plain where 90% of the population is located, see Figure 1.1 between the red line and the coast. The main forest types of Suriname are: 1) high dryland forest (rainforest), with 13.3 million hectares; 2) high and low swamp forests, covering over 700,000 hectares; 3) marsh forest, which make up 468,000 hectares, and 4) high savanna forest
with 132,000 hectares. Extractive industries mainly operate in the pristine high dryland forests, which contain many valuable hardwood species.

Figure 1.1: The Guiana Shield in northern South America. Borders after Gibbs & Barron (1993). Map modified from https://commons.wikimedia.org/wiki/File:Guiana_shield_map-fr.svg

1.2 Indigenous and Tribal peoples

1.2.1 A brief history

The British were the first to colonize Suriname and bring the institution of slavery to the country in 1651. They ceded the country to the Kingdom of the Netherlands in exchange for Manhattan in 1667. Over the following 200 years, a total of approximately 200,000 Africans
were shipped to Suriname to work under harsh conditions, mainly on coffee and sugar plantations. In the early colonial period, most of the estimated 60,000 to 70,000 Indigenous peoples – whose ancestors had occupied those lands for many centuries – fled from the coastal regions into the interior. While the number of African slaves kept growing in the 18th century, an increasing number of enslaved people started to escape the plantations and established Tribal Maroon communities in the interior. The colonizers tried to capture the Maroons and conquer their settlements, which led to bloody battles. Not only did the Maroons fight organized battles against the Dutch colonizers, but Indigenous communities also started guerilla actions, whereby more slaves were able to flee the plantations.

In the second half of the 18th century, after more than half a century of fighting, several peace agreements were signed between the Dutch colonial government on one side and Maroon communities and Indigenous peoples on the other. These treaties stated that ITPs were allowed to use and sell forest products and to inhabit all areas at more than 10 hours travel from the plantations. The customary laws of the Indigenous and Tribal peoples were recognized in these peace treaties, however it was the colonial government that retained power to break or renew these rights. In the 1830s, treaties with the Maroon communities were indeed renewed and their use of land was further confined. The new agreements stated that no Maroon community was allowed to migrate, therefore their territories had to be mapped and demarcated. From the mid 1900s the colonial government started to increasingly exploit natural resources in the interior.

More recently, mining and logging concessions took place on customary lands. ITPs started to realize how few rights and little power they had over their own territories. When Suriname became independent in 1975, about 40,000 Surinamese migrated to the Netherlands. In Suriname the political field was rather unstable as two military coups and a military dictatorship were in effect between 1980 and 1991. In 1986 a civil war, known as the Interior War, was initiated by a series of attacks by Maroon insurgents who acted for recognition of their customary laws and lands. The military government fought against the Maroon insurgents and various smaller Indigenous groups until the war officially ended in August of 1992, when the Lelydorp Peace Accord was signed. Some 10,000 Maroons and Amerindians were displaced.
from their homes and many institutions such as hospitals were closed during the war leading to higher mortality rates\textsuperscript{10}.

1.2.2 Current territories

The interior forests of Suriname are currently inhabited by 4 self-identified Indigenous peoples (Amerindians) and 6 Tribal peoples (Maroons)\textsuperscript{8}. Their living areas are shown Figure 1.2. This map excludes the usufruct areas where they hunt, gather NTFPs and carry out other traditional activities. The distinct Amerindian groups who inhabit the rural and interior of Suriname are: 1) approximately 3500 Arawak (Lokono) people, inhabiting coastal regions from West to East; 2) Carib (Kaliña), with about 2500 people, inhabiting mainly the central and eastern coastal regions; 3) Wayana, inhabiting the central and eastern part of the southern interior with a population estimated at 500 individuals; 4) Trio, inhabiting the southern central and western part of the interior with a total population of about 1500 individuals\textsuperscript{8,9,12}. All the Indigenous communities together make up less than 4% of the Surinamese population\textsuperscript{8}. The Tribal peoples – Ndyuka, Saramaka, Aluku, Paramaka, Matawai and Kwinti Maroons – mainly inhabit the central and eastern parts of the interior and make up approximately 15% of the total Surinamese population\textsuperscript{8}.

Given the ecosystems they are surrounded by it is self-evident that these ITPs are dependent on the surrounding forest for resources. These resources include water, timber, wildlife and numerous other NTFPs as daily subsistence sources. The level of forest-dependency, traditional agriculture and hunting varies greatly among Suriname’s local communities depending on distance to larger cities, access to markets and the economic situation.
Figure 1.2: Map of living areas of Indigenous (Amerindian) and Tribal (Maroon) communities by tribe in Suriname, user and ancestral territories are not displayed. 
1.2.3 Traditional authorities

All Indigenous and Tribal peoples have traditional authorities in place, who used to work independently from the state. Currently, traditional authorities are recognized and paid positions by the government of Suriname. In general, a *granman* is the highest traditional authority, followed by *hoofdkapiteins* (head captains), see Figure 1.3. *Kapiteins* are assisted by *basyas*. Arawak and Carib Amerindians in Suriname do not have a *granman* in place.

![Diagram of traditional authorities](image)

Figure 1.3: Traditional authorities of Indigenous and Tribal Peoples in Suriname. The *granman* is the highest authority, a *basya* the lowest.

1.3 Non-Timber Forest Products

Forest dwelling peoples have derived a vast amount of resources from (tropical) forests for numerous purposes over the past millennia. While living in close harmony with nature, these peoples have built up an extensive amount of knowledge about their habitat. From generation to generation this knowledge is transmitted in order to survive the resource rich, though dangerous forests. Knowledge about plants and animals in particular have been, and still are, vital to sustain the livelihoods of millions of forest-dependent people \(^{13,14}\).

All wild plant and animal products that are derived from forests or other natural and man-made vegetation types, except for commercial timber, are referred to as Non-Timber Forest Products (NTFPs) \(^{15}\). This includes the roots, flowers, any resin, a piece of bark or any other part of wild plants and trees. Also insects, fish and monkeys are included, as well as stones with spiritual value. NTFPs are important sources for food, for people themselves and also for their domesticated animals. Numerous NTFPs serve as medicine that are either used fresh, prepared in some way or stored. Other NTFPs may serve as ornaments, building materials or tools \(^{13}\). NTFPs are also widely used for cultural and spiritual practices. Next to tangible products, some
plants and other forest products are said to have intangible, magical powers \(^{16,17}\). These magical plants (or objects) are used, for example, to extend one’s powers while hunting, bring luck in love, increase crop yields or to protect one’s household against bad spirits \(^{16,17}\). Such plants are referred to as charm plants and are believed to “have spirits or soul-matter which can detach from the physical component of the plant” \(^{17}\).

The above-mentioned uses of NTFPs are mainly focused on the subsistence uses of NTFPs. Over the past decades however, an increasing demand for forest products has been seen on a local, regional and international scale \(^{13}\), stimulating the commercialisation of (tropical) NTFPs. Mainly for poor and remote forest-dwelling communities, the sales or processing of NTFPs can alleviate poverty through direct sales or handling processes \(^{13,18}\). These sales can be worth up to hundreds of US dollars on a yearly basis \(^{19}\). The increase of NTFP commercialisation is also linked to the greater need for cash in local communities, who are becoming increasingly dependent on the market economy \(^{19}\). These commercial NTFPs range from wild animals that serve as food or show piece \(^{20}\), to a wide variety of exported medicinal wild plants \(^{21}\) or forest products that have been converted into cosmetic products. Also, any wild plant sold on local or regional markets, woven baskets, jewellery made from forest seeds, wild-collected honey, fuelwood or wild mushrooms \(^{19}\). The drive to find NTFPs for cash instead of subsistence purposes changes the overall knowledge about wild plants that local communities possess.

Traditional knowledge about NTFPs held by Indigenous peoples has shifted and declined over the past century for various reasons. Influence of colonizing farmers, missionaries and government personnel, conflicts over land rights, acculturation and urbanization continue to cause social, economic and environmental changes to Indigenous communities and their territories \(^{8,22–25}\). Some losses of NTFP knowledge are due to changes in the livelihoods and lifestyles of Indigenous peoples. Certain NTFPs are substituted by modern goods that are less time-consuming to prepare, more effective and considered up-to-date \(^{24}\), others have become more important due to their commercial value. Although new charm plants have been introduced – like the ‘cash bina’, ‘Georgetown bina’ and a ‘gold mine bina’ – youngsters fail to believe in the powers of these plants \(^{17}\). As a result, formerly important knowledge about NTFPs
becomes superfluous and can be quickly forgotten or deliberately rejected when no longer used in (traditional) activities.

In Suriname and the rest of the Guianas, successive ethnobotanists have documented NTFP uses of by Amerindians for over a century. Among the early ethnobotanists documenting plant uses by Amerindians in Suriname are Ahlbrink (1931), Stahel (1944) and Ostendorf (1962)\textsuperscript{26–29}. Their work was continued by a new generation of ethnobotanists from the 1990s onwards. Reinders (1993) did research on medicinal plant use among the Warao in Guyana\textsuperscript{30}. Extensive fieldwork was done by van Andel among Arawaks, Caribs and Waraos in northwest Guyana on both subsistence and commercial NTFPs\textsuperscript{31}. More recent research among Guianas’ Amerindian tribes include a study and a review paper on magical charm plants\textsuperscript{16,17} and a study on variation of usage of NTFPs among different ethnic and socioeconomic Makushi, Arawak, and Wapishana peoples and with distinct socioeconomic status\textsuperscript{32}. Ruysschaert documented NTFP uses among Powakka Awaraks (van Andel & Ruysschaert, 2011). Among the Wayana Amerindians, Chapuis (2001) has documented several charm plant uses\textsuperscript{33} and the Amazon Conservation Team (ACT) Suriname produced an ethno-ecological baseline study including some relevant NTFP uses among the Wayana and Trio\textsuperscript{34–35}. Extensive ethnobotanical fieldwork was conducted by Plotkin and Hoffman amongst the Trio on NTFP names and uses\textsuperscript{36,37}. Still, in various Indigenous areas of Suriname, traditional knowledge on and use of NTFPs has never been documented.

1.4 Forestry sector

The lands that the ITPs use for the collection of their NTFPs are also of interest to many multinational logging and mining companies. In order to understand how this legal pluralism system works, it is necessary to clarify some practices of the Surinamese forestry industry as well.

1.4.1 Institutions and laws

In order to protect natural forest resources and to control extractive industries, Suriname has laid out well-developed policies and management systems in different national Acts that are
administered by several governmental institutions. The Foundation for Forest Management and Forest Control (in Dutch: Stichting voor Bosbeheer en Bostoezicht, SBB) is the main institution that enforces the Forest Management Act of 1992. This Act includes regulations about the harvesting of trees and their export. The SBB manages all logging concession licenses for private landowners and extractive companies. In 2003, the National Forest Policy document was issued, which has laid out national strategies to enhance the national economy through forestry practices.

Another important governmental institution is the Department of Nature Protection (in Dutch: Natuurbeheer, NB), which controls nature reserves and protected areas including wildlife as laid out in the Conservation Act and Game Act established in 1954. In March 2006, a new national biodiversity strategy report was published by the Ministry of Labour, Technological Development and Environment. The report contains the national guidelines to protect and sustainably conserve Suriname’s rich ecosystems in order to fulfil their commitments to the Convention on Biological Diversity (CBD). However, even the mere mentioning of Indigenous and Tribal Peoples is absent in this report.

1.4.2 Forest tenure types

The forests in Suriname cover 14.8 million hectares in total and are divided into several statutory tenure types:

- 5.32 million hectares are designated for natural production, which is meant for commercial harvesting of timber; this includes:
  - 1.73 million hectares for 117 logging concessions, roughly 11.7% of the total forested area; 407,000 hectares hereof are FSC certified;
  - 0.61 million hectares have been allocated to 88 Indigenous and Tribal Peoples’ communities as communal forests;
  - 2.98 million hectares are not under active concession
- 2.19 million hectares are official protected forests;
- 7.29 million hectares have neither a logging designation nor a protection status
The policies governing a communal forest are of great importance for hinterland communities. The Forest Management Act of 1992 introduced tenure regulations for communal forests as “...forests for the benefit of forest peoples living in villages and settlements in tribal societies, and that serve to meet subsistence needs of food and forest products, as well as for the purpose of possible commercial timber extraction, the collection of Non-Timber Forest Products, and land clearing for agricultural use” 42. The communal forest title looks promising since even though it does not accord ITPs full legal rights over their lands. It provides the assurance that these lands should benefit the local communities. A communal forest title allows a community the right to practice agriculture for the community’s subsistence needs, gather vegetal and animal Non-Timber Forest Products (NTFPs) and to commercially harvest timber, either directly or as rentiers 7. As rentier, a community allows a company access to their communal forest to harvest natural resources and for which the company pays the equivalent of a royalty. In reality, communal forests cover only a small portion of customary territories, the lands claimed by Indigenous and Tribal communities in accordance with their customs and traditions. Customary territories are estimated to have a 50% overlap with extractive concession areas in Suriname 8.

1.4.3 Deforestation

Suriname belongs to the High Forest Cover Low Deforestation (HFLD) countries which collectively cover about 18 % of global tropical forests 4. For a country to be categorised as an HFLD country, it has to meet the conditions of having a national forest cover higher than 50 % and a deforestation rate lower than 0.22 % per year 43. With about 80 % 44 to 94 % 45 (the latter is data provided by SBB to the FAO) of land area covered in forest and a deforestation rate between 0.03 % to 0.04 % per year 46, Suriname easily meets these standards 40. Taking into account that these numbers are from 2012, that is, five years ago, and that the production of roundwood had grown by 39.9 % in 2014, the deforestation rate would have been around 0.06 % in 2014. Even after adding the potential 33 % of unregistered, illegally harvested roundwood (see section 1.4.5), deforestation rates will still not tip the HFLD threshold. Suriname has retained this low deforestation rate mainly due to its low populace and the practice of selective
logging of only a few commercially-desirable species. As 90% of the population inhabits the coastal regions, infrastructure in the interior forests is limited and transportation of the heavy timber logs is expensive.

Extractive industries are the main driver behind deforestation and forest degradation in Suriname. The country’s largest extractive industries are gold, timber and bauxite, executed by both small-scale miners and loggers, as well as (multi-)national mining and logging companies. These companies have property rights over large concession areas for which they pay minimum annual fees and royalties to the government. The annual fees per hectare lie between US$ 0.009 and US$ 0.036, depending on the size of the concession. Royalties for A-graded wood are US$ 6,- per m³ and for grade B US$ 5.50 per m³. Among the largest logging companies are numerous Asian players, who were responsible for about 90% of Suriname’s annual rough wood export in 2014.

Agriculture, energy production and housing development are other minor drivers of deforestation in Suriname. The agricultural sector accounts for both modern and traditional operations. Traditional agriculture in the interior happens through rotational or shifting cultivation or slash and burn practices. ITPs depend on these techniques for subsistence and are therefore likely to continue these practices. Traditional shifting agriculture takes up an estimated 246,700 hectares in total, whereas slash and burn is estimated at 16,400 hectares.

The current low deforestation rates may last for a while in spite of the fact that timber export has been increasing over the past two decades and the agricultural sector is about to expand. Suriname has an estimated 1.5 million hectares of arable lands on the treeless coastal plain of which just 10% is being used. Therefore, an increase in agriculture does not consequently mean an increase in deforestation, nor expansion into ITPs’ customary territories. The Surinamese government has signed a Memorandum of Understanding (MoU) with both an Indian and Chinese company to expand current agricultural operations.

11
1.4.4 Timber harvesting procedures

The SBB controls all timber harvesting activities, which can only find place on (short-, medium- or long-term) concessions, in communal forests or on lands that are held under an Incidental Cutting License. Harvesting activities can only begin after a harvesting management plan is approved, which should include an inventory of species with accompanying size and spatial data. According to the Reduced Impact Logging system, ecological impacts by tree felling should be minimized. For every tree that is felled, a unique label number is supplied beforehand by the SBB. For any following procedures, the label number has to be entered. Therefore, in theory, the unique number shows where a log is felled, when and where it was in transport (through forest-service checkpoints) and at which mill the log has been processed. However, Suriname scored 36 out of 100 points in the Transparency International’s Corruption Perception Index in 2015 and performed no better in previous years. This is an indication that the government has relatively weak governance and that official documentation is often unreliable and not easily accessible.

1.4.5 Illegal logging activities

Illegal logging activities and corruption in the forestry sector in Suriname are undisputed. An average of 15% of the total roundwood production was illegally produced and detected between 2000 and 2005. This figure takes seized and fined roundwood into account. Another estimated 20% (with up to a maximum of 33%) of total roundwood is assumed to be undetected, illegally produced. This timber enters the markets unregistered. There has not been written much about illegal logging in Suriname. However, news articles help to clarify the poor governance and legality of the industry.

