Land Degradation & Development Group

Farming systems and farmer strategies in the Suriname Interior;

The case of the indigenous village of Matta

MSc Thesis by Oemar Idoe

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Farming systems and farmer strategies in the Suriname Interior;

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Summary

Suriname shows one of the lowest deforestation rates in the world and is still characterised by an extensive forest cover. The Indigenous and Maroon people living in the Suriname interior have been practising a shifting cultivation type of agriculture for countless generations. However, the sustainability of this agricultural practice has come under pressure, threatening the livelihoods of the people living in the interior. Due to multiple causes, farming practices have been intensified by shortening fallow and increasing the cultivation periods. This development is believed to endanger the fragile ecosystem and to have a negative impact on production. The GUYAGROFOR project - of which this research is part - was designed to provide the basis for developing new strategies for sustainable development of agro-forestry systems taking into account existing indigenous knowledge. The study presented here examines and classifies the existing farming systems within the indigenous community of Matta and tries to explain the differences observed in order to come to a farming systems typology. A connection with the GUYAGROFOR research project is made by identifying the potential of each farming system type with regard to further on-farm field trials. The chosen methodology for conducting the research on Matta's farming system and derive a farm typology, was a very informal one, in order to avoid the pitfalls of top down and extractive research methods. An import research method consisted of joining farmers in their agricultural activities and other daily routines. Transects were walked by joining people on their way to the fields, hunting areas and firewood collecting areas. During these activities a checklist was used as a guideline for asking questions during free flowing discussions. The research resulted in the development of a typology of the farming systems in Matta. Three major farmer types could be identified, full time farmers, part time farmers and traditional farmers with the category of traditional farmers splitting up into two subcategories. The developed typology could prove to be helpful for the design of any future research and for the selection of participants in on-farm trials. Not only a farm typology was constructed, but also the entire farming, processing and marketing system connected to agriculture of the Matta village has been examined and described. Special attention was directed to the interaction between traditional human activities and the natural environment in which they occur. It is argued that the pressure on fallow land has actually decreased instead of increased in the case of Matta. There are fewer fields now than there were in the past since most farmers are only partly involved in agriculture nowadays. The impact of the agricultural activities on the environment and on the diversity of natural vegetation and wildlife can be regarded as minimal, especially if compared with the ongoing logging activities in the area. Logging clearly has a much more profound and further reaching impact on vegetation, wildlife and the ecosystem as a whole then shifting cultivation in the research area.

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1 Introduction

1.1 Background and problem statement

Historically self subsistence agriculture has been the most important economic activity for people in the Suriname interior. Agricultural practice is of the “slash and burn” shifting cultivation type and in Suriname this practise is called “zwerflandbouw” or “kostgrondjes-systeem”.

Typically the agricultural practice involves cutting down a small plot in the forest which is then burned for quick release of the nutrients stored in vegetation cover. Tilling activities are minimal with just the drilling of seed holes and the plot is planted with a mixture of crops in a seemingly random fashion for two or three years and is then abandoned and left to regenerate for a 25 to 50 year period. To maintain a sustainable system a minimum fallow period between 10 to 20 years is necessary depending on soil characteristics (Budelman & Ketelaars, 1974). No chemical inputs are used and protection against pests and diseases comes from the mixed fashion in which crops are planted. Estimations based on satellite imagery interpretation suggest that over the centuries some 250.000 - 300.000 ha of forest have been converted in this way at some time or another (Oosterveer & Ravenswaay, 2004; IICA, 2003). If practiced in an extensive way the described system is sustainable and in harmony with its fragile environment.

In recent decades the sustainability of agricultural practices in the interior has come under pressure, threatening the livelihoods of indigenous and maroon people. Due to multiple causes, farming practices have been intensified by shortening the fallow and increasing the cultivation period of a plot which has a clear negative impact on production and the ecosystem. A 1999 study has shown that fallow periods have declined to 7 years in the Boven Suriname region and to 6 years in the Para district (Celos, 2003).

Two important reasons for the declining fallow periods and increasing cultivation periods are often mentioned (Oosterveer & Ravenswaay, 2004; Celos, 2003):

- Lack of male labour in the household for cutting open plots because men nowadays are often involved in other activities, such as (gold) mining or city labour;
- People have become more attached to villages thanks to the improvement of certain services and the possibility for children’s education. This makes the clearing of more distant areas problematic and the tendency is to intensify agriculture in the more immediate village surroundings.

The soils of the Suriname interior can, in general terms, be classified as very poor both chemically and physically.

The savannah belt area typically has strongly bleached sandy soils. Availability of crucial nutrients is low as well as the soil organic matter content. Due to its coarse texture and low SOM content the water retention capacity of these soils is low making drought a serious problem. A shortened fallow period (or longer cultivation period) results in a decline in production due to depletion of already low nutrient availability, soil degradation and an increase in pests, diseases and drought.

The tropical forest area has a more pronounced relief and becomes more and more mountainous when moving south. Soils are strongly weathered with a low chemical fertility.

Soils tend to degrade very rapidly, both chemically and physically, when cultivated too intensively. Soils under tropical forest in the Guyana shield region are extremely susceptible to degradation and erosion, when vegetation cover is lost for longer periods of time and erosion can become a serious problem especially in the areas with steeper slopes. It can be expected that soils which have been under too intensive exploitation for a long period of time will not recover, making regeneration of natural vegetation much more difficult.

Trials to introduce more large-scale permanent farming systems making use of external inputs and based on a mono-crop approach have mostly failed, due to unsuitable environmental conditions and the fact that these practices do not take into account the social and cultural context of the people concerned.

From the short overview given of the problems indigenous and maroon agricultural practises are facing, it becomes clear that if the current development is not diverted, food security and economic independence of the interior people are at stake as well as the continuation of the fragile ecosystem on which they depend.

1.2 Thesis objectives and research question

The objective of this thesis research falls within the framework of the GUYAGROFOR project main objective and will deal with part of the specific objective no 1 (see section 2.5, Appendix 12.1) which aims at:

> *"Integrating indigenous and maroon knowledge on environmental management with current formal agricultural and forestry practices to develop sustainable agro-forestry systems for cash crops, timber and non timber forest products"* (CELOS 2004).

In order to achieve this specific objective a thorough understanding of the different indigenous systems, the factors determining these differences, their constraints and opportunities is indispensable. The acknowledgement of this fact has led to the following research questions for this research:

- **Which different farming systems occur within the indigenous community of Matta?**
- **How are these differences explained?**
- **What is the potential of each system in relation to the GUYAGROFOR project objectives concerning the production of environmentally safe and economically viable cash crops and (non-) timber forest products.**

2 Physical and socio-economic setting

2.1 General

With a land area of 163,280 km^2, Suriname is a relatively small country on the north eastern coast of South America and, with a population of approximately 493,000 people, has one of the lowest population densities in the world (CBS 2004)[1].