Just in the first quarter of 2017 the SBB and its employees have been in the spotlight several times. In March 2017, the national fraud police stated that they have an ongoing investigation of current fraudulent procedures regarding concession allocations by SBB. According to the report, large sums of money are paid to circumvent official concession request procedures. Consequently, the secretary of the board of directors has officially resigned. In late January
2017, the minister of Physical Planning, Land- and Forestry Management, Steven Relyveld, was laid off, being suspected of fraudulent forestry practices. Under his administration, various large concessions were given out to Chinese businessmen and in the last week of his tenure four other concessions were allocated (to Tong Seng Wood NV, Suriwood Lumber Company and April International), covering 95,000 hectares. Relyveld had replaced a previous minister who was suspected of corruption as well. Earlier in January 2017, two SBB foresters had neglected to halt the transportation of illegal logs close to Zanderij, Suriname.

1.5 Land rights and tenure security

Having abandoned their nomadic lifestyle, many Indigenous communities’ traditional subsistence lifestyle practices became concentrated around their villages. Agricultural fields were located close to their homes, with hunting and NTFP gathering sites in a wider perimeter. Local communities with traditional lifestyles need their customary territories for their individual and collective wellbeing. Without access to such a territory local forest-dependent communities cannot provide for their traditional subsistence life. Their customary territories are often owned by other people or institutions (e.g. governments), which set rules about who can use these lands and the resources it contains. I define land tenure here as the ‘set of institutions and policies that determine locally how the land and its resources are accessed, who can hold and use these resources, for how long and under what conditions’.

Land tenure security depends on three main principles: 1) whether land rights are protected by a third person or institution, who is able to punish violators; 2) the breadth of rights one possesses over the land and resources, and; 3) the duration of a lease or ownership to the land.

Since colonial times many Indigenous peoples around the world have struggled to gain title over their territories, and no less so for the communities in Suriname. Finally in 1992 after the Internal War, the Lelydorp Peace Accord stated that Indigenous peoples and Maroon communities would get title over the lands requested by them. However, most rights and land titles that were promised are still not issued and the legal status of the Indigenous Peoples and Maroons has not improved or changed. All governments that have ruled since 1991, have
failed to improve tenure security and acknowledge land rights for Indigenous Peoples and Maroon communities in Suriname.\(^7\)

The report ‘Who owns the world’s land?’ from the Rights and Resources Initiative (2015), shows that Suriname, up to today, is the only country in Central and South America that has 0% of their lands either designated to or owned by ITPs.\(^5^7\) The report based its findings on the judgment issued in favour of the Surinamese plaintiffs, in the Case of Saramaka People of Suriname by the Inter-American Court of Human Rights (IACHR). That judgment states that ‘Suriname does not have a statutory or regulatory framework that recognizes Indigenous Peoples’ or local communities’ rights to own or control land’\(^5^7\). Indeed, the Constitution does not take the existence of ITPs into account and their customary legal and tenure systems are not protected by national law.\(^1^1\) Moreover, land titles that are accessible to ITPs are (i) individual leaseholds which are intended for building, planting or recreation (useless from an Indigenous collective point of view), and (ii) communal forest titles.

Communal forests are definitely areas designated for Suriname’s local communities. It is likely that the Rights and Resources Initiative’s report did not recognize this fact because ‘Suriname has no community-based tenure regime that recognizes a robust enough bundle of rights to constitute community ownership or control’ under RRI’s methodology. As noted below, communal forests have been rescinded by the State and awarded to extractive companies.

The communal title is a form of land decentralization and is managed by the highest present traditional authority, who is elected by their local community and recognized as occupying a governmental position. The traditional authority (or his/her assistants and/or council) needs the consent of the village to allow third parties such as logging and mining companies on their communal lands. However, several aspects are not in accordance with international law. Amongst others, the communal forest title contradicts Article XVIII.2 of the American Convention on Human Rights (ratified by Suriname in 1986) which states that ‘Indigenous peoples have the right to the legal recognition of their property and ownership rights with respect to lands, territories and resources they have historically occupied, as well as to the use of those to which they have historically had access for their traditional activities and livelihood.’ Only a small percentage of the areas that are asserted as customary territories have been titled
as communal forests. Additionally, in Suriname’s *Handbook Of Mining Laws And Regulations* the lesser rights of communal forests are explicitly mentioned: “…the government will further regulate the utilization and the control of the communal forest”.

Any disputes that arise from overlapping territorial claims are usually settled in favour of national or international extractive companies that are backed by State-issued permits. Such evidence is apparent in several cases in which communal forest titles were nullified by title allocations to concession holders. In the Brokopondo district a communal forest title was taken and given to the international gold mining company Iamgold. Likewise in the district of Marowijne, communal forest titled lands were cancelled and the lands allocated to a Chinese multinational investing in large-scale palm oil plantations. One of the main laws that upholds these revocations of communal forest titles is Article 41 of the Surinamese Constitution, which states that the nation has the inalienable right to take full possession of all natural resources for any economic or social development. Article 41 thereby does not recognize, amongst others, Article 14 of the ILO Convention 169, which states that: “Ownership and property rights on the lands [Indigenous Peoples] traditionally inhabit must be recognized. Moreover, in some cases special measures are needed to protect the rights of these peoples to use the lands where they not only live, but also traditionally have access for their traditional subsistence activities …”. ILO Convention 169 has not been ratified by Suriname so the government does not have to implement those regulations. Pressure from ITPs on the government to recognize the normative nature of the regulations set out in the ILO Convention 169 to protect their customary territories have failed so far. A full overview of international conventions, treaties and declarations presently signed and/or ratified by Suriname is shown in Table 1.1

Suriname, which has been a member of the Organization of American States (OAS) since 1977, ratified the American Convention on Human Rights in 1986. In doing so, it accepted the compulsory jurisprudence of the Inter-American Court of Human Rights. However, to date the government of Suriname has failed to implement and execute international jurisprudence. Ratified conventions, treaties and declarations are being neglected and individual and communal forest land titles are limited in the extent to which they safeguard collective land rights against extractive concession holders or the national government. As a result, local
communities enjoy weak rights with (or without) a communal forest title. Several land rights cases have been brought by ITPs against the Government of Suriname to the Inter-American Court of Human Rights (IACHR). In 2007, the IACHR ruled that the Saramaka people form a (Tribal) collective through their individual rights to culture and religion and that the State had violated the Saramaka’s right to property and the right to judicial protection. The court stated that: “The State shall delimit, demarcate, and grant collective title over territory of the members of the Saramaka people, in accordance with their customary laws.” More recently, in November 2015, the IAHCR found the state of Suriname guilty in the case of ‘the Kaliña and Lokono Peoples versus Suriname’ on multiple grounds. Suriname had failed to recognize the collective territorial rights of the two Indigenous tribes and had allocated customary territories to non-Indigenous individuals and bauxite mining companies (Alcoa and BHP Billiton). Although the court’s orders are binding, the court itself lacks an enforcement mechanism and so cannot enforce their jurisprudence. Suriname has so far failed to implement the orders that were ruled by the IACHR.
Table 1.1: Relevant international human and Indigenous rights agreements for Suriname.

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<tr>
<th>Name</th>
<th>Created</th>
<th>Ratified/adopted</th>
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<td><strong>Conventions, treaties and declarations of the United Nations</strong></td>
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<tr>
<td>Universal Declaration of Human Rights (UDHR)</td>
<td>1948</td>
<td>adopted</td>
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<tr>
<td>International Convention on Elimination of All Forms of Racial Discrimination (ICERD)</td>
<td>1965</td>
<td>1984 (ratified)</td>
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<tr>
<td>International Covenant on Civil and Political Rights (ICCPR)</td>
<td>1966</td>
<td>1977 (ratified)</td>
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<tr>
<td>International Covenant on Economic, Social and Cultural Rights (ICESCR)</td>
<td>1966</td>
<td>1977 (ratified)</td>
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<tr>
<td>The Convention on the Elimination of all Forms of Discrimination Against Women (CEDAW)</td>
<td>1979</td>
<td>1993 (ratified)</td>
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<tr>
<td>Convention against Torture and Other Cruel Inhuman or Degrading Treatment or Punishment (CAT)</td>
<td>1987</td>
<td>Not ratified</td>
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<tr>
<td>Declaration on the Rights of Indigenous Peoples (UNDRIP)</td>
<td>2007</td>
<td>2007 (adopted)</td>
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<tr>
<td><strong>Conventions within the Inter-American system</strong></td>
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<tr>
<td>The American Convention on Human Rights</td>
<td>1969</td>
<td>1986 (ratified)</td>
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<tr>
<td>CARICOM Charter of Civil Society</td>
<td>1997</td>
<td>adopted</td>
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<tr>
<td><strong>Environmental treaties</strong></td>
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<tr>
<td>Rio Declaration</td>
<td>1992</td>
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<tr>
<td>Convention on Biological Diversity (CBD)</td>
<td>1992</td>
<td>1996 (ratified)</td>
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<tr>
<td>International Tropical Timber Agreement (ITTA)</td>
<td>2011</td>
<td>2013 (ratified)</td>
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<tr>
<td><strong>Other international conventions and declarations</strong></td>
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<tr>
<td>International Labour Organization (ILO) Convention 169</td>
<td>1989</td>
<td>Not ratified</td>
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1.6 Research hypotheses and questions

This research was conducted in two Indigenous communities in West Suriname. The village of Apoera is inhabited by an acculturated, predominantly Arawak community that has been exposed to non-local influences for several decades. The second community is a more forest-dependent Amerindian Trio community, who settled in Sandlanding in 2002. As the two communities are separated only by a 40-minute walk, they hunt together at times and their children attend the same school in Apoera.

This study location, further explored in Chapter 2, has been chosen for various reasons. The Trio community in Sandlanding moved recently to this less remote territory and is therefore not represented in any literature. The two communities are ethnically different, vary in forest-dependency and the length of exposure to urbanization and acculturation. This site is therefore ideal to compare NTFP knowledge and observe potential cross-cultural knowledge transmission. Chapter 3 covers the topic of (differences in) NTFP knowledge that is held by the children (age 4 to 14) of both communities. The following hypotheses are posed:

1) Trio children possess more knowledge about NTFPs than their peers from Apoera, because the Trio are more forest-dependent and have been less exposed to acculturation and urbanization;

2) Cross-cultural knowledge transmission finds place between the community of Apoera and the Trio community in Sandlanding;

3) Nourishing and economically important NTFPs are better known than medicinal NTFPs;

4) Knowledge about NTFPs is similar for boys and girls;

Furthermore, there is little knowledge of which NTFPs have been commercialised in this region, who these products are sold to and if these communities’ livelihoods depend on the sales of NTFPs. Chapter 4 covers the most important commercial NTFPs, assesses the land tenure status of the areas NTFPs are collected on and evaluates potential threats to the ecosystem as a result of NTFP harvesting. In this chapter, the following research questions are posed:

1) What is the status of the Indigenous communities’ land tenure over their customary territories in West Suriname?
2) Which wild plants and animals are most important for the communities’ economy?
3) When and where are these NTFPs harvested?
4) Does the harvest threat the targeted species’ populations or the ecosystem?
Chapter 2: The study area and involved communities

2.1 Study site

The Kabalebo jurisdiction of district Sipaliwini in West Suriname is home to the Indigenous settlements and villages of Sandlanding, Apoera, Section and Washabo, along the Courantyne River (Figure 2.1). This research took place in: 1) Apoera (5° 11.43’N and 57° 10.38’W) – a predominantly Arawak village, and 2) a young Trio settlement in Sandlanding (5° 9.81’N and 57° 10.20’W), which falls under Apoera’s jurisdiction and is on a 30 to 40-minute walk from facilities in Apoera. Access to cities entails either a 7- to 10-hour (or longer when roads become less accessible due to heavy rains) drive east towards Paramaribo, the capital, or a 120 km boat ride north to Nickerie which also gives access to the coastal highway towards the capital. The area, located in a tropical rainforest climate, has a mean annual temperature of 27 °C and an annual precipitation of 1895 mm. The ecosystem along the Courantyne River is characterized by tropical lowland forest vegetation, surrounded by highland forests and swamp forests.

Figure 2.1: Study sites Apoera and Sandlanding in West Suriname in South America. Map modified from http://www.lib.utexas.edu/maps/tpc/txu-pclmaps-oclc-22834566_l-28a.jpg.
2.2 Communities

2.2.1 Apoera

2.2.1.1 History

Around 1870 shaman James Lingaard had an argument with a fellow shaman who made James take his family and his korjaal (a traditional boat) to leave the village of Poaka. James Lingaard, originally James Achocado (pronounced as ashucadu), created a new settlement called Epira together with his wife and their children Adolphus, Maurius and Paulus. Their fourth child, daughter Adolphina, stayed behind with the Poaka community. James Lingaard was a knowledgeable man who shared some of his traditional knowledge with his children. This knowledge still runs in the family today. The shaman had built a wooden kaaiman (crocodile) shaped bench, which would walk with him to the riverbank. Together with the kaaiman James was said to be able to stay under water in contact with the spirits of nature (pers. communication J. Lingaard).

Their family thrived next to the Courantyne River where more families continuously joined the small Epira community. In 1914, these families were ripped apart when (most likely) the Spanish flu killed 5 to 8 people on a daily basis. The community had to leave their new homes and peddled to Perulu where Adolphina Lingaard now joined them as well. Five years later, in 1919, the mission to create a new ‘Achocado’ settlement was continued by Adolphus Lingaard: Washabo – which means ‘let us get together’ – was created downstream the Courantyne River, close to the already existing tiny settlement of Apoera (pers. communication J. Lingaard).

Although Apoera was existent before 1900, it gained its name in 1902. Back then, the balata bleeders Wix and Lashly were active in the region. On an expedition on the Courantyne River, they had brought a young boy aged 7 or 8 back to their balata fields. The boy knocked with his fist firmly on his heart and said ‘Aporo’. Wrongly interpreted, Wix and Lashly named their balata field ‘Apoera’. The village of Section, originally called ‘Middle Section’ as it was in between Apoera and Washabo, is about 80 years old (pers. communication J. Lingaard).

Adolphus Lingaard was married to Arubella who gave him five children: Christine, Clarice, Justine, Herriete and James. The latter is the father of Julius Lingaard who shared this history.
and many local Amerindian stories (*ungi tori*) with me and who is still writing proposals for community development projects.

When Suriname gained independence in 1975, the first government (which was in place since 24 December 1973) planned for Apoera to become the second largest city in the country, a project called ‘Plan West Suriname’. Despite protests by the Indigenous inhabitants, the developments were approved and funded by the Dutch government. According to one of the elders the Dutch invested 500 million Dutch guilders. An American company built a railway from Apoera to Bakhuys, where the extraction of natural resources found place. The project also included the expansion of housing and other facilities such as a harbor, market, education center and swimming pool on ‘Phase 1’. ‘Phase 2’ was already deforested for further development (pers. communication C. Henry & J. Lingaard).

Several companies were involved in the development of Apoera (pers. communication C. Henry). Van Kessel and Tjanga Langa established the harbor and the streets, whereas extraction companies such as Suriname Timber were involved in the extraction of timber and stone. In the early 1980’s Gresalco bought two locomotives from the American company that had constructed the railway. From 1975 to 1985 many Guyanese from across the river had traveled to West Suriname to find work in the extractive industry. In the 80’s, they applied for Surinamese nationality in order to ease labor contracts and get access to national health insurance.

In 1986 the Internal War ignited in Suriname. The national army was also based in Apoera and recruited locals to defend their towns. However, many of the families fled to Guyana in 1987, where they had built camps in the pristine forest. Brunswijck’s fighters came until camp 52 (at 52 kilometers from Apoera) after which the fighters went south to Blanche-Marie which they took over. The fighters did not come further towards Apoera since one of the main bridges on the only road to the villages was blown up by locals or the national army. In 1992, when families returned from Guyana, many recently settled inhabitants and companies had left West Suriname because of the Internal War. Moreover, Plan West Suriname was not further supported after the military coup of Bouterse. The development site ‘Phase 2’ is thereby up to
today a large piece of deforested land next to the village (pers. communication J. Lingaard, C. Henry & Bony).

2.2.1.2 Current situation

As a result of extractive industrial development in the 1930s (timber), 1940s (latex derived from *Manilkara bidentata*) and 1970s (timber and stone), people from coastal Suriname and Guyana moved to West Suriname in search of employment\(^61,62\). As the immigrants were not allowed to settle in Washabo and Section by the traditional authorities, they settled in Apoera, exposing the original community to other cultures. Nowadays, Apoera has approximately 1150 inhabitants who descend from mainly Arawak, but also Warao and Carib Amerindians, speaking Guyanese Creole and Sranantongo (Dutch Creole)\(^63\) (personal communication Capt. Lewis, 2016). Most people in Apoera are religious. The Roman Catholic church is the largest in town, followed by Evangelists. There are also 2 Jehovah churches.

In 2005, 37 % of the inhabitants were children between 0 and 17 years of age\(^61\). There is a primary school in both Apoera and Washabo. Children generally attend school from age 4 to 12 (Figure 2.2). The state schools are heavily subsidized as school fees entail only SRD$ 10 per person per year (pers. communication *Juf Moor*), which is the equivalent of less than US$ 2. A secondary school has opened its doors in 2006 where children can attend school for another 4 years after the primary school (pers. communication *kapitein Lewis*). To continue studying people have to go to Paramaribo or Nickerie to attend boarding schools, something many Indigenous people cannot afford. The direction of the studies codetermines whether people return as there are more divergent job opportunities in the city.

Apoera has its own police station, fire department and an institution for child abuse, which opened early 2016 (and received over 50 reports within the first 2 months). There is a department of the national electricity company EBS. Electricity is generated through the burning of diesel and bills are distributed to all households on a monthly basis. The District Commissioner is also placed in Apoera and inhabits a modern, large building. In Apoera and Washabo there is a policlinic, which is a department of the Medical Sending care system at
which outpatients are treated. In case of more serious health problems, a patient has to travel to a larger city (often a bumpy 10-hour drive to the hospital in Paramaribo). Other people prefer to use natural medicine obtained from the forest. These medicine can be made from a single plant or a mixture of plants (and other NTFPs). Many hunters possess the knowledge on how to use plants for first aid medication. Incidents in the forest causing open wounds or snakebites and such are often treated with these bush medicine, locally referred to as ‘busi dresi’.

Figure 2.2: Children selling locally grown produce for a special mathematics event at the primary school.

The houses that are built on ‘Phase 1’ (State owned land) in Apoera differ from the ones in ‘Apoera town’ (communal forest land). The generally larger houses on Phase 1 are built on cement pillars and have toilets that are connected to sewers. The houses in Apoera town are
entirely built with lumber and have outside toilets that are not connected to the sewers. Most people own a television and some have Wi-Fi as well.

The pristine, drinkable tap water is available from about 6 am to 11 pm. The water comes from a water source nearby, is filtered and then pumped into the water tower, which distributes water for all the households in the area. Water is supposed to be supplied 24/7, however the one person regulating the water tower has to sleep as well, by which no water is available during his sleeping hours.

The main food sources are locally grown crops from traditional agricultural plots (Figure 2.3), fish and bush meat. Fruits, nuts and other NTFPs are also gathered for nourishment from the forest. Some of these NTFPs are eaten fresh, others can be stored or have to be prepared. Less people grow their own crops compared to before the 1970s. Some households still cook on a wood stove using fuelwood, however most people own a gas stove for which the gas tanks have to come from Nickerie (and run out every once in a while). People who have a daily job do not have time to farm themselves and often buy their vegetables directly from the farmers, at the market or in the tiny (Chinese) supermarkets. Fish is usually caught by local fishermen, from whom one can easily buy some fish. As for meat, American frozen chicken at the Chinese supermarket is cheaper and less time-consuming than buying a locally raised chicken alive that needs to be fully processed. Frozen meats from the supermarkets substitute bush meat more frequently (pers. communication kapitein Lewis & meneer King).
Village captain C. Lewis from Apoera explained that he is trying to keep the traditional sharing system in place: he would share bush meat with family members first and then neighbors and relatives. Mister King explained that when he grew up all people used to share food and would get something in return. This traditional sharing custom has faded and replaced by more ‘household individualism’, he explains: “I think this is due to the fact that sales have become bigger too: you can get extra money if you sell the meat that your household will not consume, instead of just giving it away”.

Many inhabitants of Apoera, Section and Washabo earn an income by working for logging companies (Greenheart and Nootje, see Figure 2.4). These companies pay their employees in US dollars, therefore this community has not seriously undergone the impact of the current national economic crisis (in November 2015, 1 SRD was worth just over US$ 0.30, one year later it was worth less than US$ 0.13). Other people sell locally grown produce and various NTFPs.
Some of these NTFPs are also bought up by *fotoman*, traders from the city. Others make extra money by providing goods or services such as being a taxi driver, barber, iceman, vendor of vegetables, cassava bread or other homemade nourishments. Hunters sell bush meat locally and to buyers from the city. However, as the unemployment rate is very high, people leave to the city or different parts in the country to find temporary work (e.g. timber harvesting, gold mining).

Tourism is not big in Apoera (yet). There are several guesthouses, which usually house people overnight who are on passage for fishing or jungle trips. Besides the peak seasons however, almost no tourists (usually Surinamese or Dutch) are to be found in Apoera. A fair number of locals from Guyana (mainly Orealla) visit West Suriname, usually because they have family living in West Suriname.

![Figure 2.4: Greenheart’s sawmill in Apoera, Suriname.](image)

### 2.2.2 Trio community in Sandlanding

Some Trio communities moved from Brazil to Suriname in the late 17th century. These Amerindians currently still inhabit areas on both sides of the border. Most of the Surinamese Trio (approximately 1000 individuals) live in the Tapanahoni-Palumeu river basin, located in southwest and central Suriname (Figure 1.2), where they share some living and usufruct areas with Wayana Amerindians. The Sipaliwini-Courantyne River basin in the southwest of the
country is inhabited by just the Trio tribe. Over the past four decades, Trios have seen many changes due to acculturation and increased contact with the modern world. These changes have had positive impacts on health care, life expectancy and education. However, these changes have enhanced the loss of traditional ecological knowledge, which includes forest management, spiritual and mythical stories and medicinal plant properties.

2.2.2.1 History

In 1989 the Trio community of Kwamalasamutu (in the south of Suriname) had proposed to Jang Djeneninpe to become a basya. At the time he was 13 years old and flattered by the invitation. A friend of his was also approached by the granman to become a basya and together they decided to accept. After 10 years of being a well-respected basya, Jang Djeneninpe moved to the island Wanapan in the Courantyne River near the Wonotobo water falls to start a new settlement. On the Surinamese side, this area is completely uninhabited. They only had contact with some local fishermen from Guyana. On one day when basya Jang’s daughter was very ill, they decided to ask the Guyanese fishermen to take her with them to see a doctor. When months later another child from the Wanapan community got very ill, basya Jang set out in his new boat to Apoera (about 200 kilometers downstream) in search of medical care. Here, basya Jang came in contact with the kapitein of Apoera, Carlo Lewis. They discussed the possibilities for the Trio community to move close to Apoera. Basya Jang had the desire for his community to have access to education and health care, as both were absent in Wanapan (pers. communication basya Jang Djeneninpe).

In agreement with the kapitein and basyas from Apoera, the Trios were allowed to build some camps on Sandlanding, which is on customary lands of the Apoera community (pers. communication basya Jang Djeneninpe & kapitein C. Lewis). In 2001, beginnings were made to build a camp, which the Trio finished on their return in 2002. In June or July of 2002 basya Jang returned with 10 people from Wanapan to officially move to Sandlanding. In 2005 another 10 Trio families have migrated to Sandlanding (pers. communication basya Jang Djeneninpe). In order to prevent misconceptions: Sandlanding is part of Apoera’s customary territory and is
also inhabited by some people from the Apoera community, not just the Trio. However, most of Sandlanding’s inhabitants are from Trio descent.

2.2.2.2 Current situation

As of March 2016, Sandlanding counts 75 Trio individuals and Wanapan is uninhabited. Hence, most individuals within this community have only been exposed to urban influences (acculturation, schooling, medical facilities and shops) for about the past 10 to 14 years. All individuals speak the Trio language, some know Sranantongo and few possess little Dutch.

In Sandlanding there is no school. Children are bused to school in Apoera Monday through Friday. There are 36 Trio children that go to school here. From the age of four it is compulsory for children to attend primary school. By that age the Trio children only possess the Trio language, while education is given in Dutch. Trio children are thereby educationally disadvantaged from the day they start and often attend primary school for at least one or two extra year(s).

Currently, three Trios are employed at the Greenheart sawmill (pers. communication Rena), others make some money by selling NTFPs such as seed jewellery (Figure 2.5), stingray and other wildlife. Their subsistence and limited market-sales are entirely based on traditional farming, hunting and gathering of NTFPs. Since they have to walk with their goods to the market for about 40 minutes, they usually go to the market maximum once a week although the market is held thrice a week.
Figure 2.5: Naomi Kupuru, the wife of baisya Jang Djeneninpe, displays some of her seed jewellery. On the left hangs a traditional cassava press which is made by baisya Jang, his son is not interested in learning the skill of traditional braiding.

All houses that were built in the first decade of 2000, were made in the traditional Trio way, see Figure 2.6 and Figure 2.7. Two more recent houses are made in ‘Apoera style’ on high wooden pillars. Close to their homes, the Trio do some minor agriculture. Here, they have planted corn, maripa (*Maximiliana maripa*), banana (*Musa* sp.), watermelon (*Citrullus lanatus*), cashew and certain plants from which they use the seeds to create jewellery with. At 10 kilometers from their home, they have their larger agricultural fields (*kostgrondjes*) where they plant both bitter and sweet cassava (*Manihot esculenta*), napa (*Ipomoea batatas*) and pineapple (*Ananas comosus*). All food products derived from these lands are for their own-use and not for sale. The Trio usually go to their *kostgrondjes* during the weekends with both women and men, unless the men are out hunting. Because the Trio do not possess transportation (bikes, scooters
or cars), a driver from Apoera is asked to bring them in the morning to their *kostgrond* and collect them and their products later that the day.

Hunting happens twice a week on Wednesdays and Saturdays with two or three men. Animals that have been hunted together will be equally shared between the hunters, with which they provide their families. Catches are not shared with others in the community unless the hunters and their family cannot consume it themselves. Fishing happens, but not on a regular basis. When the tide rises, they use a motorboat to go south on the river. Further up the river large piranhas are to be found. When ebb comes, the men slowly return home while fishing. Women know when the men will approximately return and prepare the wood-fueled fires as gas stoves are absent within this community.

Vegetal NTFPs such as fruits and nuts are usually collected during hunting trips. At the market, vegetables are bought from farmers in Apoera. Other items such as frozen chicken and rice are bought in the Chinese supermarket. Some Trio individuals prefer to take bush medicine, others visit the policlinic in Apoera, also depending on the symptoms.

All Trio people are Baptists since the American missionaries have overwhelmingly gone through all of West and South Suriname since 1959. There is a church in Sandlanding which the Trio attend every Sunday.
Figure 2.6: Trio settlement in Sandlanding, Suriname. Typical traditional Trio housing constructions.

Figure 2.7: Living room and kitchen with view on the Courantyne River. In the center a dead boesemani stingray is being prepared as food for the dogs.
Chapter 3: Children’s plant knowledge

3.1 Background

The body of traditional knowledge on Non-Timber Forest Products (NTFPs) held by Indigenous peoples has been declining over the past century. Influence of colonizing farmers, missionaries, conflicts about land rights, acculturation and urbanization continue to cause social, economic and environmental changes to Indigenous communities and their territories \(^{8,22-25}\). Some losses of traditional ethnobotanical knowledge are triggered by restricted access to forests imposed by industries or governments that exclude local communities from the harvesting of NTFPs on their customary territories \(^{5}\). Other losses are due to changes in the livelihoods and lifestyles of Indigenous peoples in which certain NTFPs are substituted by modern goods that are less time-consuming to prepare, more effective and considered up-to-date \(^{24}\). Moreover, urbanization (e.g. the introduction of state schools, shops and medical clinics) causes less time to be spent on traditional activities that involve NTFPs \(^{64-67}\). As a result, formerly important ethnobotanical knowledge becomes superfluous and may be quickly forgotten or deliberately rejected when no longer used in (traditional) activities, by which the forest-dependency of local communities is reshaped.

Factors that determine the forest-dependency of a community include the economic situation (where poorer people are found to be more dependent), access to local and/or urban markets and the remoteness of the area (i.e. the lack of roads and transportation availability) \(^{23}\). Bryon and Arnold (1999) distinguish three phases that describe the forest-dependency of local communities: 1) the main source to sustain a community’s livelihood depends on the surrounding forest. This category includes hunter-gatherers and subsistence farmers; 2) a community relies on nearby forests and its NTFPs for both subsistence and economic purposes through market sales; 3) people are not dependent on the forest for their livelihood, but their economic welfare depends (partially) on the benefits derived from NTFPs. For communities that evolve through these categories, the importance of NTFPs changes from subsistence-oriented (use value) towards economic importance (exchange value), hence changing certain ethnobotanical knowledge that is passed on to younger generations.
Traditional knowledge is transmitted in three varying ways\textsuperscript{64,68,69}: 1) \textit{vertical transmission} describes the knowledge transfer between generations but within genealogy of a family; 2) \textit{horizontal transmission} describes knowledge exchange between peers of the same generation, and; 3) \textit{oblique transmission} references knowledge transfer between generations but without familial ties. Research has shown varying outcomes in whether acculturation leads to discontinued or disturbed knowledge transmission\textsuperscript{25,65}. However, cross-cultural knowledge transmission can strengthen the (ethnobotanical) knowledge acquisition between people with different traditional backgrounds.

Most knowledge on NTFPs is acquired during childhood and adolescence\textsuperscript{25,66,70,71} through playing, experiential participation and observation and during informal (traditional) activities such as walks through the forest, (historical and mythical) stories, agricultural activities, rituals and medicinal or spiritual plant applications\textsuperscript{64,66}. Besides parents and peers, older siblings also play an important role in the transmission of ethnobotanical knowledge\textsuperscript{70}. Three to five year olds are already able to distinguish and identify various edible and non-edible plants\textsuperscript{72}, whereas children aged 12 were able to identify most of the important cultivated plants\textsuperscript{67,70,73}. For NTFPs, Zent (2009) shows that knowledge about strongly increases until the age of twenty. Disruption of knowledge transmission during childhood and adolescence can therefore reinforce the overall loss of ethnobotanical knowledge within Indigenous communities.

Many ethnobotanists have documented Amerindian plant uses in Suriname\textsuperscript{16,27–29,34–37,74}. Still, in West Suriname, traditional knowledge on and use of NTFPs has never been documented. No data exist on the current transfer of traditional knowledge among Amerindians in the country’s rapidly changing society. This chapter compares children’s knowledge about NTFPs between the acculturated, predominantly Arawak village of Apoera that has been exposed to non-local influences for several decades and the more forest-dependent Trio community in Sandlanding. As the two communities live close to each other, they hunt together at times and their children attend the same school. This offers opportunities for cross-cultural exchange of ethnobotanical knowledge. The hypotheses are:
1) Trio children possess more knowledge about NTFPs than their peers from Apoera, because the Trio are more forest-dependent and have been less exposed to acculturation and urbanization;

2) Cross-cultural knowledge transmission finds place between the two of Apoera and Sandlanding communities;

3) Nourishing and economically important NTFPs are better known than medicinal NTFPs;

4) Knowledge about NTFPs is similar for boys and girls;

### 3.2 Materials and methods

#### 3.2.1 Ethnobotanical data collection

Prior to the start of ethnobotanical fieldwork, a meeting was set up with the local authorities of Apoera and Sandlanding to request their consent according to Free, Prior and Informed Consent (FPIC) guidelines. Fieldwork took place in March and April 2016 for five weeks. Forest walks were held with four women and eight men from both communities, whose personal data such as age, gender and ethnicity were documented. During the walks, their knowledge of NTFPs was documented and photographs and voucher specimens were taken of the studied plants in accordance with the plant collecting permit issued by the Foundation for Forest Management and Production Control (SBB) in Suriname. The specimens were deposited in the National Herbarium of Suriname (BBS) and Naturalis Biodiversity Center (L) at Leiden, the Netherlands. Scientific names were verified through theplantlist.org. For a complete overview of described NTFP species, please refer to Appendix A. Since the uses are not public (solely available to the communities) and the herbarium specimen lie in two Dutch speaking countries, the full descriptions are written in Dutch.

#### 3.2.2 Questionnaires

In order to gather data on children’s NTFP knowledge, eight individuals from each class at the primary school were each asked to identify the names and uses of nine freshly collected NTFPs.
Generally, five boys and five girls were selected, but always included all present Trio children since they formed a minority and would otherwise be underrepresented. The NTFP species were selected from data collected and described in section 2.2 and represented commonly known species present in the near vicinity of both villages. Besides leaves and flowers (when present), used plant parts were displayed as well. Age, ethnicity and gender of all participants were recorded. One Trio adult translated for younger Trio children who had trouble understanding Dutch or Sranantongo. The NTFPs were divided into food, commercial and medicinal plants. The details on the uses of NTFPs have been documented but this information is not reported here, but made fully available to the communities, as agreed in the FPIC contract with the communities. Local names were verified with data obtained during fieldwork and existing literature\textsuperscript{36,74,76}.

Figure 3.1: Children taking the vegetal NTFP questionnaire.
3.2.3 Data analysis

To determine the level of knowledge of a participant, the children could score one point per correct answer for either the vernacular name or the use of an NTFP, so a total of 18 points could be scored. Correctly identified NTFP characteristics (names and uses) were considered as a proxy for the NTFP knowledge of a participant. The totals were then transformed to percentages. Linear regression was used to model the relationship between NTFP knowledge and age. Independent samples t-tests were done to test for differences in scores between Indigenous group and gender. Paired t-tests were performed to analyse whether the means differed between dependent groups, such as the known uses and names of NTFPs and different NTFP categories (food/commercial and medicine). Statistical tests were carried out by using SPSS 24.0. Differences were considered significant when p <0.05.

3.3 Results

In total, 74 children (39 girls and 35 boys) participated in the questionnaire to identify names and uses of nine frequent occurring NTFP species, known to both communities (Table 1). Ethnicity was given preference over gender as fewer Trio children attended the school, thereby shifting the 50-50 gender ratio. Of all participants, 51 were children from Apoera (predominantly Arawak with mixed Warao and Carib) and 23 were of Trio descent who inhabited Sandlanding. Six children decided not to participate in this study.
Table 3.1: Local and scientific names of the nine key NTFPs used in this research.