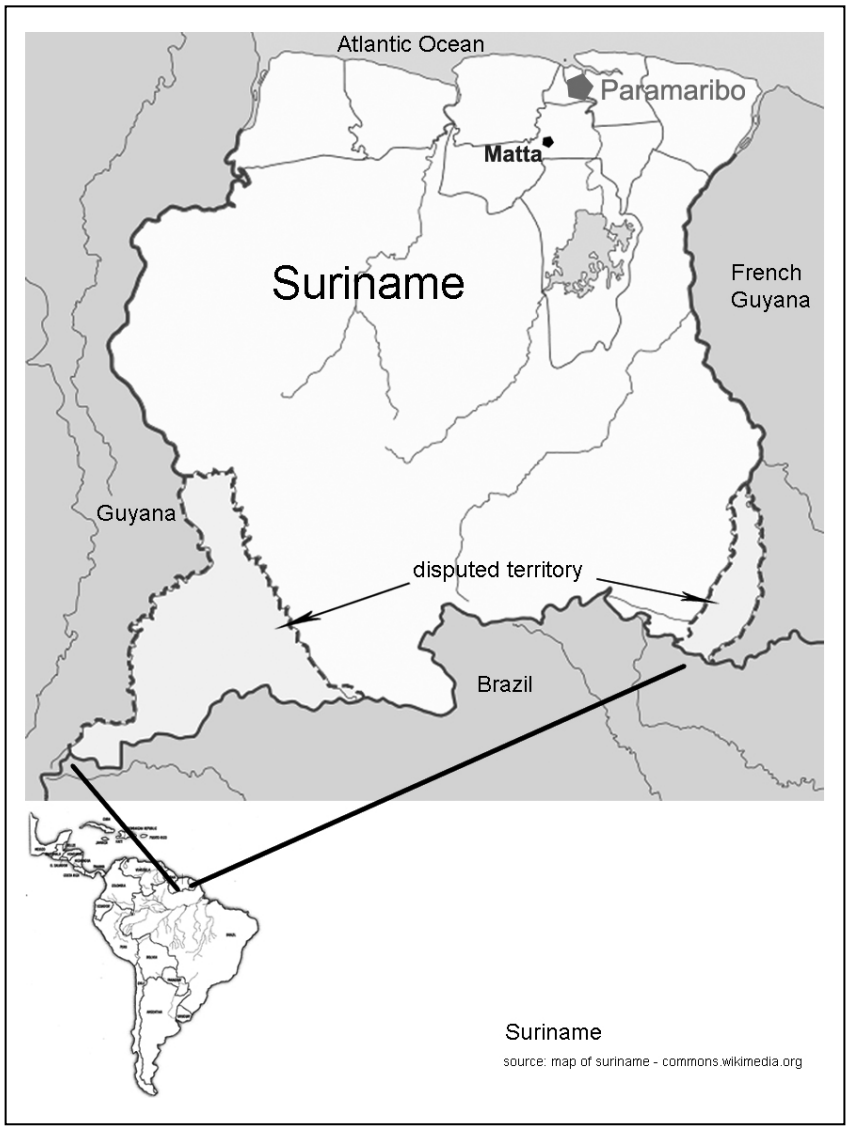


Figure 1: Map of Suriname including research area Matta

2.2 Geomorphology

Suriname lies on the Guyana Shield, a vast and deeply weathered geological formation of Precambrian origins which stretches from the Amazon to the Orinoco river (Hammond 2005). Over 80% of Suriname's landmass lies directly on the shield where it expresses itself as a residual hill and mountain area, covered by tropical rainforest. The remaining landmass consists of undulating to flat fluviatiel coarse sand deposits which in their turn are largely covered by low-lying marine sediments (Poels, 1987). Based on its geomorphology we can distinguish four different ecological and physiographic regions (Poels, 1987; Goense, 1987):

[1] Different sources give different figures: CBS, UN, CIA worldfactbook

- **The Residual Hills** (135,000 km^2)

  This area covers well over 80% of the country and consists mainly of the deeply weathered pre-Cambrian crystalline basement complex of the Guyana shield covered by tropical rainforest. Soils are old and highly leached, making them very poor in plant available nutrients and cat-ion exchange capacity. The residual hills form the largest part of what in Suriname is referred to as “the interior” and is mostly uninhabited except for some maroon communities along the major rivers and some very small Amerindian communities to the extreme south of the country. Some shift in this demographic picture might have occurred during the last decade due to a large influx of illegal gold miners from Brazil.

- **The savannah belt or Zanderij formation** (8,750 km^2)

  The Zanderij formation consists of sediments of bleached white sands and unbleached sediments with textures ranging from sand to sandy loams and clays, which were deposited by a system of braided rivers during the Pliocene when dryer climatic conditions reduced vegetation cover of the pre-Cambrian shield resulting in high erosion levels. Some 40% of the area consists of the bleached white sands but only a relatively small area of 7% has the typical savannah vegetation of grasses and shrubs. For most of the area the natural vegetation consists of mixed mesophytic dryland forest and hydrophytic swamp forest. The savannah belt is where most Amerindian villages of the Arrawak and Caraib people are situated including the village where this research was conducted: Matta.

- **The old coastal plain** (4,300 km^2)

  The old coastal plain consists of elevated marine clay deposits and sand ridges which are oriented in an east to west direction. It was formed during the Pleistocene under the influence of alternating high and low sea levels during glacial and interglacial periods. The old coastal plain does not form a continuous area but is dissected by intrusions of the young coastal plain. Vegetation on the sand ridges consists of mesophytic and xerophytic forest. On the terraces of the clay flats a mesophytic forest type dominates with some swamp forest on the wetter clays. Land use consists of some small scale farming and cattle rearing.

- **The young coastal plain** (16,200 km^2)

  The young coastal plain was formed by marine sediments deposited during the Holocene. The landscape is characterized by brackish and fresh water swamps, sand and shell ridges and peat swamps. The clay soils are heavy, with over 60% of clay sized particles in different stages of ripening and reaching a thickness of 25 meters near the coast. Lateral sedimentation is still taking place, fed by long shore currents transporting the clay from the Amazon river. The vegetation consists of swamp forests, peat land and, along large parts of the coast, estuarine riverbanks overgrown by mangrove forest. Over 80% of Suriname’s population lives in the northern part of the young coastal plain and virtually all permanent agricultural land is to be found here.

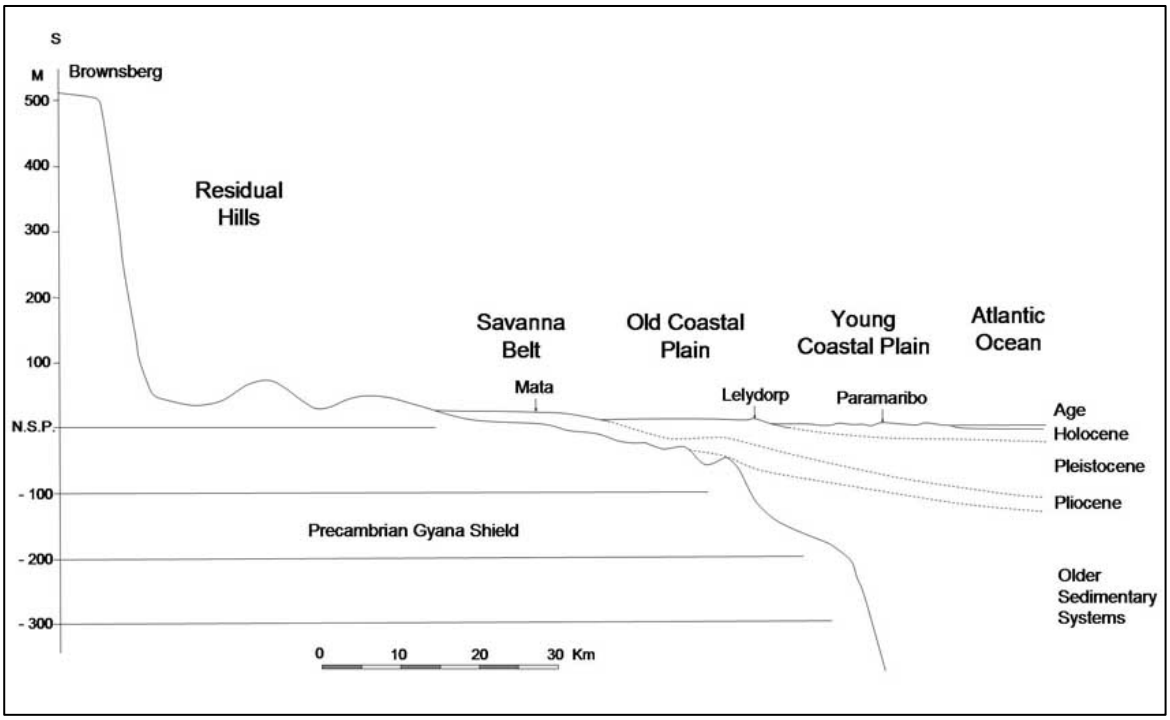


Figure 2: North-South profile of Suriname

2.3 Climate

Suriname has a tropical climate with abundant rainfall, uniform temperature and high humidity. Average air temperature is 25-27.5°C throughout the year in the north, and a little cooler, at around 23-25°C in the southern regions (Sweeney et al, 2007). In the coastal regions the average daily temperature is 27° Celsius. January is the coldest month with an average temperature of 26 °C. In October it is warmest with an average of 31°C. Annual variation of the average temperature is very low. It lies in a range of 2-3°C (NIMOS, 2005).

Near the equator, from about 5° northern to 5° southern latitude, the northeast and southeast trade winds converge in a low pressure zone known as the Intertropical Convergence Zone or ITCZ. The tropical climate of Surinam is dominated by the migration of this Inter Tropical Conversion Zone (ITCZ). Therefore two wet and two dry seasons are to be observed. The major wet season between May and July brings 50% of the total annual rainfall with about 250-400 mm per month. The minor wet season bringing around 150-200 mm

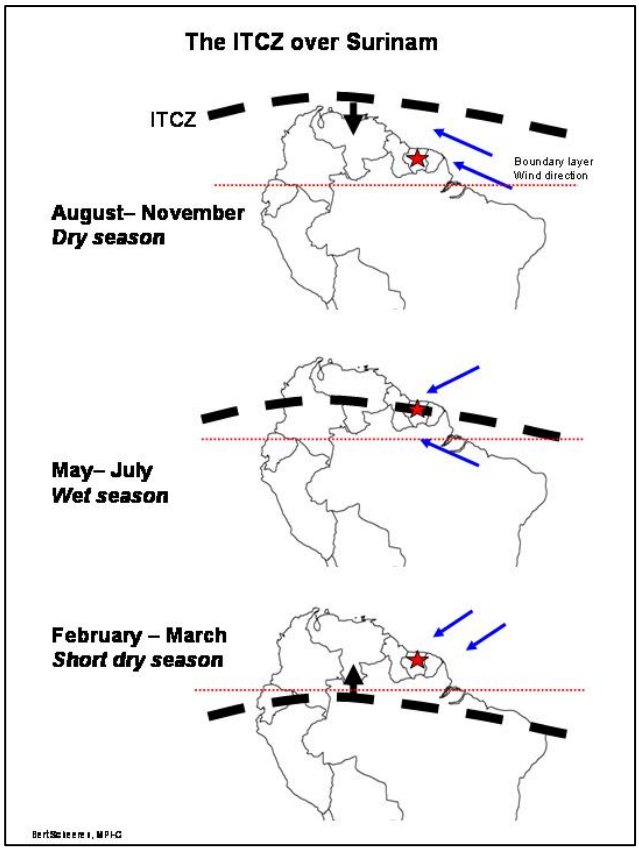


Figure 3: Migration of the ITCZ over Suriname

Source: Gabriel Scheeren, Max-Planck-Institut

per month lasts from November to January (see Figure 4). Here around 20% of the annual rainfall is observed (NIMOS, 2005). Average total annual rainfall is 2,400 mm.

The location of the ITCZ varies over the year. It moves north during the northern summer and south during the northern winter. Additionally the location of the ITCZ is based on the relative distribution of landmass and ocean. Due to the higher variation in land temperatures the ITCZ over land ventures further north or south than the ITCZ over the oceans.

For Suriname this results into the before mentioned wet and dry seasons. In the long wet season (May - July) the ITCZ - coming from the Central Amazon - moves over Suriname to a few degrees north of Suriname. This rainy season is followed by a relatively dry period from August to October. Thereafter the ITCZ migrates back to the South causing a shorter wet season from November to January. The seasonal cycle is completed by a dry season from February to April with the ITCZ at its most southern position (see Figure 3).

Additionally, the El Niño Southern Oscillation (ENSO) causes inter-annual variations in climate in Suriname. It occurs once every 2-7 years. “El Niño episodes are associated with dry conditions throughout the year, and bring warmer temperatures between June and August, whilst La Niña episodes are associated with wetter conditions throughout the years and cooler temperatures between June and August.” (Sweeney et al, 2007).

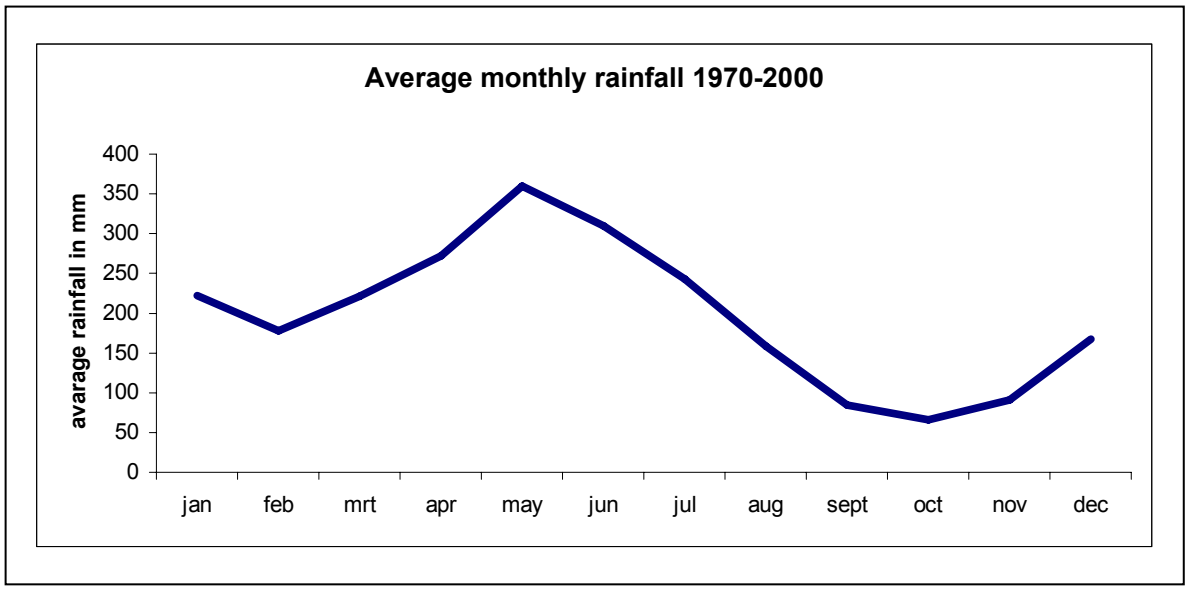


Figure 4: Average monthly rainfall 1970-2000 in Suriname

2.4 Socio-economic indicators

2.4.1 Suriname

Despite of having a relatively small population, Surinamese society is characterised by a wide ethnic and cultural diversity. A bit more than one-third of the population are Hindustanis (37.0%), descendents from 19th-century indentured labourers brought from northern India. People of African descent, the Creoles, are the second largest population group (30.8%) followed by the Indonesian or Javanese (15.3%) and the Maroons (10%), the descendants of West African slaves who were imported in the 17th and 18th centuries and escaped to the interior. The rest of the population is comprised of native Indigenous people (2.6%), Chinese (1.7%), Europeans and others (2.3%).

The official language is Dutch, but the most commonly spoken language by all population groups is Sranang tongo or Surinamese, the Creole language. Sarnami (the Surinamese dialect of Hindi), and Javanese are the two other major languages.

The majority of the population is concentrated in the coastal area, with over 65% of the population living in the capital Paramaribo and its immediate surroundings. Only the native Indigenous peoples and the Maroons, in total ca. 13% of the population are living in the interior (for more details on the interior see next section).

Before World War II the economy - built up under Dutch hegemony - was a plantation economy. The income generated was derived from the plantations along the rivers and coastal areas. Nowadays agriculture is playing a secondary role in Suriname's economy (NIMOS, p. 31). Most of the alluvial coastland is devoted to rice production, which sums up to around 10% of Suriname's total export revenues. The rest of the cultivated arable land is mostly under horticultural crops. The export of bananas amounts up to 2.5 % of total export revenues (FAO).

Since the 1960's the economy has become largely based on bauxite mining and related processing activities. In this time the mining activities have accounted for 70-80% of total export revenues. Until today the economy of Suriname remains quite undiversified with the bauxite sector still being most important for foreign exchange earnings, government income and contribution to the GDP (Gross Domestic Product) and employment (NIMOS, p. 31). Over the last decade gold mining is gaining importance.

When looking into the sectoral origin of GDP at current prices it becomes clear that the tertiary sector was the main contributing sector in 2003. Trade, restaurants, hotels, transport and communication, financial intermediation, renting and business activities and other service activities reached a share of almost half of GDP (46.7%) and government sector and defence circa one fifth of GDP (18.7%). The primary sector (agriculture and fishery) contributed with a bit more the 15% and the secondary sector (industry, electricity, gas, water, construction) has remained stable in the preceding years reaching a share of GDP of 13% in 2003 (NIMOS, p. 32).

Total cultivated area in Suriname has decreased over the period 1998-2004 from 60,000 ha to 55,000 ha and average production for most crops has remained stagnant (ABS, 2005).

2.4.2 Interior

There is no clear definition of the term interior but the government of Suriname formulates it as "those areas where people largely live in a tribal setting on original tribal land and fall under the authority of traditional leadership" (IICA, 2003). Under this definition some 148,000 km^2 or 80% of the territory is defined as interior and the area has an estimated population of 60,000 people.

Although the interior is often pictured as a geographical unit, there are large differences in economical and social development and in the level of integration with the coastal plain between different regions within the interior. The level of accessibility is the most important factor determining these differences (Oosterveer & Ravenswaay, 2004).

The interior of Suriname is very scarcely populated and its inhabitants consist of several groups of indigenous Amerindian and Maroon peoples. The Amerindians (Indigenous people) are the original inhabitants of Suriname. Some 10,000 years ago the first tribes moved into the open Savannah as hunters and gatherers. From the seventeenth century until late in the nineteenth century slaves from Africa were imported to work the plantations. Those who managed to escape from slavery, fled deep into the forest where they developed distinctive communities having their own structure, language and culture.