<table>
<thead>
<tr>
<th>Sranantongo</th>
<th>Arawak</th>
<th>Trio</th>
<th>Scientific name</th>
<th>Family</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kokriki</td>
<td>Barakaro</td>
<td>Weteu</td>
<td><em>Ormosia costulata</em></td>
<td>Fabaceae</td>
<td>Commercial</td>
</tr>
<tr>
<td>Krapa (siri)</td>
<td>Karaba</td>
<td>Karapa</td>
<td><em>Carapa guianensis</em></td>
<td>Meliaceae</td>
<td>Commercial/Med.</td>
</tr>
<tr>
<td>Ingi noto</td>
<td>Totoka</td>
<td>Tuhka</td>
<td><em>Bertholletia excelsa</em></td>
<td>Lecythidaceae</td>
<td>Commercial/Food</td>
</tr>
<tr>
<td>Redi loki</td>
<td>Shimiri kuru</td>
<td>Kauru</td>
<td><em>Hymenaea courbaril</em></td>
<td>Fabaceae</td>
<td>Food</td>
</tr>
<tr>
<td>Slabriki</td>
<td>Yawahe pesi</td>
<td>Pianaroy</td>
<td><em>Senna alata</em></td>
<td>Fabaceae</td>
<td>Medicinal</td>
</tr>
<tr>
<td>Sangrafu</td>
<td>Hokuri shikaro</td>
<td>Oloke</td>
<td><em>Costus scaber</em></td>
<td>Costaceae</td>
<td>Medicinal</td>
</tr>
<tr>
<td>Mokomoko</td>
<td>Yurika</td>
<td>Kurukuni</td>
<td><em>Montrichardia arborescens</em></td>
<td>Araceae</td>
<td>Medicinal</td>
</tr>
<tr>
<td>Kwasi bita</td>
<td>Kareudan</td>
<td>Malaria ep</td>
<td><em>Quassia amara</em></td>
<td>Simarubaceae</td>
<td>Medicinal</td>
</tr>
<tr>
<td>Busi papaja</td>
<td>Wana soro</td>
<td>Ume</td>
<td><em>Cecropia sciadophylla</em></td>
<td>Cecopiaceae</td>
<td>Medicinal</td>
</tr>
</tbody>
</table>

Linear regression analysis showed a strong relationship between age and correctly identified NTFP names and uses (p = 0.000 for both ethnic groups, Figure 3.2). Although Apoerian informants scored slightly higher than Trio informants, there was no significant difference found in NTFP knowledge between children of both communities (p = 0.210).
Figure 3.2: Linear regression of individual scores for Apoerian (n = 51) and Trio (n = 23) children by age.

On average, Trio children were able to name 14 % of the NTFPs, while Apoerian children named 20 % correctly, but this difference was insignificant (p = 0.215, Fig. 3). For NTFP uses a similar pattern was seen: Trio children knew 23 % of the NTFP uses, whereas Apoerians 29 %. The differences were not significant (p = 0.189,). When the groups were split up into two age classes (4 to 9 and 10 to 14), we did not find significant differences in NTFP knowledge between Trio and Apoera children (Figure 3.3). However, when the ethnic variances were disregarded, we found that younger children (aged 4 to 9) scored significantly higher on identifying NTFP uses (20 %) than NTFP names (7 %), (p = 0.000). For the older children this difference was insignificant (p = 0.155).
Figure 3.3: Comparison of correctly identified NTFP names and uses between Apoera and Trio children for all ages (n = 74), ages 4 to 9 (n = 42) and ages 10 to 14 (n = 32).

When we further analyzed participants of both communities taken together, we found that correctly identified names for food/commercial and medicinal NTFPs did not significantly differ (p = 0.896, Figure 3.4). However, uses of food/commercial species were significantly more often correctly identified (53 %) than medicinal uses (8 %), see Figure 3.4.

When analyzed by age, we found that the uses of commercial/food NTFPs are understood by the youngest children, while knowledge of the names of commercial/food NTFPs and medicinal NTFPs appears to be acquired later. The knowledge acquired the latest were the medicinal plant uses (Figure 3.5). The youngest Apoerian who named a medicinal NTFP correctly was 4 years old, while the youngest Trio was 9 years of age, both were boys. For correctly answering the use of a medicinal NTFP, the youngest child from Apoera was aged 6 (boy) and from the Trio a 10-year-old girl.
Figure 3.4: Comparison of identified NTFP characteristics (names and uses) for a group of commercial/food NTFPs and medicinal NTFPs.

Figure 3.5: Linear regression of correctly identified medicinal NTFP (mNTFP) and commercial/food NTFP (cNTFP) names and uses by age. Each dot represents the participant’s percentage of a correctly identified NTFP characteristic (cNTFP use, cNTFP name, mNTFP use, mNTFP name).
Knowledge about edible/commercial and medicinal NTFPs were compared between Apoerian and Sandlanding children. Overall, the children possessed similar NTFP knowledge except for the uses of medicinal plants, with which the Apoerian children were better acquainted (p = 0.041).

When comparing knowledge among gender groups on the names and uses of NTFPs, there was no significant difference found for any of the tested values. Neither were any significant differences found for gender when the data of one community was analyzed: boys and girls of the Trio community scored similar to our test, likewise for their Apoerian peers.

Figure 3.6 displays the languages used by the children when they correctly identified the species used in the questionnaire. Sranantongo was mostly used by both Apoera’s (50.5 %) and Trio (46.2 %) children, followed by Dutch (45.5 % by children from Apoera, 38.5 % Trio) and the Trio language (3.0 % by Apoerians, 15.4 % by Trios). English was used once to identify *Carapa guianensis*, Arawak was never used by any of the children. Although frequently occurring in and around the villages, *Senna alata* was not correctly identified once – possibly because the specimen lacked the conspicuous yellow flowers, neither was *Costus scaber* by Trio children.
Figure 3.6: Different languages used by Apoera’s and Trio children for correctly identified NTFP names per species.

3.4 Discussion and conclusions

The main findings of this study include that the more acculturated and urbanized children from Apoera possessed similar knowledge on NTFPs as the more forest-depending Trio children. In both groups, edible and commercial NTFPs are better known than medicinal NTFPs and no knowledge differences existed between boys and girls. Cross-cultural knowledge transfer exists between Apoerians and Trios. Trio children had acquired more knowledge from their Apoera peers than vice-versa.

As predicted, overall knowledge on NTFPs increased with age, as older children must have observed and experienced, both actively and passively, more traditional activities that involve NTFPs. We found that different characteristics (names and uses) were acquired at different ages. Younger children were better acquainted with NTFP uses than with names, confirming
that ethnobotanical knowledge transmission at a young age mostly happens through observation\textsuperscript{66}. This finding also makes evolutionary sense as it is more important to know whether a biological element is edible (e.g. the observation of fresh consumption) or potentially fatal (e.g. observing the process of boiling), rather than knowing the name of an object.

In the youngest group, NTFPs with commercial or nourishing value were better known than medicinal plants. Older children steadily increased their knowledge on NTFP uses and their corresponding local names, including the medicinal plants. Acquisition of plant knowledge seems thus more observer-oriented with a focus on food and commercial plants for younger children, whereas older children probably acquire more factual information on medicinal plants through active teaching. In contrast to food and commercially extracted NTFPs, medicinal plants are not used on a daily basis and their application requires specialized traditional knowledge\textsuperscript{25}. Whereas feeding and trading happen constantly, medicinal plants are collected only when someone is ill. That means, even though basic medicinal plant knowledge is known to many individuals, children are likely to acquire this knowledge when they reach the age to join hunting and NTFP gathering trips. Therefore, it would be interesting to follow-up on this research with adolescents.

In line with an earlier review on 61 studies on gender and ethnobotanical knowledge\textsuperscript{77}, no significant differences were found in NTFP knowledge between boys and girls in the two groups.

As the Trio community’s subsistence was still entirely dependent on their natural environment until 12 to 14 years ago, we anticipated that their children would have more NTFP knowledge than their Apoerian peers. Apoera’s community have been exposed to acculturation and urbanization for several decades, factors which tend to erode vertical knowledge transmission\textsuperscript{66}. Moreover, the Trio are still more reliant on traditional hunting, NTFP gathering and agricultural practices than their Apoerian neighbors, who are economically more prosperous and can therefore afford to buy food and tools in local shops. In contrast to our expectation, our comparisons of ethnobotanical knowledge, showed that Trio children possess similar knowledge on NTFPs as Apoera children, or less, in the case of medicinal plant applications.
First of all, several studies have found that attending state schools reduces the amount of traditional knowledge that children possess\textsuperscript{64,67}. They reasonably argue that children spend less time with other individuals (peers, siblings and adults) in the community, during which traditional (ethnobotanical) knowledge could have been acquired through the course of daily activities. Besides, state schools in Suriname, like many other countries, do not include the teaching of traditional practices in their curriculum. This means that (state) schooling hours disrupt vertical, horizontal and oblique traditional knowledge transmission, visualized by line 1 in Figure 3.7.

The journey to and from school is also an important moment for children to become acquainted with forest products through (playing) interaction with peers\textsuperscript{31,78}. In our case, Trio children are collected and returned to Sandlanding by a school bus, which eliminates their daily forest walk and thereby possibly disrupts horizontal traditional knowledge transmission (line 2 in Figure 3.7), so children from the two communities do not spend much time together after school. The school bus also limits the opportunity for cross-cultural horizontal knowledge transmission outside school hours. However, they still have the rest of the day to interact with their siblings, parents and other community members, during which traditional knowledge is actively and passively passed on (own observation).

The Trio’s agricultural plots are located more than 10 kilometers from their settlement. Practically this means that adults (usually the women) charter an Apoerian car owner to take them to their agricultural fields. It is economically and spatially inconvenient to bring children along in a car that could also be filled up with other workers and produce (mainly cassava). Plots closer to home would have created more opportunities for Trio children to acquire ethnobotanical knowledge on their way to their gardens\textsuperscript{79}. In Apoera it has become less common to have familial agricultural plots, leading to discontinued NTFP knowledge transmission. For both children groups, this results in disrupted vertical traditional knowledge transmission (line 3 in Figure 3.7).

A third explanation for the comparable NTFP knowledge for both children groups is the fact that the Trios migrated from an ecologically different environment. The Trio adults explained that they had grown up in ‘a different flora, of which they learned all the traits and practices’. 
Trio women repeatedly mentioned that there was a wider variety of delicious fruits and herbs in their birthplace (Kwamalasumutu) in southern Suriname. It is likely that the Sandlanding Trio lack knowledge on plants in West Suriname. As a result, the vertical and oblique transmission of ethnobotanical knowledge to their children is limited to species that occur in both ecosystems and/or cultures (line 4, Figure 3.7). Figure 3.7 shows that the Trio children experience more knowledge transmission disruptions than their Apoerian peers.

Figure 3.7: Transmission disruptions of NTFP knowledge from adults to children and between children from Apoera and the Trio community in Sandlanding.
1: School limits traditional teaching occasions
2: School bus limits forest walks
3: Distant and diminishing agricultural plots limit forest walks
4: Migration from different environment limits local plant knowledge

The local names reported by children showed that NTFP knowledge transmission took place between the two communities. Children from Apoera did not mention any Arawak name. This was not surprising as only some elderly people still speak the Arawak language. Trio children identified three NTFPs (all commercial/food NTFPs) usually in their own language (wetei, Ormosia costulata; kauru, Hymenaea courbaril; tuhka, Bertholletia excelsa), while the other
names were usually given in Sranantongo or Dutch. For both groups, NTFP uses were described in Dutch, likely because questions were asked in Dutch (or translated to Trio when necessary). When children from Apoera correctly identified the seeds of *Ormamia costulata* (the most important commercial vegetal NTFP for this Trio community), these were called ‘weto’, using the Trio name instead of the Sranantongo name ‘kokriki’. The fact that Trio children mostly knew Sranantongo or Dutch names and Apoerian offspring knew one Trio name, indicates that cross-cultural NTFP knowledge transmission takes place between these communities, especially from the community of Apoera to the Trio. Further research could clarify whether this happens through direct horizontal knowledge transmission between the children, or through other ways.

There is an opportunity for a traditional teaching program as state schools do not include this in their curriculum and children were eager to know more about the NTFPs presented in the questionnaire. To some it will be of great use as families currently still depend on their surrounding environment. Because the curriculum is developed by the state, such a program would have to be approved and, if possible, funded by the government. The development and execution of a traditional teaching program, however, should be done by locals with sufficient knowledge of the locally relevant NTFP practices.
Chapter 4: Livelihood security through Non-Timber Forest Product commercialisation: an ecological and land tenure assessment

4.1 Background

Non-Timber Forest Products (NTFPs) sustain the livelihoods of millions of people worldwide, serving as nourishment, medicine, construction material, ritual objects and other (traditional) purposes. NTFPs have been traded and sold on local and regional markets for centuries. In the past decades, globalisation has increased the international demand for certain forest products enormously and several NTFPs nowadays have a global market. Examples of such widely traded NTFPs are Brazil nut (Bertholletia excelsa), natural oils (such as Andiroba oil derived from Carapa spp.) and the pet trade (such as macaws and snakes). The commercialisation of NTFPs creates employment opportunities for local harvesters and processors, thereby alleviating poverty for many rural and Indigenous communities. However, the shift from subsistence oriented NTFP use by local communities to commercial extraction for international trade, can only be sustainable with secure land tenure for harvesters, well adopted institutional arrangements and adequate monitoring and enforcement strategies.

Every NTFP that is harvested for commercial purposes has a unique production-to-consumption chain, also called a value chain. The value chain of an NTFP describes the actions of harvesting, processing and the transportation of a given forest product to final consumers. The involved actors range from individual harvesters and accomplices to middlemen and large-scale commercial factories. Short chains, locally sold NTFPs for instance, are simple and come with little governance. However, internationally sold forest products have a much more complex producer-to-consumer system with many more actors involved who are bound to national and international top-down policies.

In order for local communities to continue to collect and sell NTFPs, they need – at least to some extent – rights and access to the lands they collect these NTFPs on. All lands are under a national property or tenure regime, usually categorized as private property, state property, communal property or open access. Forest governance systems are laid out by governmental institutions in statutory laws and regulations. In many forest tenure systems however,
communities also have their own governance system in place, referred to as customary laws\textsuperscript{84}. Customary laws are often not recognized or protected in statutory law\textsuperscript{84}. Within one regime multiple governance systems can overlap, this is known as legal pluralism. Within one regime, multiple actors can each have a different bundle of rights over the same land (e.g. locals can gather NTFPs while a logging company is allowed to harvest trees). However, when land rights are legally held by outside individuals or companies (such as extractive or large-scale agriculture companies) that have different interests than local communities, the access to and duration of gathering NTFPs can be constrained. As mentioned previously in the general introduction, secure land tenure regimes depend on three principal factors: 1) whether land rights are protected by a higher authority, whether third person or institution, including the (devolution of) power to sanction violators; 2) the rights one has associated with its territory and resources, referred to as a bundle of rights., and; 3) the duration of a lease or ownership to the land.

Since Indigenous people have a pre-existing right to have (native) title over their customary territories, their land rights are recognized by several international institutions, treaties and conventions. The International Labour Organization Convention no. 169 (ILO169), the Convention on Biological Diversity (CBD) and the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) are the most important ones. Inter-governmental institutions such as the Organization of American States (OAS) and the associated Inter-American Court for Human Rights (IACHR) set policies and can convict States that not comply. However, they cannot levy sanctions in national jurisdictions for violations of human and Indigenous rights. The government of Suriname has adopted or ratified the CBD and the UNDRIP, but not the ILO169 (see for more treaties and conventions Table 1.1).

Besides potential issues for local peoples caused by insecure land tenure, the resilience of species populations and entire ecosystems can be seriously affected by the unsustainable harvesting of NTFPs\textsuperscript{85}. Overharvesting of certain animal species or entire plants, leaves, fruits, roots or bark can cause population decline and trigger trophic cascades when these include ecological keystone species\textsuperscript{86}. The international trade in wildlife and timber is also regulated by international institutions, conventions and treaties (e.g. United Nations, Convention on Biological Diversity - CBD, International Consortium on Combating Wildlife Crime - ICCWC,
World Bank, the Convention on Trade in Endangered Species of Wild Fauna and Flora - CITES, the International Union for Conservation of Nature - IUCN and the wildlife trade monitoring network called TRAFFIC\(^87\). The CITES treaty (adopted by 183 States, including Suriname) regulates the import and export of threatened species to prevent those from extinction based on recommendations from institutions such as IUCN and TRAFFIC.

Suriname exports both vegetal and animal NTFPs to various countries. By statutory law, Indigenous and Tribal peoples have to obey the national hunting calendar, which indicates hunting seasons per species\(^88\). The calendar also states the quantity of allowed hunted specimens per species per hunt, known as the bag limit. If these regulations are disregarded, hunters risk imprisonment and/or fines about US$ 2,650\(^89\). For local communities inhabiting the southern part of the country, hunting season is open all year except for (inter-) nationally protected species. International wildlife export from Suriname is regulated by CITES, therefore, threatened species cannot be legally traded. In 2005, revenues from wildlife were worth over US$ 1 million\(^40\). After, 2007 this amount dropped to US$ 404,000 due to restrictions from the European Union on bird imports.