There are 4 main groups of Indigenous people living in Suriname

- The Carib or Kalina (2,500 people);
- The Arawak or Lokono (2,000 people);
- The Trio (800 people);
- The Wayana (600 people).

The Carib and Arawak villages are mainly situated in the savannah area south of Paramaribo and along the lower Marowijne, the Corantijn and Nickerie rivers and the Coppename Basin. The Trio and Wayana people live much more south, deep in the countries' interior along the Lawa, Tapanahony, Palumeu, Sipaliwini and Ulemari rivers.

Six distinct groups of Maroon people live in the Suriname interior:

- The Ndjukas of the Tapanahoni River;
- The Saramakas along the Suriname River, Gran Rio, Pikin Rio and north of Afobaka;
- The Matawais of the middle and upper Saramacca River;
- The Paramakas living along the Marowijne;
- The Kwintis along the Coppename and upper Saramacca;
- The Bonis or Alukus along the Lawa River.

Traditionally the indigenous as well as the Maroon communities are living from shifting cultivation agriculture, hunting, fishing and gathering. On shifting cultivation fields they cultivate crops such as, dry rice, maize, several tuber crops (i.e. cassava, yams and sweet potatoes), bananas, peanuts, pepper and sugarcane. An important characteristic of the Suriname interior is its virtual inaccessibility. Most of the indigenous and Maroon communities cannot be reached by overland infrastructure, effectively cutting them off from markets and public services provided in the populated coastal regions.

Most of the interior people live in a tribal setting with traditional laws concerning society and land rights and they don't feel much connection with the official powers and legislation. However, formally all land in the Suriname interior is state owned and over the past decade mining and logging concessions given out by the Surinamese government on traditional Maroon or indigenous land has given rise to conflicting situations.

2.5 The GUYAGROFOR project

The GUYAGROFOR project is executed within three countries namely Brazil, Venezuela and Suriname all of which find part of their landmass in the Guyana shield region.

For Suriname the main partners are the Faculty of technology of the Anton de Kom University of Suriname (AdeK) and the centre for agricultural research in Suriname (CELOS), and a partner in some of the formulated work packages is Tropenbos International Suriname. Coordinator for project execution in Suriname is CELOS. Overall Management and scientific coordination for all three countries is executed by ALTERRA Wageningen in the Netherlands.

GUYAGROFOR has a project duration of four years and is broken down into six work packages which are further subdivided into 35 deliverables. Furthermore within the project two main parts can be distinguished which are executed simultaneously: a part dealing with biophysical integration and innovation and a part dealing with market chain exploration (Appendix 1) The overall project approach for research and implementation is strongly people centred with emphasis on participatory tools for doing research.

From the general problem statement presented in the introduction it has become clear that the sustainability of the traditional farming system is failing, threatening the livelihoods of

hinterland people and the ecology of the rainforest. It is also made clear that the simple importation of more intensive farming methods, as practiced in the coastal areas, is not an option. There is, however, an increasing need within the Maroon and indigenous population to practice more permanent forms of agriculture and to engage more in the market in order to improve their standard of living.

The GUYAGROFOR project recognizes the fact that indigenous and Maroon communities harbour important traditional knowledge and hundreds of years of experience regarding the management of agricultural production in a rainforest ecosystem as well as the sustainable exploitation of timber and non timber forest products (GUYAGROFOR, 2004).

GUYAGROFOR also recognizes the fact that successful development and implementation of new or improved farming practices greatly depends on the incorporation of traditional knowledge and will have to take into account the socio-cultural context of Indigenous and Maroon society (GUYAGROFOR, 2004).

The project's main objective is formulated as follows:

> *"To develop new strategies for sustainable development of agro-forestry systems that support the socio-economic and organizational empowerment of indigenous and Maroon communities in Suriname, Brazil and Venezuela, while contributing to the national economy"* (CELOS 2004)

Three specific objectives are derived from the main objective:

- Biophysical integration and innovation;
- Market chain exploration;
- Institutional and organizational support and knowledge exchange.

The research presented in this document falls within the diagnostic phase of the biophysical integration and innovation part of the project (Appendix 1). This means that the research is imbedded within Work package 1. Keeping in mind the project's philosophy regarding participation, the focus will be on farming systems research using PRA tools.

3 Research methods

The overall project philosophy regarding participation and farming systems research determined the chosen methodology to conduct this research. During the projects diagnostic phase (during which this research took place), extractive research methods and formal surveys were to be avoided as much as possible and emphasis was more on the functioning of the farming system rather than on physical characteristics and quantitative data. In other words; the chosen approach is more of a functional nature rather than structural. It goes without saying that some basic quantitative data gathering has to be part of any research regarding these topics.

3.1 Originally planned methodology

At the core of this research stands the development of a farm system typology. ICRA (2004) distinguishes two main approaches towards developing such a typology which both start out with two common steps:

- Purposeful and iterative sampling;
- Multivariate analyses.

The first step is to draw up a hypothesis for the explanation of the differences between the farming systems. In order to do so a first preparatory or diagnostic appraisal will have to be done. This consists of the following activities:

- Exploration of available literature regarding the farming systems;
- Preliminary, informal, interviews with some key informants;
- The development of an agro-ecosystems map at village level;
- Drawing up an agro-ecological transect.

After the development of a hypothesis the next step is to define the variables needed to test the hypothesis. A preliminary list of possible indicators and variables is given in appendix 1.1. After defining the variables the approaches follow different steps in order to test the hypotheses. An overview of these steps is given in Figure 5.

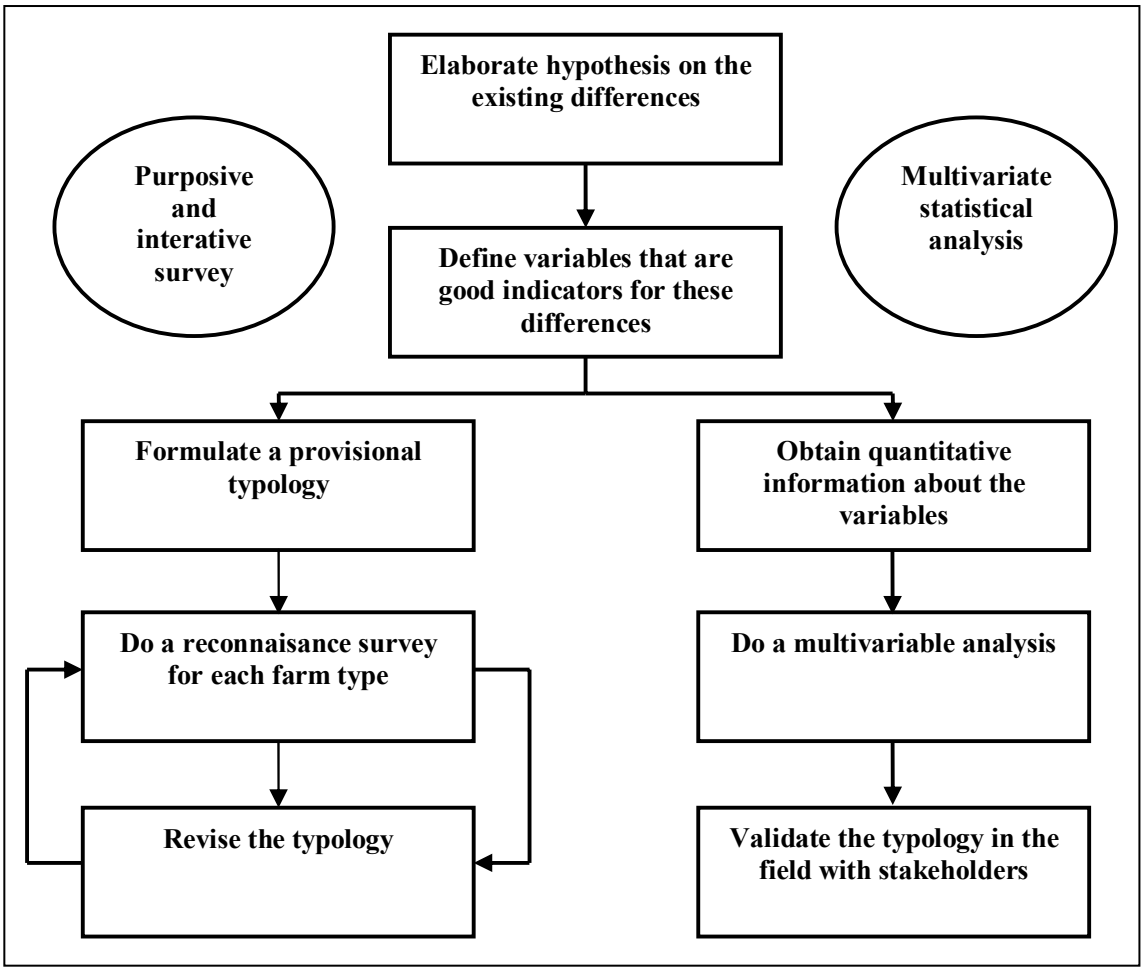


Figure 5: Approaches towards the development of a farm system typology

Source: adapted from ICRA, 2004

This research basically follows the purposeful and iterative sampling method since it is less extractive, more flexible and not as demanding on time and resources. However, in order to avoid errors due to researcher's bias some basic quantitative sampling and analyses had also been planned to form part of the research. To enable this, a more formal questionnaire had to be developed based on the two previously mentioned steps. A number of 15 respondents were set as a minimum for the questionnaire.

Roughly three months of fieldwork had been planned for the village of Matta and data gathering was planned to take place in the form of:

- Secondary data on farming systems and practice in the Guyana shield region;
- Informal individual interviews;
- Frequent visits of farmers plots and personal observations;
- Semi structured interviews;
- Formal survey/questionnaire;
- Exchange with other researchers/students;
- Interpretation of satellite imagery.

Previous experiences with more formal and structured approaches towards data collection have shown that there are certain pitfalls related to these methods. One of these pitfalls is the fact that no real connection is made with the respondents. Data gathered in this fashion could be incomplete and certain important issues or farmers motives might not rise to the surface. A good interpretation and analyses of the collected data also depends on a thorough understanding of these issues.

In an attempt to avoid the pitfalls mentioned above, great emphasis is put on the more informal aspects of this research. Housing is arranged within a village household in order to facilitate contact and to gain a better understanding of the dynamics at household level. Getting to know the respondents before formally interviewing them and joining into everyday village live is an indispensable part of the proposed research method. The “formal” part of the survey will always take place “on site” e.g. at the farmers field while joining the farmer with his or her field activities of that day.

3.2 Adaptations on the methodology

By the time fieldwork in Matta could finally start, it soon became clear that some adaptations had to be made to the originally planned method. The start of the fieldwork coincided with the presence of researchers from CELOS and Students of the Anton de Kom University. In order not to “over ask” farmers it was decided that formally surveying a farmer more than once was undesirable. A first assessment indicated that the total amount of true farming households was lower than expected and I decided to more or less skip the formal survey, the idea being that for the more formalized and quantitative data I would use the CELOS survey.

A second problem arose concerning the group activities, the agro-ecosystems village map and the agro-ecological transect. CELOS had also planned some group sessions and response was extremely low. At the last two CELOS sessions no participants showed up. This made me decide to also skip my formal group sessions in their original form in order not to aggravate apparent scepticism among the villagers and try a different strategy altogether while at the same time maintaining the methodology framework as described previously.

In practice this meant an even more informal approach than originally intended. Much time was invested in integrating into village live. Transects were walked by joining people on their way to the fields, hunting areas and firewood collecting areas. “Group sessions” consisted of discussions at people’s homes and during social occasions and the formal survey was replaced by a checklist used when joining farmers in their agricultural activities and other daily routines.

Appointments with farmers were made according to their own willingness to participate and availability, days started according to farmers own schedule and I participated in whatever activity was planned for that day (such as, clearing, burning, planting, harvesting, transport and product transformation). During these activities the checklist (Appendix 1.1) was used as a guideline for asking questions during free flowing discussions.

This approach yielded a wealth of information on farming practises and people’s perception on agriculture, village life and socio economical bottlenecks and opportunities. On the other hand the data collected is of a much more anecdotal nature and less structured than would have been the case with a more formal approach, making the final analyses somewhat challenging.

However it is my impression that the chosen approach was much appreciated by the people concerned and this was rewarded by a great deal of trust and frankness from the side of the people from Matta.

4 Households in Matta

4.1 Matta village

General overview

In order to give a definition of a household in Matta, some insight in the village layout and Arawak culture is needed. The present day people of Matta are believed to be the descendants of the Arawak who lived at Saron, on the banks of the Saramacca river. After a raid by Maroons at the end of the eighteenth century the village was rebuild at its present location (Voorhoeve 1960). Matta is situated some ten kilometres to the west of the national airport of Zanderij and 60 kilometres from the capital Paramaribo by road. The village occupies an area of several square kilometres with small clusters of houses/huts, widely spaced and often separated by strips of shrubs and high forest, on the northern edge of the open savannah. The village is intersected by several creeks and most clusters are situated alongside these creeks. These clusters each have their own private strip of creek which is used for bathing and washing purposes. Some families also depend on the creeks for drinking water. Those with galvanised roofs collect rainwater for drinking purposes.

After construction of the road in the 1950's, some families have moved towards the road creating a somewhat denser habitation pattern. Since most community services are also situated next to the last stretch of the road, some kind of village centre emerges.

The population number for Matta is somewhere in the range of 400 to 500 people. With a significant amount of people working or attending school outside the village, population numbers tend to fluctuate. Typically Matta is much more populated during the weekends. A recent census by the village counsel, to determine the amount of connections needed for the planned electricity grid, arrived at the total amount of 114 connections needed for the village. Based on this figure I conclude that the village consists of about a 110 independent households. The exact number of clusters is difficult to determine since boundaries are not always very clear, especially in the village centre. However, based on my own observations and satellite imagery interpretations, I estimate the number of clusters to be somewhere between 40 and 50.

Public services

At the time of this research the village had to cope with some serious problems regarding public services.

Electricity

For its electricity supply the village depends on a state owned petrol generator, with the state being responsible for the petrol supply. Petrol deliveries have been erratic and insufficient for many years already and in practice electric power is only available during the evenings for a few days a month. A start has been made with the execution of a long lived plan to hook the village up to the national electricity grid but at the time of this research these efforts were on a hold due to bad planning, insufficient funding and theft of materials.

Water

There was no water supply system in the village but plans to provide such a system are in an advanced state. Until then the village depends on rain and creek water for drinking and other purposes. Although people do perceive the lack of a water supply system as inconvenient, there appear to be no health problems related to the current situation.

Telecommunication

Matta has a small telecommunication office from the national telephone company from where it is possible to make and receive telephone calls. Reception of the mobile network is almost not possible in the village. At a few specific spots in the village reception is sometimes possible.

Infrastructure

The ten kilometre stretch of road between Matta and Zanderij is in very bad condition. Despite many promises from the side of the government, no serious action has been undertaken to improve this situation.

Education

There is one, public, school in Matta which only offers the first six classes of primary education. Children following secondary education need to take the bus to Onverwacht each morning which leaves very early and comes back late. These children make very long days. During the rainy season there are days that the road is in such a bad condition that the children can't get to school at all. Those who continue to follow any form of higher education the only option is to move to the capital.

Healthcare

There is a basic clinic and healthcare worker residing in the village. For all other then basic healthcare including medical emergencies, people have to go to the city.

Social structures

Official authority in the village is the village council. The council is elected by Matta residents and consists of a village Captain (equivalent to a major) and four Basjas (counsellors to the village captain). The village council is the responsible entity, where formal and legislative matters are concerned and serves as the spokes person towards outside village parties. The council also has a controlling function within the village and a mediating function if conflicts occur.

Associations

At the time of this research there were no functioning associations of any kind in the village, this in contrast to just a few years before when several associations ranging from a women's group to a cultural association were still active in the village. The reasons behind this development are definitively interesting but lie beyond the scope of this research.

Churches

Until not too long ago, almost every Matta inhabitant was a member of the Catholic Church. Over the past decade a considerable number of new churches have gained ground in the village. There is one Presbyterian church and two evangelical churches, furthermore there is a small group of seventh day Adventists and a few Jehovah witnesses. There are some indications that the arrival of these new and competing churches has a somewhat destabilizing effect on social structures and unity within the village. Lines of division based on belonging to different churches run through families and the village as a whole. It is beyond

the scope of this study to do an analysis of this development, but if one would want to research the background for the failure of associations, the lack of a sense unity and the difficulties with undertaking collective action, the role and impact of the churches would be an interesting place to start.

4.2 Household situation

Traditionally a cluster consisted of husband and wife, unmarried children, married daughters and their husbands and grandchildren (van Renselaar & Voorhoeve, 1960) with a separate house for each nuclear family within the cluster. In general terms these scattered family clusters still determine the basic village layout but there appears to be a trend towards even more independent nuclear family units. In traditional Arawak society family ties were determined by the maternal line. Men went to live within the wives family cluster and children got the surname of the mother's kinship group. Since the introduction of legal marriage children are named after their father. This makes the determination of degrees of kinship, based on surnames, between families and individuals within the village very confusing. Personally I observed that the maternal kinship lines are still experienced as very important by many people and family ties along maternal lines appear to be stronger.