In Suriname, the domestic and international trade in medicinal plants – over 245 plant species – were more valuable in financial terms than the export of wildlife: an estimated US$ 1.5 million\(^21\). A study by van Andel and Havinga (2008) on medicinal plant extraction by Maroons showed that 49% of the commercial, medicinal species were collected in the wild and thus can be considered as NTFPs. Due to the large percentage of cultivated and domesticated medicinal species, and the dominance of weedy and secondary forest species, the harvesting pressure on wild medicinal species was relatively low\(^90\). For the past decade, there is no data available on the commercial extraction of NTFPs and their potential ecological impact in Suriname.

The current research, carried out in two indigenous communities in West Suriname, focused on the economically most important NTFPs, their collection localities and their corresponding production-to-consumption chains. Subsequently, the status of the communities’ land tenure was assessed. The following research questions were posed:
1) What is the status of the Indigenous communities’ land tenure over their customary territories in West Suriname?

2) Which wild plants and animals are most important for the communities’ economy?

3) When and where are these NTFPs harvested?

4) Does the harvest threat the targeted species’ populations or the ecosystem?

4.2 Methods

4.2.1 Ethnobotanical data collection

Prior to the start of ethnobotanical fieldwork, a meeting was set up with the local authorities of Apoera and Sandlanding to request their consent according to Free, Prior and Informed Consent (FPIC) guidelines. Plant collection and export permits were obtained from the Foundation for Forest Management and Forest Control (SBB). Fieldwork was done in March and April 2016. Forest walks were held with individuals from both communities (four women, eight men), whose age, gender and ethnicity were documented. We documented traditional ethnobotanical knowledge of NTFPs and took photographs of the animals and collected voucher plant specimens, which we identified and deposited at the National Herbarium of Suriname (BBS) and the Naturalis Biodiversity Center (L) in the Netherlands.

4.2.2 Interviews and surveys

To identify the economically most important NTFPs (vegetal and animal), semi-structured interviews were held with hunters and NTFP gatherers from Apoera (n = 7) and Sandlanding (n = 6). Our questionnaires were based on the ‘National socioeconomic surveys in forestry’ sourcebook by the FAO (2016). We gathered information on when NTFPs were harvested and sold and NTFP processing periods to construct a complete profile of the producer-to-consumer chain. We also collected information on the legal ownership status and access to areas where these products occurred, prices and sales units and on collectors, buyers and consumers of the NTFPs. We included questions of the availability of NTFPs and whether these had been increasing or declining and the reasons for this.
Three market surveys were carried out during which vendors were questioned about their products, prices and quantities sold, and vegetation types from which they were harvested. Additionally, questionnaires were held with local informants and the traditional authorities to clarify land tenure status. Other data such as maps and background information on land tenure regimes were obtained with the help of other researchers, the communities, an IPO and from literature and the internet.

All questionnaires and interviews were conducted after having obtained the Free, Prior and Informed Consent of all participants.

4.3 Results and discussion

4.3.1 Land tenure in West Suriname

In the 1950s, the three Indigenous communities of Apoera, Section and Washabo were assigned one collective piece of land, nowadays renamed to ‘communal forest’. Until 1997, one village captain was the traditional chief for all three villages. After that date, each of the villages has had their own traditional authorities in place, captains and basyas (assistants). Currently, the highest authority in Apoera is a captain who is assisted by six basyas, three women and three men. The highest traditional authority of the Trio in Sandlanding is a basya. Within the communal forest, villagers are allowed to practice their traditional customs, i.e. sourcing housing materials, hunting, farming, logging and gathering NTFPs. They also have the right to exclude others from their territory. However, the communal forest (shown in orange on Figure 4.2) covers only a small portion of the territory that has been customarily used by the current Indigenous communities and their ancestors. This is clearly visualized by the extensive range of ‘traditional marks’ that fall outside the communal forest, shown in Figure 4.2. The tenure regime in the communal forest is allegedly under a State-recognized common property regime, held by the communities of Washabo, Section and Apoera. However, as I have not found the official gazette notice that covers this communal forest, it might be a de facto communal property system. The State of Suriname remains the holder of the radical title to these lands and has the right to alienate their rights.
Fishermen on the Courantyne River are subject to regulations set out by the ministry of (agriculture, animal husbandry and) fisheries. The fishermen operate in a common-pool resource system, which – at times – also functions as a de facto open access regime. First of all, it should be made clear that the river belongs to the State of Suriname. Guyana’s territory starts at the high-water mark on the left bank of the Courantyne River. Guyana does not own any part of the river. Therefore, (local) (Amerindian and coast-lander) Guyanese fishermen are only allowed to fish in these Surinamese waters with the requisite licenses. Enforcement is carried out by coast guards and national police, which indeed has resulted in fines, arrests and taxes for Indigenous subsistence fishermen from Guyana. Surinamese fishermen generally knew which fish species were allowed to be caught during each season and reported no issues with law enforcers. However, for all resources that are not listed by the ministry of fisheries, the river works as a de facto open access regime. This will be further explored in Section 4.3.3.1.

North of the villages, the Kaboerikreek (Kaboeri creek) is intensively used for hunting, fishing, farming, gathering NTFPs and other traditional activities, see Figure 4.2. Kaboeri, in Arawak language, translates as ‘rich in fish’. Agricultural plots and some camps are still to be found along the creek. However, the last permanent inhabitants left about 70 years ago. The entire Kaboeri creek system, which partly falls inside the communal forest, also falls within a proposed nature reserve. Since this proposal dates back to 1979, it seems unlikely that this area is still under active consideration for protected area status although it is still labelled as such on the forest tenure map published by the national Foundation for Forest Management and Production Control (SBB) in 2013. State owned nature reserves often jeopardize traditional activities when they overlap with customary territories. However, a signed document (written in Dutch) from October 1979 (see Figure 4.1) states that the Indigenous communities would still be allowed to practice their traditional activities within the nature reserve. However, expansion of customary activities (including commercial hunting and fishing) would not be allowed within the nature reserve. Although the document takes the communities’ subsistence needs into account, it prioritizes the national interest and states that “...the faster the hinterland communities will develop, the less they will be emotionally attached to their traditional territory, which only covers a very small portion of Surinamese domain, and the more they will
see themselves as Surinamese citizens”. However, as this whole area is far from road access and as the creek is solely accessible to very small boats, these lands can also be considered *de facto* open access.

Further west, south and southeast of the communities, most of their customary territory has been allocated to multinational timber harvesting companies, as shown on the green areas on the map. The property regime in this area is State owned, with time-limited leaseholds to concession holders who have the exclusive right to harvest timber. On these concession lands, unless FSC certified, the Indigenous communities are also allowed to hunt and gather NTFPs for customary purposes. However, when active logging finds place, locals are not allowed on the concession (mainly for safety reasons). Again, enforcement of these rules is proven to be difficult, according to an SBB employee.

The area where the Trio live (Sandlanding) and hunt, falls outside the communal forest, though within the customary territory of Apoera. As earlier mentioned in Section 2.2.2.1 the Trio gained access to this territory in 2001 through consultation with the local authorities of Apoera. These lands are State-owned under statutory law, called *domein*. State ‘domain’ is accessible for local communities and are considered open access lands. However, the white-with red striped area in Figure 4.2, south of Sandlanding, where many locals from all the villages hunt, is under request for logging purposes. The traditional authority *kapitein* Lewis explained that the allocation of logging rights to these lands was postponed, partially due to consultations with the traditional authorities.

It is obvious that land tenure security for the communities of West Suriname is very minimal to non-existent over their customary territories outside the communal forest. The map, (Figure 4.2) clearly shows that concession areas overlap the customary territories and interfere with traditional activities of the Indigenous communities.
Figure 4.1a and b: This document from 1979 proposed the creation of a nature reserve bordering the West Surinamese Indigenous communities’ communal forest in the north and east, still ‘in process’ today.
Figure 4.2: Map of West Suriname. This map is modified from: 1) map which visualizes customary uses (mapped by individuals of the communities in a collaborative project with VIDS), and 2); forest tenure map made by the Surinamese Foundation for Forest Management and Production Control (SBB). Numbers show certain NTFP collection sites, roman numbers show different tenure regimes. Figure continues on next page.
4.3.2 Most important commercial vegetal NTFPs

For the community of Apoera, crabwood oil derived from *Carapa guianensis* was the most important commercial vegetal NTFP, followed by the Brazil nut (*Bertholletia excelsa*) and the nut of the *Caryocar nuciferum*, locally called *sawari*. See Table 4.1 for an overview of the most important commercial NTFPs for both communities. For the community of Sandlanding, the only vegetal NTFPs used for commercial purposes are the ones used to make jewellery. The most frequently used are the seeds of *Ormósia costulata*. See Appendix A for a complete list of commercial NTFPs sold by the communities of Apoera and Sandlanding.

Table 4.1: Most important commercial vegetal NTFPs for the Apoera and Trio community.

<table>
<thead>
<tr>
<th>Apoera - vegetal</th>
<th>1st most important NTFP</th>
<th>2nd most important NTFP</th>
<th>3rd most important NTFP</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Carapa guianensis</em></td>
<td><em>Bertholletia excelsa</em></td>
<td><em>Caryocar nuciferum</em></td>
<td></td>
</tr>
<tr>
<td>krapa (Sr)</td>
<td>ingi noto (Sr), tuhka (Tr)</td>
<td>sawari (Sr)</td>
<td></td>
</tr>
<tr>
<td>crabwood oil (En)</td>
<td>brazil nut (En)</td>
<td>souari (En)</td>
<td></td>
</tr>
<tr>
<td>Trio - vegetal</td>
<td>seeds for jewellery, mainly:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Ormósia costulata</em></td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>wetei (Tr), kokriki (Sr)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apoera - animal</td>
<td><em>Potamotrygon boesemani</em></td>
<td><em>Tayassu pecari</em></td>
<td><em>Cuniculus paca</em></td>
</tr>
<tr>
<td>spari (Sr)</td>
<td>pingo (Sr)</td>
<td>heii (Sr)</td>
<td></td>
</tr>
<tr>
<td>stingray (En)</td>
<td>white-lipped peccary (En)</td>
<td>lowland paca (En)</td>
<td></td>
</tr>
<tr>
<td>Trio - animal</td>
<td><em>Potamotrygon boesemani</em></td>
<td><em>Tayassu pecari</em></td>
<td><em>Hoplias aimarat</em></td>
</tr>
<tr>
<td>spari (Sr)</td>
<td>pingo (Sr)</td>
<td>anjumara (Sr)</td>
<td></td>
</tr>
<tr>
<td>stingray (En)</td>
<td>white-lipped peccary (En)</td>
<td>wolf fish (En)</td>
<td></td>
</tr>
</tbody>
</table>
4.3.2.1 Carapa guianensis (Meliaceae)

Figure 4.3: Leaves, fruits and seeds of Carapa guianensis Aubl.

The seeds from the crabwood tree (Carapa guianensis, Figure 4.3), which belongs to the Meliaceae family, are referred to as krapa siri and are used to make crabwood oil. This is hard work and a lengthy process: first, the crabwood seeds are collected from the forest floor starting in March (Figure 4.4). The making of crabwood oil is solely done by women, however the men help to collect seeds and return the bags that can weigh over 50 kilograms home (Figure 4.5). The seeds are boiled for a couple of hours (Figure 4.6 and Figure 4.7) and are stored to dry. After about 2 to 3 weeks, when red fungi start to appear, the seeds are cracked open by knife, one by one, in order to remove the inner seed paste (Figure 4.8). Next, the paste is left to drain for a week (Figure 4.9), after which it has to be massaged thrice a day for 5 minutes (Figure 4.10). In between massaging periods, the oil will drip out over a period of another three weeks (Figure 4.11). This whole process is continuously repeated until no more fresh seeds are to be found on the forest floor.
Figure 4.4: Crabwood seeds collected from the forest floor.

Figure 4.5: Husband and son help to gather seeds. The bags can weigh over 50 kilograms.

Figure 4.6: Bags of crabwood seeds are emptied into a huge bowl. After adding leaves from a certain plant (chef’s secret), the seeds are ready to be boiled.

Figure 4.7: After ca. 6 hours of boiling, the water is drained and the seeds are ready be stored for about 2 weeks.

Figure 4.8: An orange fungus appears, indicating the time to crack them with a knife, one by one by one by one.

Figure 4.9: The inner pulp from the cracked seeds is kneaded and left to drain for about a week.
Crabwood oil is used throughout the Guianas to rub on dry skin and hair, and sometimes drunk to rinse their body from the inside. It is bought directly from the makers and sold on the local market in Apoera for US$ 5 – 7 per liter. In 2015, 52 crabwood oil makers produced 3939 liters of oil in Apoera, Section and Washabo. Buyers from larger cities (Paramaribo and Nickerie) come to Apoera to buy the oil as well, which they resell on markets in the city. Some relatives of the crabwood oil makers go to the market in Paramaribo because they can sell it for a better
price and in larger quantities. They mentioned that middlemen who sell crabwood oil on city markets, often say that smaller quantities were delivered or bottles were stolen. On amazon.com and other websites in Europe, the US and Canada, a 125 ml bottle of crabwood oil costs about US$ 10, up to a 16-fold the local price.

Crabwood seeds are largely, though not exclusively, collected in an area that falls outside the communal forest (number 1, Figure 4.2) and was under request by an extractive company to become a logging concession (in 2013), as indicated on the map (Figure 4.2). The nuts are collected as close as possible to roads because the collection bags are heavy when filled with seeds. Areas close to roads are easily accessible for logging once a logging permit would be issued. Crabwood trees also occurred closer to Apoera (right next to ‘Phase 2’), but when an airstrip was built and therefore most of the crabwood trees were removed without the consent of the community. Whether this piece of land falls within or just outside the communal forest is not clear, but it shows the community’s poor tenure security over their lands where they collect their economically most profitable NTFPs.

Over time, seed gathering influences the number of tree seedlings and juveniles in a negative way\textsuperscript{94,95}, which would impact the population of Carapa trees. Seed collectors also compete with animals that feed on crab seeds. However, as the crabwood forests are otherwise rather undisturbed, animals can forage in places away from the road, which limits the effects of foraging humans.

Carapa guianensis is increasingly harvested as A-class roundwood timber: 1146 m\textsuperscript{3} in 2012, over a 4-fold increase compared to 2 years earlier\textsuperscript{49}, which made up 0.29 % of total roundwood production. Increased logging of crabwood trees is likely to conflict with the customary uses of crabwood harvesters and the animals that feed on the seeds. Such foraging animals can also serve as bush meat, impacting wildlife stocks for local hunters.

4.3.2.2  Bertholletia excelsa (brazil nut) and Caryocar nuciferum (butter nut)

The brazil nut (Bertholletia excelsa, Lecythidaceae family) is a well-known nut in the Western world that occurs in South America. The large capsule containing the nuts ripens for 12 months
before it drops on the ground. The outer shell is extremely tough and is usually opened, by humans, using a machete. According to the harvesters, the only animal that can open the fruits are macaws (Ara spp.), because of their strong beak. The nuts inside the woody capsule also have a hard shell (Figure 4.13). These are eaten fresh and used to make oil with.

The nuts are collected February through May in large bags (Figure 4.14). Brazil nuts are sold locally on the market for US$ 1.80 per kilogram and are bought up by one man in Apoera in bulk, who sells them to market vendors from Paramaribo. Online, (e.g. amazon.com and amazon.ca), these nuts are sold for about US$ 25 – 35 per kilogram, at 14 to 19-fold the local price. The butter or souari nut (Caryocar nuciferum, Caryocaraceae family) is locally valued at the same price, collecting happens in June and July.

The nuts of both these species are collected outside the communal forest and occur on state domain (number 2 on Figure 4.2), in the proposed nature reserve.

The ecological risk of collecting large quantities of nuts results in a decline in seedlings and seed-depended animals (such as agoutis and large herbivores), and therefore the sustainability of the harvest. Both species are protected from logging by the Forest Management Act of Suriname. Bertholletia excelsa is listed as vulnerable on the IUCN Red List of threatened species, while Caryocar nuciferum has not been assessed.
Figure 4.13: Collecting *ingi noto* (*Bertholletia excelsa*) nuts in two *warimbo* (*Ischnosiphon arouma*) leaves.

Figure 4.14: Bags filled with brazil nuts collected on a multiple day trip by two Indigenous harvesters.
4.3.2.3 *Ormosia costulata*

The seeds of *weteu* (Trio) or *kokiki* (Sr) (*Ormosia costulata*, Fabaceae family) formed the most important parts to create jewellery with for the women of the Trio community in Sandlanding (Figure 4.15). Other than seed jewellery, these Trio did not sell any vegetal NTFPs.

![Image of a necklace made from *Ormosia costulata* seeds](image)

**Figure 4.15:** One of the ingenious pieces of jewellery made by Naomi Kupuru. The black/purple spotted dark orange seeds come from *Ormosia costulata*. Most parts are made from vegetal NTFPs as well, some of which were collected far upstream or in Guyana.