Clusters as I define them consist of 1-3 housing structures instead of the 3-6 structures per cluster that were noted by van Renselaar & Voorhoeve in the 1960's. When looking at a larger scale the older clusters can still spatially be recognised with related families more or less grouped in the same area.

The basic independent economic unit in Arawak society is the nuclear family and when analysing the farming system it seems logical to take the nuclear family household as the basic unit for analyses. However, such units are not always applicable in Matta. This is partly due to the strong individualistic properties of Arawak society and partly due to changes within the family structure as a result of men working outside the village and children following an education in the capital.

For this analysis I have decided to work with "farming units", which can consist of a nuclear family household, a single widow, a son or daughter within a household etc., as long as people themselves indicate to be involved in some kind of agricultural activity and that their agricultural activities are (economically) independent from other farming units.

A recent census by the village counsel, to determine the amount of connections needed for the planned electricity grid, arrived at the total amount of 114 household units for the village. With some 40 identified farming units one can state that roughly one third of the households are more or less involved in agriculture.

The traditional Arawak housing structure is a large rectangular open hut called a "kamp" (camp) by the people, when referring to their homes in Dutch. Sizes for a camp can vary but their basic form is always the same (photo 4.1, 4.2 & 4.3). The skeleton of the structure is made from round hardwood poles of various sizes and the roof is made from the leaves of the Truli palm (*Manicaria saccifera*). The camp still is the most common structure in Matta but some changes in its original design and purpose can be observed. Most people have created closed bedrooms by sealing of one or two sides of the camp and practically no one sleeps in hammocks in open camps anymore. Some people have constructed separate wooden or brick "bungalows", but maintain a camp as the centre for all daily household activities. There is a trend towards the use of galvanised plates as roofing material despite the fact that Truli roofs are preferred since they are much cooler. The lack of Truli palms nearby is mentioned as the main reason for this shift towards galvanised plates.

All houses are constructed on the higher bleached sandy soils (soil type 1, see chapter 5.2) and the area surrounding the habitation is kept completely free of vegetation in order to avoid visits of unwelcome animal guests.

Homestead gardens do not form part of Arawak agricultural practice and, besides one or two exceptions; none are to be found in the village. The bleached soils are also not very suitable for most crops. Some households do have a small number of fruit trees around the house such as; citrus spp, mango (*Mangifera indica*), awarra (*Astrocaryum vulgare*), jackfruit (*Artocarpus heterophyllus*), mope (*Spondias mombin*) and avocado (*Persea Americana*). Most fruits are used for home consumption and are not commercialised except for awarra which are sold by some people either as whole fruit or processed into a juice.

The keeping of livestock is an uncommon practice in Arawak culture. Traditionally the animal proteins needed in the diet come from hunting and fishing. A few households breed chicken at a very small scale and sell eggs and poultry within the village. No other kinds of livestock are kept in the village. Sometimes wild animals are kept as pets, mostly parrots and monkey's.

Photos chapter 4: Village life

Photo 4.1: Matta village

Photo 4.2: Housing structure

Photo 4.3: Housing structure

Photo 4.4: Numerous small creeks run through the village which are used for washing and bathing purposes and as a source for drinking water

Photo 4.5: The village bakery

Photo 4.6: After school fun

Photo 4.7: Social gatherings are frequent

5 The farming and cropping systems

5.1 General description of the system

Agriculture as practiced in Matta is of the slash and burn type, also referred to as swidden or shifting cultivation. In Suriname the system is called the “kostgronden systeem” referring to the name of slash and burn fields which are called kostgrondje. A traditional kostgrondje in Matta always comprises the following crops in order of relative importance: bitter cassava *(Manihot esculentum)*, pineapple *(Ananas comosus)*, cush-cuch *(Dioscorea trifida)*, passion fruit *(Passiflora laurifolia),* sweet and black potato *(Ipomea batatas)* and some sugarcane *(Sacharrum officinarum).*

The basic cycle of the system in Matta consists of the following components:

1. Clearing the forest (see photo 5.1)

   After choosing a suitable location, the farmer starts with the clearing of a new plot at the end of the large rainy season (mid August). The criteria for choosing a certain location differ, depending on farmer’s objectives and preferences. Some important criteria that were mentioned are related to soil type, drainage, previous fallow, distance from the homestead and distance to other fields. Related families tend to choose their fields in the same area. It is uncommon (but not forbidden) to chose a location in an area dominated by fields of another family group (paragraph 5.3, figure 7). Clearing starts with the cutting down of the undergrowth with a machete after which the large trees are felt. In some cases chainsaws are used but in many cases felling is still done manually with an axe which makes the clearing of a new plot one of the more labour demanding periods in the cultivation cycle. Clearing of the vegetation is an all male activity and is mostly done with the help of some close relatives (sons, brother, etc.). In some cases the clearing of a new field is done in two steps by first burning cleared undergrowth before felling the larger trees.

2. Burning (see photo 5.2 & 5.3)

   After all standing vegetation has been cut down; the material is left to dry for several weeks before effective burning can take place thus making it very important to finalize clearing activities well before the rainy season starts. Shortly after burning all unburned, loose material (larger branches, small logs) is collected on mounds throughout the field and then burned a second time thus creating scattered ash heaps in the field. The large logs that cannot be burned are either left where they are or carried to the side of the field. Stubbles are left standing in the field.

3. Planting (see photo 5.4 & 5.5)

   Ideally planting starts simultaneously with the last clearing and burning activities and should be executed as quickly as possible in order to fully profit from released nutrients and to get a good head start over weeds. This peak moment in labour requirements traditionally was tackled by organizing a group work session called a Majuri. During a Majuri the host has to provide drinks and a meal and in principle anyone who wishes to participate is welcome. In practice it is mostly relatives and friends who join a Majuri. Men mostly engage themselves in the collection and burning of all large unburned material and at the same time women are mainly occupied with the planting of the most important tuber crops (cassava and cush-cush). Other crops are planted by the farmer himself over the following weeks. Pineapple is planted after the tuber crops are well established.

Majuris are still organized on a regular basis but the practice has become less common. An analysis of the driving forces behind this decline is beyond the scope of this study but its significance is perceived as relevant and could be an indication of changing social structures.

For most of the important crops propagation is vegetative and planting material comes from farmers' older field in the form of stem cuttings for cassava, tubers for cush-cush and sweet potato and slips or suckers for pineapple.

4. Maintenance

Weeding is done manually two-three times in the first year with a three to four month's interval. After this there are no field-wide weeding operations anymore, but as the first cassava crop is harvested, the spots surrounding the harvested plants are cleaned. Traditionally no chemical or organic fertilizers and no herbicides or pesticides or any other input except for labour where used during the cropping cycle and, except for some pesticide use to combat carrier ants, this is still the case for most farmers.

5. Harvest

The harvest of the most important crops starts with cassava which, for most varieties, can begin after nine months. Cassava is harvested according to the farmer's needs and processing, storage and transportation capacities. Typically a farmer harvests the amount of cassava he can carry and process in one day or in others words one moutete[2], kourkourou[3] or wheelbarrow, per person per visit. Harvesting is done by carefully pulling out the whole plant while taking care not to leave any tubers in the ground. The stalks are cut into large chunks and for each harvested plant two or three cuttings are placed in the remaining hole and covered. This will form the second cassava crop. The remaining stalks are usually piled up in heaps next to developing passion fruit plants in order to form a climbing framework for the vines.

After twelve months the pineapple harvest starts (although this can take much longer in some cases) reaching its peak in May. The other tuber crops generally have also matured by this time and are harvested according to farmers needs.

At the end of the second year only the second cassava crop, passion fruit and possibly pineapple remain in the field as harvestable crops. Unless there is still a considerable pineapple crop in the field there will be no more significant maintenance and during the third year the field will gradually turn into a fallow. During this phase however it is often still used as a source for planting material.

5.2 Soils

Unlike some other farming communities, Matta farmers have no elaborate soil classification system. Only two soil types are recognised in the Arawak language (or at least in Matta): Sand (Motoko) and Clay (Waja). A third type is defined by the Surinamese word Moksi which defines all soils perceived as a sand and clay mixture. True clay soils have not been observed in cultivated fields and soils defined as waja are often sandy soils with a relatively large clay/loam fraction. When probed to be more specific regarding soil type, farmers do provide a detailed description like, for example "This is mixed soil (moksi), it is yellow sand with some clay and some black soil". However a traditional classification with distinct words for distinct soil types does not exist or disappeared from the vocabulary.

[2] A traditional woven basket used to carry heavy loads.
[3] Idem.

While conducting the fieldwork I lacked a standardized scientific soil-type classification for the area. Based on personal and qualitative observations I developed a classification for the most common soil types encountered in order to be able to make some comparisons. I used the following classification during the field assessment and for analyses of the results:

1. Bleached sand well drained, mostly on higher ground. Open savannah vegetation;
2. Bleached sand poorly drained, lower ground, high risk of water logging. Open savannah vegetation with Mauritius palm;
3. Bleached sandy soils under savannah forest, some clay and organic matter content;
4. Sandy clay/loam soils with reasonable organic matter content on higher ground. High dry land forest;
5. Sandy clay/loam soils on lower ground. Organic matter appears to be higher than on higher ground but water logging during the rainy season is a definite problem. Marsh forest;
6. Soils of swamp like areas. High organic matter content, in some cases almost peat like. Semi permanent water logging. Swamp and creek forest.

Most fields find themselves on types 3, 4 and 5. Soil number 5 appears to be the most favourable when looking at soil structure and fertility but with tuber crops at the core of the farming system the risk of water logging makes it less desirable than soils 3 and 4 (in most cases).

Soils 5 and 6 appear to be very promising for horticultural crops if some kind of water management at field level could be introduced. Soil types 1 and 2 are structurally and chemically very poor and contain almost no organic matter content. These soils can have serious water logging problems, where there is an impermeable layer, and during the dry season drought is always a problem. These soils are generally not selected for agricultural purposes.

5.3 Land rights

Despite several treaties between the Indigenous and maroon communities and the former colonizing powers, no tribal land or traditional land rights are recognized by Surinamese law. In recent years there is some movement towards more recognition of land rights for Indigenous and Maroon communities; however the debate is still ongoing and for now the Surinamese government still regards all land in the Suriname interior as domain land, meaning that it is state owned (Kambel & Mackay, 1999; Kambel & de Jong, 2006).

Matta owns two HKV (houtkap vergunning) or logging permits (see Figure 6), the boundaries of which can be interpreted as the boundaries of the area over which the village has some autonomy. A HKV can be seen as a licence, granted by the Surinamese government, to harvest wood and non-wood forest products and practice shifting cultivation in a certain designated area around a village. The HKV does not however comprise all the areas that are traditionally being used for agricultural activities and especially those cultivating to the north of the village, do so outside of the HKV. All land outside the HKV of Matta has been given out in logging concessions to private parties.

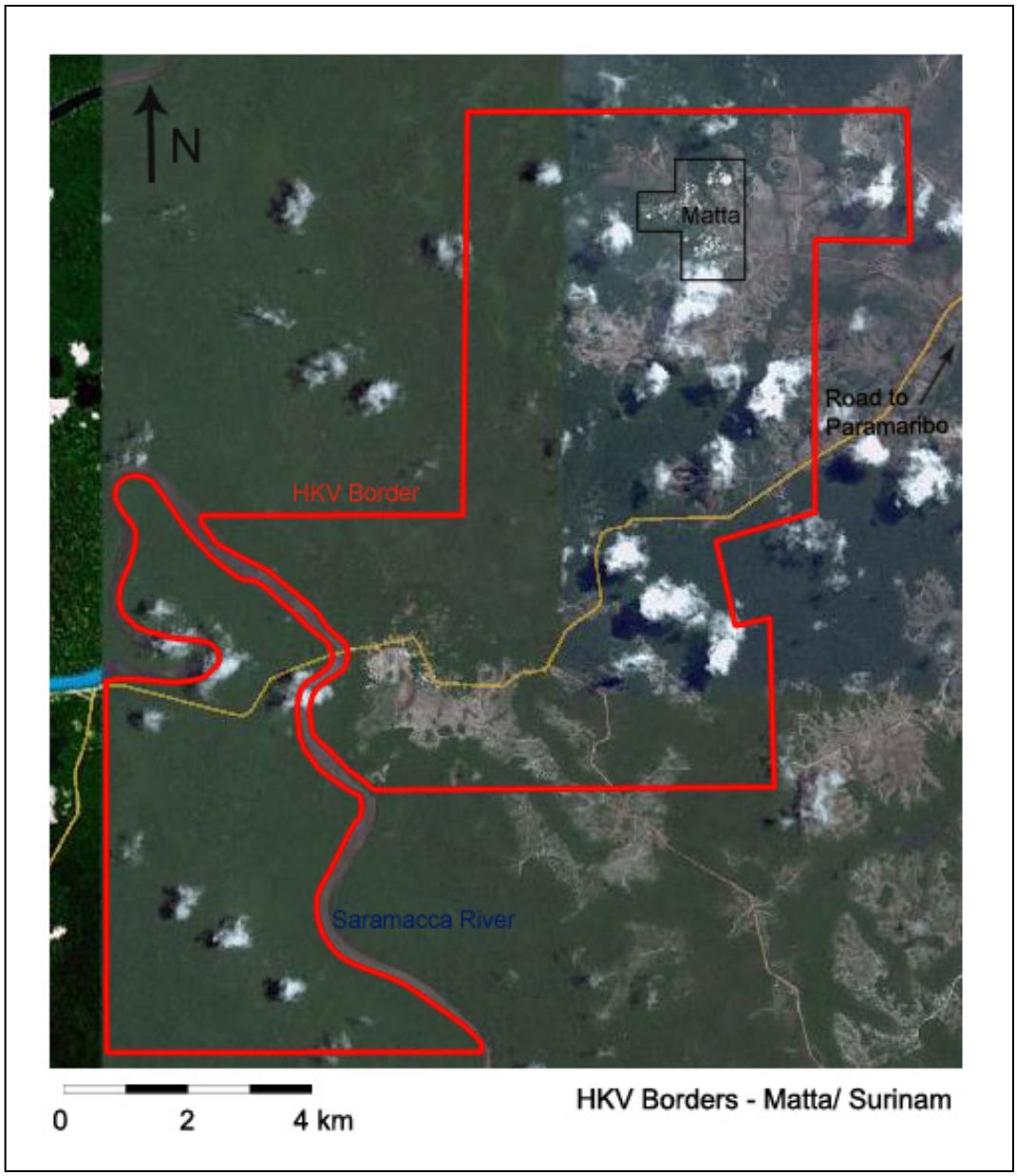


Figure 6: Map of Matta's HKV

Since no formal, individual, land rights exist, all land on Matta territory can be regarded as communal. In principal every resident of the village has the right to clear a field anywhere he or she sees fit, as long as it is not yet claimed by someone else (a new field is sometimes claimed by placing poles to demarcate the future boundaries of the field). It is not obligatory for a Matta resident to ask permission to the village council for clearing new land unless there is some kind of dispute concerning this particular area. I have, however not come across any example where this was the case, which can be seen as an indicator that there is no scarcity of suitable agricultural land as yet.

In practice there appear to be some kind of customary regulations concerning the utilisation of fields and fallows. Fields and fallows are more or less clustered into family areas and have been so for several generations. Although not formally forbidden, it is unusual to clear a field in the fallow of another family area unless explicit permission by this family is given.

The determining factor for the location of these clusters appears to be the spatial distribution of families within the village (now or in the past). Field clusters belonging to a family group tend to be located closest to that families “epicentre” in the village.