Because the market in Apoera is on a 40-minute walk, the Trio women sold their jewellery usually every other Saturday on the market. The women explained that locals do not frequently buy any jewellery, however when present, national or international tourists were better customers. Since the Trio women had no access to a larger market and kept making jewellery, they each had hundreds of pieces of jewellery ready to be sold. Through a connection in
Paramaribo, the Trio women now also sell jewellery in the capital and in shops in the Netherlands.

*Ormisia costulata* produces many seeds and cannot all be collected, the Trio women explained. They reported that a new flag-line was set out by the logging company that owns the concession in the area where they collect *weteu* seeds, visualized by number 3 on Figure 4.2. It is a matter of time before logging activities start on this part of their customary territory. The Trio would then probably have to find another site to collect this NTFP.

### 4.3.3 Most important commercial animal NTFPs

For both communities, a stingray endemic to the Courantyne River, *Potamotrygon boesemani*, was the most important commercially traded animal NTFP by far. There is little literature on this remarkable species. Other economically important species included the white-lipped peccary (*Tayassu pecari*), lowland paca (*Cuniculus paca*) and wolf fish (*Hoplias aimara*).

#### 4.3.3.1 *Potamotrygon boesemani* (Boesemani stingray)

*Potamotrygon boesemani* was described as a new species in 2008. It occurs solely in the Courantyne River basin and is not listed on the IUCN Red List of threatened species. This species, well known to the Indigenous communities for its venomous sting and its delicious taste, has become the most important commercial animal NTFP for the communities along the Courantyne River. At times, this stingray, called *spari* in Sranantongo and *amerare kure irepo* in Trio language, used to be cooked alive by the Trio and eaten as a delicacy. However, *spari* has become the most expensive local delicacy known to the region as buyers from the city paid up to US$ 300 per specimen. The boesemani stingray has become a highly desirable showpiece in mainly Asian aquaria.

This species is most easily caught during dry seasons (at night), when the water level in the river and creeks is less high. Several methods were used to catch the *spari*. Spears with a small though sharp tip were shot through one of the fins of the animal, immobilising it. Other hunters
used Y-shaped (home-made) sticks to pin the stingrays to the ground and some used nets to trawl river and creek beds. Once a specimen was immobilised, the hunter would wear swim goggles (if he/she possessed a pair) and put his/her head underwater to cut off the spari’s sting(s) using scissors or a knife. This species has one or two serrated caudal stings which reach a length up to 2.5 times the size of the tail width. People who got stung in their feet and legs, would suffer extreme pain for weeks. However, a spari’s sting is not fatal, if the right antidote is available. If a person is stung in the upper body, the sting could very well be fatal according to many hunters. No fatal accounts were reported during the time of my fieldwork.

Transportation of this species comes with difficulties. Local hunters and fishermen reported that spari need fresh water every 15 to 30 minutes, otherwise it suffocates. Transportation was reported to be most successful in cages behind a boat at slow speed or in baskets with air pumps. However, since many people did not own a boat, air pumps, cages or the knowledge about how to keep this species alive in captivity, hundreds of stingray died during transportation to the villages during the period I spent in West Suriname (late January through late April 2016). People who did not own a boat would go hunting at night wearing rubber boots, wading through creeks with a headlamp on their head, a spear in one hand, and in the other an empty basket. The wading individuals were surrounded by people in small boats, also on the hunt. In both directions of the creek, headlamps from spari hunters were visible. A majority of the population, including some women in these communities who generally do not hunt, were on the hunt for spari. Hunters, NTFP gatherers and others without a daily job who could get their hands on a boat, would go on multiple day-to-week trips in search for some stingrays. In February and early March 2016, the animals were caught close to the villages in the river and surrounding creeks. When spari populations started to decline in the vicinity of the villages, hunters were travelling further and further away. Around late March and April 2016, people were often not successful in catching a single specimen on multiple day hunts, even as far away as the Wonotobo falls (7 hours of travel by small motorboat), located on the Courantyne River. Similar spari hunting scenery was apparent in the Guyanese creek system of the Courantyne River.
These stingrays were solely hunted by locals and then sold to buyers from Paramaribo who would arrive in charter planes, by car or in four-wheel drive vans and buses (Figure 4.17). Guyanese buyers and fishermen tried to buy spari during transportation on the river, before the animals would have arrived on the Surinamese riverbank. In Apoera, a middleman had set up three large tanks equipped with air pumps to store stingrays. In Sandlanding, one inhabitant used an inflatable swimming pool to store some specimens. Buyers would await larger batches to come in (up to 15 or 20 spari a time) for days. Often, many of the stingrays would have died before arrival in the village (Figure 4.18). At the time, on a single trip to the Wonotobo falls 15 animals died, worth US$ 3,750, or the equivalent of 2,678 Trio bracelets. Then, travel to the capital by car or bus was a high risk for both buyers and spari, as many of the latter died during the journey. One buyer reported that a live spari could fetch US$ 1,250 per specimen, or five times the price paid in the village, when sold to an international buyer. Mid-sized (18 – 25 cm) females were most wanted.

Figure 4.16: *Potamotrygon boesemani* just coming to shore.  
Figure 4.17: A spari specimen is carried to the bus of a stingray buyer.
When fieldwork was finished, I started to call and email international stingray salesmen and companies. Specimens for sale were located in France, the Netherlands, Russia, China and Taiwan. The most expensive specimen I found for sale was in China (local name: stingray, 頃; boesemani, 波斯玛尼) for 80,000 Yuan or US$ 11,570 for a 42-centimeter sized male (Figure 4.19), 46 times the amount paid to local fishermen. Apparently, further international transportation was not managed any better as a Taiwanese dealer explained: “I got Boesemani rays from Suriname directly. This ray is the most difficult [animal] for acclimation I ever met, really wild style rays and I lost many pieces.”. His retail price was US$ 10,000 for a 30 – 40 cm sized pair. The spari are often sold in pairs as well. On the Dutch market prices were lower: US$ 3200 for a pair of 15 to 25 cm ones, US$ 8,500 for a 45 to 50 cm sized pair.
Figure 4.19: *Potamotrygon boesemani* offered for sale on a Chinese website (http://51hongyu.com/category-44-b0.html, accessed on 02 February 2017) for up to 80,000 yuan, the equivalent of about US$ 11,570.

Although *spari* species are seen by the locals as valuable and beautiful creatures, the large amount of money that can be earned with it, takes precedence over traditional ecological ‘feelings’ for a species. When an SBB team came to Apoera in early 2016 to organize a workshop on the role of ecological keystone species, only the local authorities and a handful of people showed up at the meeting. The SBB basically explained that it was better to catch two *spari*, instead of 10. However, there are no regulations on offtake. An open access regime can be sustainable when the demands for open access resources are low and harvesting practices do not harm the populations and the surrounding ecosystem. Clearly, in a *de facto* open access scenario like this one, local hunters opt to take the ‘swimming cash’ of US$ 2,500 for 10 rays instead of US$ 500 for two specimens before returning home. Theoretically, the *spari* are common-pool resources since they are subtractable and the exclusion of fishermen is possible, albeit expensive. With the income earned by *spari* sales, the Trio in Sandlanding who first
gained access to electricity in March 2016, were buying freezers, a huge flat screen television and started to replace their traditional houses for partially concrete houses.

Since this stingray was only recently scientifically described, its role in the ecosystem of the Courantyne River basin is still unclear. However, literature on different stingray species show that these keystone species have a great influence on their ecosystem as they modify physical and biological habitat elements through foraging and predation \(^98\). Moreover, stingrays are known to prey on different trophic groups within their ecosystem \(^99\). Removing such a substantial number of bosemani stingrays within a few months is therefore likely to have serious impacts on local trophic systems of the Courantyne River basin and the entire ecosystem. Because so many species die during transportation, the actual sales of this species are much lower than the numbers that have been captured. The species’ narrow endemic state, the great loss of animals during transportation, the lack of national and international recognition of this species in combination with a sudden increase in international demand, has seriously endangered this species of stingray.

4.3.3.2 *Tayassu pecari* (white-lipped peccary) and *Cuniculus paca* (lowland paca)

Another commercially traded animal was the white-lipped peccary (*Tayassu pecari*, Tayassuidae family) is the second most important commercialised animal NTFP for the community of Apoera and the Trios from Sandlanding. This species is IUCN red-listed as vulnerable (VU) because of an estimated decline of 30% of the population within the last 18 years due to (illegal) hunting and habitat loss \(^100\). By Surinamese statutory hunting laws, this animal is only allowed to be hunted (and sold) during the open season from August through March, with a maximum (called a bag limit) of one specimen per hunting trip \(^88\).

The lowland paca (*Cuniculus paca*, Cuniculidae family), referred to as *hei* in Sranantongo, is listed on the IUCN red list as LC, ‘Least Concern’. For Apoera’s community, this is the third most important commercial animal NTFP. Members of the Trio community do consume and sell paca as well. However, it does not appear in their top 3. These species are directly bought from hunters by other locals for subsistence purposes. The meat of both animals was sold for US$
2.80 per kilogram. People come to West Suriname to buy or hunt peccary themselves for own consumption.

Local hunters reported that almost all wildlife is in decline, especially compared to 20 years and longer ago. The reasons they gave for the decline were the following:

1) Increased demand for subsistence bush meat from local people as a result of a population increase;
2) Increased local commercial hunting for bush meat (for local sales);
3) Increased demand for bush meat from non-locals (non-local hunters and subsistence oriented users);
4) Wildlife retreats from nearby concession areas (machinery noise, people);
5) Wildlife has learned to avoid frequently visited hunting areas.

Hunting by the communities of Apoera and Sandlanding takes place entirely outside their communal forest (see the bow-and-arrow icons on the map in Figure 4.2. The hunting marks depicted on Figure 4.2 within the communal forest are frequently used by the inhabitants of Washabo. Southeast of Apoera hunters are limited by active logging concessions. Expansion of logging activities closer to the villages would have consequences for hunters, because wildlife will keep their distance from machinery and people. Also, access to hunting grounds could be restricted on active or FSC-certified concession sites.

4.3.3.3 *Hoplias aimara* (wolf fish)

The wolf fish, called *anjumara* in Sranantongo, is a large predator fish that reaches lengths over 100 cm. This species is more commonly consumed and sold by the Trio, because it occurs in their old habitat near the Wonotobo falls where they still hunt. The Trio placed this NTFP as the third most important commercial species and sell the fish for SRD 17.50 per kilogram, about US$ 2.40. They used to sell their catch on the same day of their return from hunting, because of the lack of electricity (and thereby fridges and freezers), in Sandlanding up to March 2016. Both local and city people buy wolf fish.
Fishermen have noticed a decrease in abundance of *anjumara* in the Courantyne River. The fish is no longer found in waters closer to Apoera, because of increased in fishing by locals and organized fishing trips for tourists.

### 4.4 Conclusions

The most important commercial NTFPs are listed in Table 4.2, including their buyers, the land tenure status of harvesting sites and whether ecological impacts have been observed.

This study shows the land tenure insecurity in the areas where commercial NTFPs are harvested by the communities of Apoera and Sandlanding in West Suriname. Some families within these communities depend entirely on the income generated by NTFPs sales, other families partially and just a few families generate their entire income through other work. Although Suriname has ratified the Convention on Biological Diversity (CBD) and adopted the Declaration on the Rights of Indigenous Peoples (UNDRIP), the government has not yet started any form of collaborative management (in West Suriname’s) ITP’s territories. This gap opens up a space for developing collaborative management regulations which could be incorporated into national policies and procedures, and would represent an important step in advancing local governance and biodiversity management.

As for the species that are harvested and hunted, another important lesson is learned. There are an untold number of species which are not listed by CITES, such as the *Potamotrygon boesemani* and *Caryocar nuciferum* and which are traded internationally. When national policies are also non-existent, the quantity of gathered and sold NTFPs depends entirely on the local communities’ decisions, which are driven by demand from outside. The current globalised world can create a sudden high demand for certain NTFPs. The astronomical amounts of money that the sale of live *spari* generatea for these local communities, signals that in the absence of sustainable harvesting rules this animal will soon join the ranks of the many species made extinct through human action.
Table 4.2: List of most important commercial NTFPs for the Trio and Apoera communities, with correlated tenure and ecological issues.

<table>
<thead>
<tr>
<th>NTFP, vegetal (v)/animal (a)</th>
<th>Market</th>
<th>Tenure status</th>
<th>Ecological risks</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Carapa guianensis,</em> (v)</td>
<td>Local and non-local consumers</td>
<td>State domain under request for timber harvesting</td>
<td>Overharvesting seeds for long period can decrease regeneration and food source for game animals</td>
</tr>
<tr>
<td></td>
<td>Middle men [small-scale]</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Bertholletia excelsa,</em> (v)</td>
<td>Local consumers</td>
<td>State domain, proposed nature reserve</td>
<td>Overharvesting seeds for long period can decrease regeneration and food source for game animals</td>
</tr>
<tr>
<td></td>
<td>Locally commercialized [small-scale]</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Middle men from city market [small-scale]</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Caryocar nuciferum,</em> (v)</td>
<td>Local consumers</td>
<td>State domain, proposed nature reserve</td>
<td>Overharvesting seeds for long period can decrease regeneration and food source for game animals</td>
</tr>
<tr>
<td></td>
<td>Locally commercialized [small-scale]</td>
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</tr>
<tr>
<td></td>
<td>Middle men from city market [small-scale]</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Ormosia costulata,</em> (v)</td>
<td>Non-local customers, tourists, Paramaribo and international market [small-scale]</td>
<td>Logging concession site</td>
<td>Unknown</td>
</tr>
<tr>
<td><em>Potamotrygon boesemani,</em> (a)</td>
<td>Paramaribo and international market [large-scale]</td>
<td>State domain, <em>de facto</em> open access regime</td>
<td>Extreme decrease in population, may lead to extinction. Potential threats to ecosystem</td>
</tr>
<tr>
<td><em>Tayassu pecari,</em> (a)</td>
<td>Local and non-local consumers Locally commercialized [small-scale]</td>
<td>State domain and logging concession sites</td>
<td>Decrease in population noticed</td>
</tr>
<tr>
<td><em>Cuniculus paca,</em> (a)</td>
<td>Local and non-local consumers Locally commercialized [small-scale]</td>
<td>State domain and logging concession sites</td>
<td>Decrease in population noticed</td>
</tr>
<tr>
<td><em>Hoplias aimara,</em> (a)</td>
<td>Local and non-local consumers Locally commercialized [small-scale]</td>
<td>State domain, <em>de facto</em> open access regime</td>
<td>Decrease in population noticed</td>
</tr>
</tbody>
</table>
4.5 Recommendations

In order to improve NTFP security for the communities of West Suriname and to prevent further harmful decline in wildlife and foremost in *Potamotrygon boesemani* stingray, some policy recommendations are laid out for collaborative forest governance. The most important principles that result in successful outcomes for local communities and ecosystems are:\(^8^0^\): i) secure land tenure; ii) collaboratively-developed rules that reflect and respect local communities and the ecosystems; iii) effective monitoring and enforcement. One of the international conservation programs that covers these principles is Reducing Emissions from Deforestation and Forest Degradation (REDD+). The REDD+ proposal issued by Suriname has been approved in 2014. This provides opportunities for future collaborative (research) projects. The main idea behind REDD+ is that Northern countries pay for carbon sequestration in Southern countries through forestry practices whilst taking biodiversity and the needs and rights of local communities into account. The following four recommendations will build on the above-mentioned principles to safeguard biodiversity and local communities’ interests, and include potential REDD+ opportunities.

4.5.1 Research on ecological impact of harvesting NTFPs

The ecological impact from harvesting seeds from different tree species is currently unknown, as is the impact from hunting wildlife. A five-step long-term research process could be set up to determine and manage the sustainability of gathering NTFPs:\(^1^0^2^) :

1) Situation analysis (gather existing data on species, the ecosystem and collecting operations);
2) Resource inventory (quantity of targeted species);
3) Yield and generation studies;
4) Assessment of harvest impacts;
5) Periodic monitoring and harvest adjustments
This collaborative research could be done to determine impacts on targeted NTFP species and their surrounding ecosystem. Local NTFP gatherers can help to do the monitoring for vegetal NTFPs, while hunters could monitor wildlife. Currently, the hunting calendar focuses on bag limits – a number of species you can carry in your bag, on a single trip. Within this system, a hunter could theoretically make 3 trips a day for the entire hunting season carrying the maximum number of hunted animals each time. It seems advisable to co-develop by government and local community representatives a system for sustainable off-take number of hunted animals per hunting season, rather than per hunting trip. However, as in many other cases, the monitoring and enforcement of NTFP hunting and gathering rules are a major challenge and often costly. Because there is currently no effective monitoring system in place, the success of any rules will depend on full participation of all affected and interested parties.

4.5.2 Safeguard traditional NTFP practices – protect lands and/or species (through REDD+)

Traditional cultural practices such as gathering subsistence NTFPs and commercial NTFPs (as disclosed in this chapter) should be safeguarded, as long as these practices are in consonance with the conservation of biodiversity.

By affirming respect for the policies set out in the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), the government of Suriname could take steps to comply with, amongst others, Article 2C:

“States shall provide effective mechanisms for prevention of, and redress for any action which has the aim or effect of dispossessing them of their lands, territories or resources.”

In order to safeguard the making of crabwood oil and traditional jewellery, the lands these seeds are collected on should be demarcated and protected. If allocating land rights to traditional authorities is not considered feasible, then co-management of activities on these lands involving the government, logging companies and the communities could be an important interim step. It should be guaranteed to the communities that these areas should not be logged, especially the tree species of interest (*Ormosia costulata* and *Carapa guianensis*).
Safeguarding these tree stands would also make an excellent REDD+ project, as it includes all the pillars of REDD+: 1) trees will be saved from being cut, resulting in the sequestration of carbon; 2) forest biodiversity and ecosystem services will be maintained and/or enhanced; 3) it will promote the sustainable livelihoods of Indigenous communities; 4) it could promote the application of Free, Prior and Informed Consent (FPIC) guidelines over these areas, strengthening Indigenous land rights; 5) promote ‘fair funding’ through implementing an equitable, transparent and participatory funding mechanism. The latter could be realized by improving market access and establishing direct connections to (international) companies that sell crabwood oil or other NTFPs.

4.5.3 Stingray conservation and sustainable harvesting education

As the research in this chapter has shown, there are very clear signs that the *Potamotrygon boesemani* population has been heavily reduced within a matter of months. In order to stave off localized extinction, it would be necessary to place an immediate moratorium on the export of *P. boesemani*. Prior to the export ban, consultations should take place with the local communities to discuss and agree on specific steps. Inter-governmental discussions should also take place with the Guyanese government officials and local communities, so as to prevent all the boesemani stingrays simply being sold in and exported through Guyana.

Any moratorium will cut the income of the remaining *spari* hunters, which will cause dissatisfaction in the communities. However, hunters and other community members have experiences of boom-and-bust commodities. They have the most direct knowledge of the growing scarcity of *spari* and so would come around to accepting that continuation of current unsustainable harvesting practices would soon result in zero income through *spari* sales. That would be the most unwelcome outcome for both the communities and the stingray population.

A sustainable program could be set up to breed stingrays in controlled environments within the local communities. This is already being done in the Netherlands. Knowledgeable stingray breeders could come to the Indigenous villages to set up water tanks with air pumps and other necessary equipment. They could explain what conditions are best for the *spari* to produce.
offspring and guide the local families throughout the process. In this way the communities could still earn money through the sales of *spari*, and the natural population might find a new balance.

To monitor whether the *P. boesemani* population is resilient enough to make a comeback, research and monitoring systems should be in place. Since long-term assessments are difficult to make with short-term scientific studies, monitoring can be done by the former harvesters \(^{103}\), for which they should receive fair compensation. Besides keeping track of the natural population, further research should determine what the effects are on other natural elements of the Courantyne River basin.

In order to prevent future boesemani stingray stocks from being depleted, it would be helpful if the bond with the animal is nurtured. A governmental program through the SBB, which sought to educate the villagers on the potential impacts of overharvesting of this species, was poorly attended by the locals (held early 2016 in Apoera). Among the Maori of New Zealand stingrays occur in narratives and are considered to be guardians of the waters where the Maori collect NTFPs \(^{104,105}\). It would be interesting and instructive to have a few Maori people share their beliefs and customs regarding their *spari* with the Courantyne villagers.

These projects could be funded by the government of Suriname, since they are – according to the ratified Convention on Biological Diversity (CBD), Article 10C – legally bound to:

> “Protect and encourage customary use of biological resources in accordance with traditional cultural practices that are compatible with conservation or sustainable use requirements.”

If these recommendations regarding *spari* conservation are followed, the government would fulfil its role to protect both biodiversity and Indigenous practices. The Indigenous communities of West Suriname could develop a deeper bond with the *spari*, the stingray population would have a chance to recover and through breeding the species, the communities could still earn an income.
4.5.4 Strengthen Indigenous co-management (through REDD+)

Because large areas where the Indigenous communities depend on fall outside their communal forest, co-management over the ‘extended’ customary territory should be established among the government, intermediate NGOs, Indigenous Peoples Organizations (IPOs) and the involved local communities. This might include the devolution of forest governance over an extended area, than just the communal forest. Devolution of forest governance is defined as ‘the formal transfer to local communities, indigenous groups, private firms or individuals of rights and responsibilities over forest resources previously vested in centralized national governments’.

It should be clear that such devolution will only work when the different levels of governing bodies work together and the local communities receive conservation education and training.

It is thereby common for communities to develop management plans (in collaboration with experts/researchers/IPOs/NGOs) that have to be approved by other authorities such as a national forestry department. However, it requires the traditional authorities and individuals from all communities to work together, instead of the current four (Apoera, Section, Washabo, Sandlanding) solo-operating institutions.

Areas that could be included in the communal forest:

1) Southeast of the villages where:
   - crabwood stands occur;
   - (subsistence) hunting finds place;
   - jewellery seeds are collected;
   - traditional farming grounds are located

2) The nature reserve that was proposed in 1979

Since the latter proposed nature reserve borders the communal forest and serves for many traditional activities, it forms an excellent site for the devolution of powers to the Indigenous communities. This area, which surrounds the biodiversity-rich Kaboeri creek, could also become the locus of another REDD+ project by promoting ecotourism, while safeguarding biodiversity and excluding outsiders from commercial fishing, hunting and timber harvesting. Monitoring
and enforcement can be done by the locals while taking tourists on trips (a camp is already built for overnight jungle stays). Ecotourism would also create jobs within the communities for many others. Hereby, think of people with accommodation, boats, cars, tour guides (cultural and natural), small restaurants, shops, bars. People can sell their handicrafts, their vegetables, fish, meat, cassava bread etc. Money raised through ecotourism could be used communally to improve healthcare and traditional education, for example. Two hours per week in school could be spent on traditional education where children can learn their original language, play traditional songs, get to know medicinal plants (they were eager to learn during the NTFP questionnaires in primary school, see Chapter 3) and become acquainted with other traditional customs that tend to be forgotten. Teachers should be (elder) locals who receive fair payment for their hours.

In general, the basis of this co-management could be formed through strengthening the communities’ bundle of rights. These rights can include:

- Rights of access – which should be limited to the communities of Apoera, Washabo, Sandlanding, Section and Hardlanding;
- Rights of extraction - to gather natural resources for subsistence (and co-managed commercial) purposes;
- FPIC – the right for the communities to take part in decision-making processes over activities that take place within their co-managed territories;
- The right to exclude others (e.g. hunters from the city, logging companies etc.);
- The duration of these rights should not be time-limited;
- Extinguishability of rights – the government currently retains the right to alienate the lands for the public good and revoke a communal title.

However, it should be clear that solely allocating these rights or granting title over customary lands without proper governance systems in place, would have limited outcomes for ecosystem management. The important message is that the locals depend on the natural resources extracted from their customary lands. If someone higher up the chain of authority decides to allocate these lands to an actor with different interests, the livelihoods of these communities...
can easily be destroyed. By strengthening governance and their breadth of rights, the communities’ livelihood security would improve. Realising these goals through a conservation program such as REDD+ could result in a win-win situation for both the government and the communities.
Chapter 5: Conclusions and future perspectives

5.1 Conclusions

This research has shown that the Trio community in Sandlanding and the Amerindian inhabitants of Apoera make extensive use of natural resources extracted from the forests that surround their villages. They collect many different NTFPs that serve for subsistence and commercial purposes. The body of knowledge about these NTFPs has been built up over millennia and is still passed on to younger generations today. Against expectations, the children of the more forest-dependent Trio community did not possess more knowledge about NTFPs than their more urbanised and acculturated peers from Apoera. This finding shows that the time of acculturation and urbanisation does not influence the rate of NTFP knowledge loss between 15 years (exposure of Trio community) and several decades (exposure of Apoera community), but rather that this knowledge is lost in the first 15 years of exposure. Adult Trio members have been entirely dependent on their natural surroundings before they came to Sandlanding. Therefore, their children are the first generation to being exposed to urban influence. Attending a State (primary) school and limited forest walks seemed to be the main drivers behind disrupted NTFP knowledge transmission. Fundamental to this argument is the fact that children have less time being involved in (traditional) activities that partake NTFPs.

For the ethnobotanical knowledge that is passed on, it was shown that children were acquainted with the applications of commercial and edible NTFPs prior to mastering the corresponding plant names. This finding confirms that knowledge acquisition at a young age happens through observation. This result also makes evolutionary sense because a name will not clarify whether a plant is deadly or edible. Knowledge of the application of a plant on the other hand, could help identify potential risks. For all children, the application of commercial and food NTFPs were much better known than the applications of medicinal NTFPs. Besides the fact that the use of medicinal NTFPs is specialized knowledge, it is also only applied when people are sick. Therefore, the application of medicinal NTFPs is likely to happen less frequently than commercial and food NTFPs. Since specialized medicinal plant knowledge is known to only certain villagers, it is prone to be eroded the soonest.
The use of Sranantongo plant names by the Trio children and the use of Trio plant names by the children from Apoera, showed that ethnomedical knowledge exchange indeed takes place between the two communities. These Amerindian communities exchange ethnomedical information and thereby strengthen their body of knowledge about certain NTFPs. This finding contradicts that acculturation erodes the body of traditional knowledge. Rather, at least on ‘small-scale acculturation’ level, it can strengthen the ethnomedical knowledge as both communities learn customs that involve NTFPs from one another. For these communities, it is therefore clear that urbanisation (i.e. schools and shops) augment the loss of traditional ethnomedical knowledge, while acculturation can reverse that process.

By defining the three most important commercial NTFPs, land tenure issues were identified on the lands these NTFPs were collected on. Land tenure security for the Indigenous communities of West Suriname was found to be poor as most of the gathering sites fall outside the communal forest – the piece of territory the communities have title over. Some of the collection sites fell within active logging concessions, others were under request for the allocation of land or access rights. The three principles that secure tenure is based on (i: how many rights one enjoys – bundle of rights; ii) whether those rights are protected; iii) duration of rights) are almost non-existent over many of their customary collection territories. In accordance to the by Surinamese government ratified and accepted CBD and UNDRIP, and in accordance to the jurisprudence from the IAHCR, the government should improve local participation processes through FPIC principles. It also should ensure that areas where NTFPs are collected are not being logged or become inaccessible to the communities, as their livelihoods and income depend on it. When these steps are found to be too radical, the protection of important NTFP species could be an interim step towards co-management.

Besides land tenure issues, an assessment was made on current and future (potential) harmful impacts on NTFP species and their ecosystems as a result of unsustainable harvesting practices. For vegetal NTFPs, it is hard to determine potential risks as little literature covers how many plant(s) (parts) are collected, what the resource inventory is, how long (re)generation of targeted species can take up and what the impacts are from harvesting on the rest of the ecosystem. For animal NTFPs, hunters noted a clear decrease in both wildlife and fish stocks,
Although not substantial enough that hunting was becoming strenuous. However, for the endemic stingray *Potamotrygon boesemani*, the tides have turned within a matter of months. Because of a sudden increase in global demand for this species as showpiece, the population of the boesemani stingray has imperiled. Besides the colossal impact on the population, the consequences to the trophic biome of the Courantyne River basin are unknown. The underlying cause is human imprudence and globalisation on one side. On the other side the lack of conservation governance. Since this species (and many other) is not listed by CITES, international and national regulations regarding the export of *P. boesemani* are absent. Although unsustainable, the incentive of earning a year’s salary within a week is too big to spare the animal for the local communities. If not you, a hundred others will catch the stingray.

The outcomes of this research show how nature’s bounty in the customary territories of the Indigenous communities in West Suriname are of irreplaceable value up to today. The sustainable continuation of many activities, however, calls for co-management between branches of governmental institutions, NGOs, Indigenous Peoples Organizations (IPOs) and the local communities themselves. The government will need to reach out to the communities to involve them at the level of decision-making processes (FPIC principles), NGOs and IPOs will need to support and educate individuals from the communities to become competent with existing and future programs. However, without the devotion of the Indigenous communities themselves to start governing (traditional) activities through implementation of co-developed rules and regulations, participatory programs will not succeed.

### 5.2 Future perspectives

The FPIC agreement stated that all documented traditional knowledge belonged to the local communities and that they would indicate, per species, which knowledge was allowed to be shared. After a few discussions, it became clear that the communities only wanted to make the usage categories public (such as ‘food’, ‘building material’, ‘medicine’ and ‘spiritual’). I fully understand and respect this decision. Therefore, this thesis does not include any of the documented traditional knowledge that was captured during the fieldwork. However, due to
time pressure from the late issued government research permits that led in turn to a restricted available fieldwork period, a limited amount of NTFP knowledge has been documented. To prevent traditional ethnobotanical knowledge to be lost (which is solely passed on orally), knowledgeable locals should continue recording their knowledge, in collaboration with a researcher or organisation if preferred.

The study on the trans-cultural transmission of ethnobotanical knowledge was appealing. A follow-up study however, to determine how this knowledge is transferred between different generations and between the communities would be very interesting. Through such research it could become clear in what ways acculturation could strengthen and expand communities’ traditional knowledge, instead of weakening it.

The greatest need for more research is in the area of ecological impacts from the harvesting of NTFPs. Since no literature is available on the endemic stingray *Potamotrygon boesemani*, further research could focus, inter alia, on their numbers, age classes and their roles and influence on the trophic levels within the ecosystem. Other research should be carried out to determine the impact of seed collection intensity by area and season (for *Carapa guianensis*, *Bertholletia excelsa*, *Ormosia costulata* and *Caryocar nuciferum*) on the occurrence of seedlings. Population numbers on different species of ‘bush meat’ and fish stocks are completely absent and would be highly desirable to regulate allowed hunting numbers.

I would be very pleased to return and carry out some of these studies, in cooperation with the local communities.
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Appendices

Appendix A shows a full list of commercial NTFPs used by the communities of Apoera and/or Sandlanding.

Appendix B shows all NTFP species from which traditional knowledge was collected and herbarium specimens were made. The traditional knowledge is only available to the communities themselves and not to the public.
### Appendix A - Table of commercial NTFPs sold by the communities of Apoera and Sandlanding

<table>
<thead>
<tr>
<th>Local name</th>
<th>English name</th>
<th>Scientific name</th>
<th>Type</th>
<th>Unit</th>
<th>Price per unit (in US$)</th>
<th>Price per unit (in SRD)</th>
<th>Months sold</th>
<th>IUCN red list status</th>
</tr>
</thead>
<tbody>
<tr>
<td>krapa siri (Sr)</td>
<td>crabwood oil</td>
<td><em>Carapa guianensis</em></td>
<td>Plant</td>
<td>liter</td>
<td>5 - 7</td>
<td>40 - 50</td>
<td>Jul - Sept</td>
<td>-</td>
</tr>
<tr>
<td>ingi noto (Sr)</td>
<td>brazil nut</td>
<td><em>Bertholletia excelsa</em></td>
<td>Plant</td>
<td>kilo</td>
<td>1.82</td>
<td>13</td>
<td>Feb - May</td>
<td>-</td>
</tr>
<tr>
<td>sawari (Sr)</td>
<td>souari</td>
<td><em>Caryocar nuciferum</em></td>
<td>Plant</td>
<td>kilo</td>
<td></td>
<td></td>
<td>Jun - Jul</td>
<td>-</td>
</tr>
<tr>
<td>spari (Sr)</td>
<td>stringray</td>
<td><em>Potamotrygon boesemani</em></td>
<td>Fish</td>
<td>animal</td>
<td>200 - 300</td>
<td>-</td>
<td>Aug - Mar</td>
<td>VU</td>
</tr>
<tr>
<td>pingo (Sr)</td>
<td>white-lipped peccary</td>
<td><em>Tayassu pecari</em></td>
<td>Meat</td>
<td>kilo</td>
<td>2.80</td>
<td>20</td>
<td>Jan - Dec</td>
<td>LC</td>
</tr>
<tr>
<td>hei (Sr)</td>
<td>lowland paca</td>
<td><em>Cuniculus pacu</em></td>
<td>Meat</td>
<td>kilo</td>
<td>2.80</td>
<td>20</td>
<td>Jan - Dec</td>
<td>LC</td>
</tr>
<tr>
<td>anjumara (Sr)</td>
<td>wolf fish</td>
<td><em>Hoplias amara</em></td>
<td>Fish</td>
<td>kilo</td>
<td>2.45</td>
<td>17.5</td>
<td>-</td>
<td>not listed</td>
</tr>
<tr>
<td>konkoni (Sr)</td>
<td>agouti</td>
<td><em>Dasyprocta leporina</em></td>
<td>Meat</td>
<td>animal</td>
<td>2.80 – 5.60</td>
<td>25 - 50</td>
<td>Jan - Dec</td>
<td>LC</td>
</tr>
<tr>
<td>marai (Sr)</td>
<td>marail guan</td>
<td><em>Penelope mombo</em></td>
<td>Bird</td>
<td>animal</td>
<td>2.80 – 5.60</td>
<td>25 - 50</td>
<td>Jul - Nov</td>
<td>not listed</td>
</tr>
<tr>
<td>pakira (Sr)</td>
<td>collared peccary</td>
<td><em>Pecari tajacu</em></td>
<td>Meat</td>
<td>kilo</td>
<td>4.90</td>
<td>35</td>
<td>Aug - Mar</td>
<td>LC</td>
</tr>
<tr>
<td>dia (Sr)</td>
<td>red brocket</td>
<td><em>Mazama americana</em></td>
<td>Meat</td>
<td>kilo</td>
<td>2.60</td>
<td>18.5</td>
<td>Mar - Sept</td>
<td>DD</td>
</tr>
<tr>
<td>sekrepatu (Sr)</td>
<td>turtle</td>
<td><em>Chelonoidis carbonaria</em></td>
<td>Meat</td>
<td>animal</td>
<td>5 - 10</td>
<td>40 - 70</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>kapuwa (Sr)</td>
<td>capybara</td>
<td><em>Hydrochaeris hydrochaeris</em></td>
<td>Meat</td>
<td>kilo</td>
<td>1.40</td>
<td>10</td>
<td>Jan - Dec</td>
<td>LC</td>
</tr>
<tr>
<td>Local name</td>
<td>English name</td>
<td>Scientific name</td>
<td>Type</td>
<td>Unit</td>
<td>Price per unit (in US$)</td>
<td>Price per unit (in SRD)</td>
<td>Months sold</td>
<td>IUCN red list status</td>
</tr>
<tr>
<td>-------------------</td>
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<td>------</td>
<td>-------------------------</td>
<td>-------------------------</td>
<td>-------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>kapasi (Sr)</td>
<td>armadillo</td>
<td>unknown</td>
<td>Meat</td>
<td>kilo</td>
<td>1.40</td>
<td>10</td>
<td>Aug - Mar</td>
<td>-</td>
</tr>
<tr>
<td>powisi (Sr)</td>
<td>black currasow</td>
<td>Crax alector</td>
<td>Bird</td>
<td>animal</td>
<td>8 - 14</td>
<td>60 - 100</td>
<td>Jul - Nov</td>
<td>VU</td>
</tr>
<tr>
<td>bofru (Sr)</td>
<td>lowland tapir</td>
<td>Tapirus terrestris</td>
<td>Meat</td>
<td>kilo</td>
<td>1.40</td>
<td>10</td>
<td>Jun - Aug</td>
<td>VU</td>
</tr>
<tr>
<td>kubi (Sr)</td>
<td>pacora</td>
<td>Plagioscion surinamensis</td>
<td>Fish</td>
<td>kilo</td>
<td>1.40</td>
<td>10</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>pacu (Sr)</td>
<td>tambaqui</td>
<td>Colossoma macropomum</td>
<td>Fish</td>
<td>kilo</td>
<td>3.50</td>
<td>25</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>mopé (Sr)</td>
<td>true yellow mombin</td>
<td>Spondias mombin</td>
<td>Plant</td>
<td>kilo</td>
<td>-</td>
<td>-</td>
<td>Feb - Jun</td>
<td>-</td>
</tr>
<tr>
<td>kujaridu (Tr)</td>
<td>unknown</td>
<td></td>
<td>Plant</td>
<td>kilo</td>
<td>1.05</td>
<td>7.5</td>
<td>Jul</td>
<td>-</td>
</tr>
<tr>
<td>karau (Tr), switi</td>
<td>cf. Ice-cream-bean</td>
<td>Inga sp.</td>
<td>Plant</td>
<td>kilo</td>
<td>0.70</td>
<td>5</td>
<td>Jan - Mar</td>
<td>-</td>
</tr>
<tr>
<td>bonki (Sr)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>oloi (Tr),</td>
<td>kill my darling</td>
<td>Dimorphandra conjugata</td>
<td>Plant</td>
<td>kilo</td>
<td>-</td>
<td>-</td>
<td>Feb - Mar</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>boskasju (Sr)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>groene boomboa (NL)</td>
<td>emerald tree boa</td>
<td>Corallus caninus</td>
<td>Animal</td>
<td>animal</td>
<td>200</td>
<td>-</td>
<td>Jan - Dec</td>
<td>LC</td>
</tr>
</tbody>
</table>
Appendix B - Voucher specimens made during fieldwork

PLANTS OF SURINAME

Kabalebo Resort

warimbo (Sr), waruma (Trio)

MARANTACEAE

Ischnosiphon arouma (Aubl.) Körn.

#TvdB001 20 March 2016

De stengel van de warimbo wordt gespleten om vlechtwerk te maken. Onder andere werden casave persen en manden gemaakt.

Beschrijving: Bladeren waaiervormig gegroepeerd, blad asymmetrisch, bladrand gaaf, bovenzijde blad donkergroen en onderzijde licht groen met grijs -paarse tint. Bloeiwijze eindstandig gegroepeerde aar met 7 tot 15 bloemen per aar.

Coördinaten: 4.860351; -57.283119

Duplicaten: 2: NHS, Paramaribo, SR; NHN, Leiden, NL.

PLANTS OF SURINAME

Kabalebo Resort

karapa (Tr), karaba (Ar), krapa boom (NL), krapa siri (Sr)

MELIACEAE

Carapa guianensis Aubl.

#TvdB002 20 March 2016

Arawak gebruik: De noten van de krapa boom worden gebruikt om krapa olie te
PLANTS OF SURINAME

Kabalebo Resort

busi pepre, anesi wiri (Sr)

PIPERACEAE

Piper peltatum L.

#TvdB003 20 March 2016

PLANTS OF SURINAME

Kabalebo Resort

sangrafu (Sr), oloke (Trio), hokuri shikaro (Ar), turtle cane (En)

COSTACEAE

Costus scaber Ruiz & Pav.

#TvdB004 21 March 2016
PLANTS OF SURINAME

Kabalebo Resort

korsu weri (Sr)

ASTERACEAE

Chromolaena odorata (L.) R.M.King & H.Rob.

#TvdB005 21 March 2016

PLANTS OF SURINAME

Kabalebo Resort

sipyo (Ca), haiawa (Ar), boskaars (NL)

BURSERACEAE

Protium heptaphyllum (Aubl.) Marchand

#TvdB006 23 March 2016
PLANTS OF SURINAME

Kabalebo Resort

brasabrasa (Sr)

ARACEAE

*Philodendron hederaceum* (Jacq.) Schott

#TvdB007 23 March 2016

Caraïb: Wordt gebruikt tijdens de jacht op pingos. Als de dieren weglopen wordt de brasabrasa aan een boom gehangen met een kamina (bostouw). Een klier in het achterste van de pingos is geestelijk verbonden met de plant waardoor hij terug moet komen naar de hangende brasabrasa. Na het jagen dient de plant weggehaald te worden, anders pienaar je de pingos aangezien ze zich aangetrokken blijven voelen aan de plant. // Arawak: ten afkooksel van de bladeren wordt gedronken om geelzucht tegen te gaan.

Beschrijving: Epifiet, klimt strak tegen de boom. Bladeren iets los van stam, verspreid, bladvoet hartvormig tot geoord, bladtop (stekel)puntig. Rond bladnerven donkergroen, de rest van het blad licht grijze waas.

Coördinaten: 5.261204; -57.104354

---

PLANTS OF SURINAME

Kabalebo Resort

ume (Tr), wasasoro (Ar), busi papaja (Sr)

CECROPIACEAE

*Cecropia cf. sciadophylla* Mart.

#TvdB008 24 March 2016

Arawak: een afkooksel van de bladeren wordt gedronken om geelzucht tegen te gaan.
PLANTS OF SURINAME

Kabalebo Resort

inki pipa (Sr), wadara (Ar)

LECYTHIDACEAE

*Couratari sp.*

#TvdB009

24 March 2016

---

PLANTS OF SURINAME

Kabalebo Resort

oke (Ar)

ARACEAE

*Philodendron sp.*

#TvdB011

30 March 2016
PLANTS OF SURINAME

Kabalebo Resort

popokainangra (Sr), piana iroi (Trio)

RUBIACEAE

Uncaria guianensis (Aubl.) J.F.Gmel.

#TvdB012 30 March 2016

PLANTS OF SURINAME

Kabalebo Resort

menu (Trio), lana (Ar), tapuripa (Sr) tapurupo (Ca)

RUBIACEAE

Genipa americana L.

#TvdB013 1 April 2016
PLANTS OF SURINAME

Kabalebo Resort

malaria epi (Tr), kareudan (Ar), kwasi bita (Sr), malaria epi (Trio)

SIMARUBACEAE

Quassia amara L.

#TvdB014 1 April 2016

PLANTS OF SURINAME

Kabalebo Resort

aromatata (Ar)

FABACEAE

Clathrotropis brachypetala (Tul.) Kleinhoonte

#TvdB015 2 April 2016
Arawak: de alata udu wordt gebruikt als bouwmateriaal. Er worden zoal pilaren in kampen mee gemaakt omdat het hout heel sterkt is en niet snel brandt.


Coördinaten: 5.062318; -57.114338

Duplicaten: 2: NHS, Paramaribo, SR; NHN, Leiden, NL.

---

**PLANTS OF SURINAME**

Kabalebo Resort

alata udu (Sr), kuri dan (Ar)

APOCYNACEAE

*Geissospermum argenteum* Woodson

#TvdB016 2 April 2016

---

**PLANTS OF SURINAME**

Kabalebo Resort

fungu (Sr), bogorada (Ar)

CHRYSOBALANACEAE

*Licania sp.*

#TvdB017 3 April 2016
**PLANTS OF SURINAME**

Kabalebo Resort

kapadula (Ar), brontitei (Sr), sakataitu (Trio)

dilenniaceae

*Tetracera volubilis* L.

#TvdB018

3 April 2016

---

**PLANTS OF SURINAME**

Kabalebo Resort

wojeng (Trio)

cannabinaceae

*Trema micrantha* (L.) Blume

#TvdB019

4 April 2016
**PLANTS OF SURINAME**

Kabalebo Resort

wetei (Trio), Barakaro (Ar), kokriki (Sr)

**FABACEAE**

*Ormosia costulata* (Miq.) Kleinhoonte

#TvdB020 5 April 2016

**PLANTS OF SURINAME**

Kabalebo Resort

spatae (Trio)

**SMILACACEAE**

*Smilax schomburgkiana* Kunth

#TvdB021 5 April 2016
**PLANTS OF SURINAME**

Kabalebo Resort

**wuradi (Trio)**

LOGANIACEAE

*Strychnos cf. erichsonii* M.R.Schomb. ex Progel

#TvdB022 5 April 2016

---

**PLANTS OF SURINAME**

Kabalebo Resort

**yariyari (Ar)**

ANNONACEAE

*Anaxagorea dolichocarpa* Sprague & Sandwith

#TvdB024 6 April 2016
**PLANTS OF SURINAME**

Kabalebo Resort

mato (Tr), kasarerodan (Ar)

ANNONACEAE

*Guatteria scandens*

#TvdB025

8 April 2016

**PLANTS OF SURINAME**

Kabalebo Resort

hikuridan (Ar)

APOCYNACEAE

*Tabernaemontana undulata* Vahl

#TvdB026

8 April 2016
PLANTS OF SURINAME

Kabalebo Resort

morokokohehe (Trio), sekrepatu trapu (Sr)

FABACEAE

*Bauhinia guianensis* Aubl.

#TvdB027 19 April 2016

PLANTS OF SURINAME

Kabalebo Resort

kajwa (Ar), maho (Sr)

MALVACEAE

*Hibiscus tiliaceus* L.

#TvdB028 8 April 2016
**PLANTS OF SURINAME**

Kabalebo Resort

shishimbiri obano (Ar), sibi wiri (Sr)

**SCROPHULARIACEAE**

*Scoparia dulcis* L.

#TvdB029 20 April 2016

---

**PLANTS OF SURINAME**

Kabalebo Resort

konsakawiwiri (Sr), teteliu bina (Ar)

**PIPERACEAE**

*Peperomia pellucida* (L.) Kunth

#TvdB030 20 April 2016
PLANTS OF SURINAME

Kabalebo Resort

gado dede (Sr)

COMMELINACEAE

Commelina diffusa Burm.f.

#TvdB031 20 April 2016

PLANTS OF SURINAME

Kabalebo Resort

tonka bin (Ar), tonka wiwiri (Sr)

CANTACEAE

Justicia pectoralis Jacq.

#TvdB032 21 April 2016
**PLANTS OF SURINAME**

Kabalebo Resort

**Lowisa weri (Sr)**

EUPHORBIACEAE

*Phyllanthus amarus* Schumach. & Thonn.

#TvdB033

21 April 2016

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**PLANTS OF SURINAME**

Kabalebo Resort

**wilde sopropo (NL)**

CUCURBITACEAE

*Momordica charantia* L.

#TvdB034

22 April 2016

---

Arawak: Na deze plant schoongewassen te hebben, wordt deze gekookt. Het afkooksel wordt gedronken om het lichaam te reinigen en de nuttiger ervan sterker te maken.

Beschrijving: 45cm hoog kruid. Bladeren samengesteld en geveerd, 8 tot 28 deelblaadjes van 2-7mm x 5-20mm. Elk deelblaadjespaar heeft een bloemetje (wit)/vruchtje (groen) eronder.

Coördinaten: 5.184141; -57.164226

Duplicaten: 2: NHS, Paramaribo, SR; NHN, Leiden, NL.

Arawak: Deze plant kookt men om als thee te nuttigen. Ook wordt er mee gebaad om jeuk aan het lichaam te verminderen.
**PLANTS OF SURINAME**

Kabalebo Resort

pianarov (Tr), yawahe pesi (Ar), slabriki (Sr)

FABACEAE

*Senna alata* (L.) Roxb.

#TvdB035 22 April 2016

**PLANTS OF SURINAME**

Kabalebo Resort

kurkuni (Tr), Yurika (Ar), mokomoko (Sr)

ARACEAE

*Montrichardia arborescens* (L.) Schott

#TvdB036 22 April 2016
**PLANTS OF SURINAME**

Kabalebo Resort

*boter, melk en kaas (NL)*

**SAPINDACEAE**

*Paullinia pinnata*

#TvdB037 20 April 2016

**PLANTS OF SURINAME**

Kabalebo Resort

*kapi (Tr)*

**CONNARACEAE**

*sp.*

#TvdB038 19 April 2016
**PLANTS OF SURINAME**

Kabalebo Resort

pula (Tr), khareme jarula (Ar)

**APOCYNACEAE**

cf. Aspidosperma sp.

#TvdB039

19 April 2016

---

**PLANTS OF SURINAME**

Kabalebo Resort

arita (Tr)

**BURSERACEAE**

*Tetragastris sp.*

#TvdB040

19 April 2016
PLANTS OF SURINAME

Kabalebo Resort

buba (Ar)

ARECAEAE

*Socratea exorrhiza*

#TvdB041 8 April 2016

---

PLANTS OF SURINAME

Kabalebo Resort

adaba (Ar)

ULMACEAE

*cf. Ampelocera edentula*

#TvdB042 8 April 2016
Kabalebo Resort

busi papaja (Sr), wanamoso (Ar)

CECROPIACEAE

*Cecropia peltata*

#TvdB043

Ar:
De top van de wanamoso wordt doormidden gesneden, waarna de witte vezels uit de binnekant worden geschaat. Dit goedje wordt op open wonden geplaatst om bloeden te stoppen en infectie te voorkomen.

Beschrijving:

Coördinaten:

Duplicaten: 0.

Kabalebo Resort

kauru (Tr), rode lokus (NL), shimiri kuru (Ar), loki redi (Sr)

FABACEAE

*Hymenaea courbaril*

#TvdB044 6 April 2016
**PLANTS OF SURINAME**

Kabalebo Resort

kakarali (Ar), bajkrati (Sr)

**LECYTHIDACEAE**

*Eschweilera sp.*

#TvdB045 6 April 2016

**PLANTS OF SURINAME**

Kabalebo Resort

*ooto (Trio)*

**FABACEAE**

*Dipteryx odorata*

#TvdB046 5 April 2016
PLANTS OF SURINAME

Kabalebo Resort

wiri (Tr), dali (Ar), baboenhout (NL)

MYRISTICACEAE

Virola sp.

#TvdB047

4 April 2016

PLANTS OF SURINAME

Kabalebo Resort

kwata patu

LECYTHIDACEAE

sp.

#TvdB048

2 April 2016
LECYTHIDACEAE

*Bertholletia excelsa*

Noten worden gegeten. Ook worden de noten soms geraspt en samen met cassavebrood gebakken.

PLANTS OF SURINAME

Kabalebo Resort

*tuhka* (Tr), *totoka* (Ar), *ingi noto* (Sr)

Coördinaten:

Duplicaten: 0.

#TvdB049 23 April 2016

FABACEAE

*Inga alba*

Beschrijving:

Coördinaten:

Duplicaten: 0.

#TvdB050 2 April 2016
PARI UDU (Sr), HARIRA ARULA (Ar)

APOCYNACEAE

*cf. Aspidospermum sp.*

---

BERGI BITA (Sr)

APOCYNACEAE

*Geissospermum cf. laeve*

---
PLANTS OF SURINAME

Kabalebo Resort

podosiri (Sr), pina (Sr)

ARECAEAE

Euterpe oleracea

#TvdB053

20 March 16

Gran tangi.