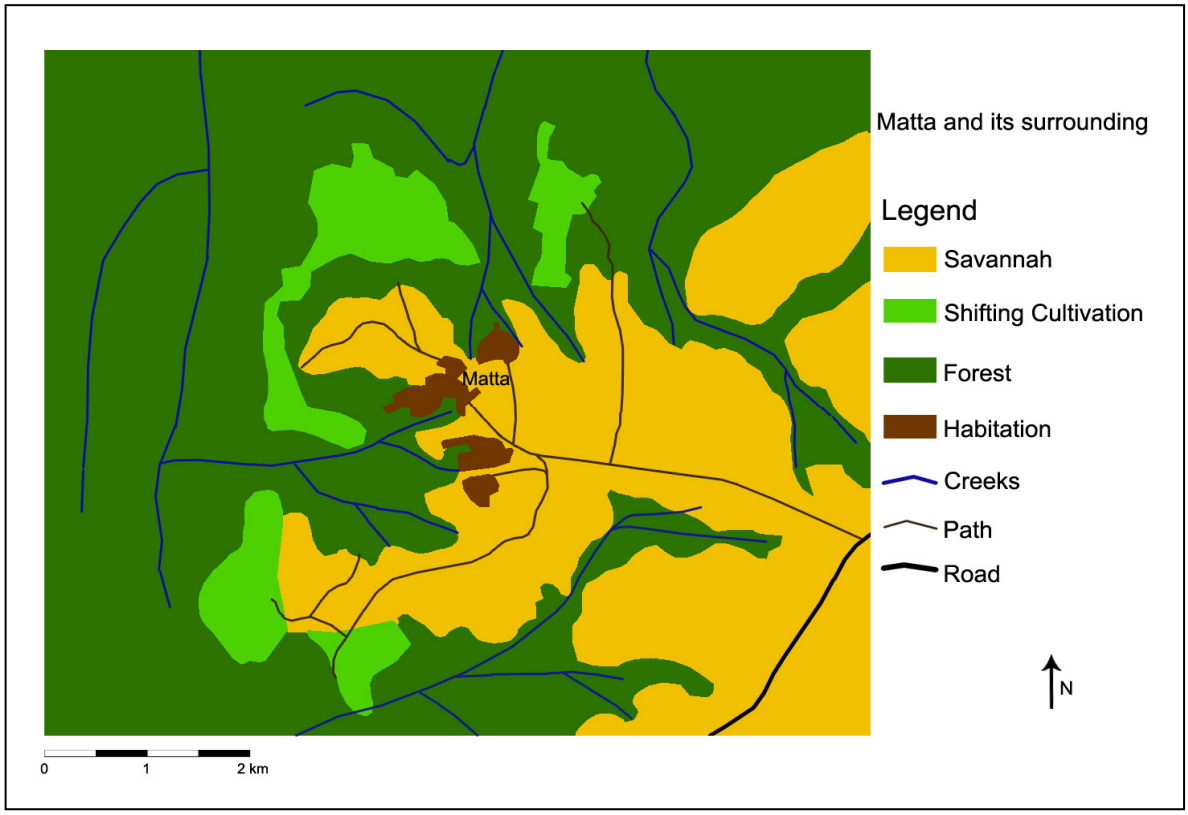


Figure 7: The spatial distribution of clustered fields and fallows and extended family homesteads

There is no formal restriction on the amount of land that can be cultivated by one farming unit. Field sizes are determined by the amount of land a farming unit is able to clear, plant and maintain in the case of 100% farmers or the amount of land that is seen fit to meet needs concerning home consumption and/or extra income. Field sizes range from ¼ hectare for some elder people and off farm workers up to 2 hectares for some 100% farmers. As a general rule a field is cultivated for two years and people on average have two “large fields” under cultivation, one in the first year of cultivation and one in the second. Every year a new field is cleared and an old one abandoned. Many people also have a smaller field on the bleached sandy soils close to the homestead with mostly pineapple and sometimes bitter cassava. This appears to be a more recent development which will be discussed further one in this document.

In some cases a field can be “sold”. This happens when a field has already been cleared and planted but, due to one reason or another (sickness, off farm employment, old age), the owner is no longer able to maintain and harvest the field. In this case the buyer has the right to harvest the planted crops and, if the field is still in its first year of cultivation, to plant a second cassava crop.

5.4 Plot selection

When selecting a new plot, the farmer takes several factors into consideration. These factors can have both negative and positive aspects attached to them and it depends on farmer motives and strategy which combination of factors he/she prefers. I will argue here that plot selection can be used as one of the indicators to come to a farm typology for Matta. In order to do so I will briefly discuss the most important factors, as mentioned by the farmers of Matta.

Previous fallow & vegetation

Most farmers agree that a long fallow has clear advantages. Higher production, related to better soil fertility and structure are often mentioned as a major advantage. Interestingly enough, soil fertility is not mentioned as the only major reason why a long fallow is usually preferred. Many farmers indicate to have much less problems with weeds during the first year of cultivation on a previously long fallow. Weeds start to develop later, in lower numbers and with less vigour, as compared to short fallows. Some farmers perceive this as the most important advantage of a long fallow. On the other hand there are farmers who, although they acknowledge the advantages described above, select their plots on shorter fallows. For them the following advantages of a short fallow outweigh those of a long one. The shorter fallows are usually situated closer to the homestead and the clearing of a short fallow is less labour demanding.

Species composition of the standing vegetation, which is partly related to the duration of previous fallow, also serves as an indicator for plot suitability concerning weed problems and soil fertility.

In the case of old fallow or pristine forest the prevailing tree species give some indication concerning soil suitability with respect to fertility, risk of water logging and soil workability. Walaba (*Eperua falcata*) dominated forest, for example, indicates bleached, imperfectly drained, sandy soils. Combined with the shallow rooting system of the walaba tree, which impairs soil workability, these areas are generally avoided.

Soil type

The soils preferred by most farmers are referred to as “mixed” soils which coincides with type 3 and 4 soils according to the classification given in section 5.2. Fertility and soil structure are perceived as adequate.

The bleached white sand soils, or soil types 1 and 2, are generally regarded as unsuitable for agriculture. Some farmers however do select a plot on these soils. Although unsuitable for most crops, cassava and pineapple can be cultivated here, be it with much lower production levels than on the other soils. The lack of dense and high standing vegetation makes them easy to clear and weeds are a minor problem. The loose structure makes planting operations easy. The farmer’s strategy concerning these fields involves very low labour input which together with their proximity to the homestead makes them worthwhile as an extra source of income in the perception of these farmers. There seems to be a slight trend towards an increase of these types of fields.

The more loamy/clay soils are regarded as most fertile but they can, if clay/loam content is to high, be too heavy for the cassava based system and since these soils mostly occur in the lower lying areas towards creeks and swamp, water logging is a problem. Some farmers however indicate they clearly prefer these soils due to their high fertility and suitability for certain crops. In order to minimize the risk of water logging, plot selection usually takes place during the rainy season, so a farmer can check if a certain area is prone to flooding.

Textbox 1

I came across some examples where farmers took a deliberate gamble with soils prone to water logging. In all cases it concerned soils that were known to be highly productive (soil type 5) but too wet in some years. The strategy towards these plots is to minimize the efforts put into them, if the crop gets lost, not too much effort is lost and if the fields don't get waterlogged the yields will be very high when compared to the effort put into them.

- One farmer densely planted a field with pineapple. Conditions were to wet in that year and 70% of the crop was lost. The gamble didn't pay off. (photo 5.7)
- One farmer planted a small field with densely spaced cassava. Conditions were wet and 50% percent of the crop was lost. Still the remaining crop yielded very well and the farmer considered it was worth the effort.

Distance to homestead

The travel distance to the field can be an important criterion for plot selection. Most plots are situated in a semi circle around the village with a distance ranging from 1 to 3 kilometres from the homestead (see Figure 7). Travel time ranges from 15 to 45 minutes, and the longer distances are problematic for certain categories of farmers. Part time farmers lack the time to frequently visit distant fields and prefer to clear fields at a closer proximity to the homestead. Some older farmers experience trouble with long distance fields especially when harvested products have to be carried home. They however perceive distant fields as better and so do the younger traditional farmers and some full time farmers. Main reasons why distant fields are perceived as better are: higher production and less weed problems. This is directly related to soil type and longer fallow in the more distant areas. Disadvantages of more distant fields, besides the travel time and transport problems are the larger effort needed to clear a plot and an increased risk of damage due to pests (see section 6.2).

There is a direct relation between fallow period and distance to homestead. The suitable areas closest to the village show the shortest fallow periods ranging from 5 to 10 years while in the outer ring fallows generally exceed 20 years.

As a general rule we observe that soils on nearby fields (close to the forest edge) are of type 2 and 3 and as we move further away, soils become heavier and wetter. If we move even further away, in any direction, soils become too wet to be suitable for current agricultural practises.

5.5 The crops

One of the most striking properties of the farming systems in Matta is the number of species and the number of varieties of some species that are intercropped within one field. There are two main factors determining the type and number of crops in a field.

The first factor obviously is soil type. Although it has been stated that no elaborate soil classification exists, most farmers are well aware of different soil properties. The most diverse systems are found on soils of type 4 and 5 whilst the least diverse are found on soils of type 1 and 2 with a pineapple monoculture, comprising of only 2 varieties, as an extreme example of low diversity. Within a field, the random fashion in which some crops appear to have been planted, often represents differences in soil types and relief at micro level, indicating the farmer has a good understanding of subtle differences in soil properties.

The second important factor determining the choice of crops and crop diversity is the type of farmer and his/her objectives. This is also one of the main indicators leading towards a farm typology which will be discussed in more detail further on in this document.

Table 1 presents a non exhaustive list of crops that were observed on shifting cultivation fields. The cultivation of vegetable crops is a recent development and these crops were not part of the traditional Arawak cropping system.

Table 1: Crop type and varieties on shifting cultivation fields Matta

Crop type	# var.	Crop type	# var.
Tuber crops		**Vegetable crops**	
Cassava (*Manihot esculentum*)	30+	Tanier spinache (Xanthosoma brasilense)	1
Cush-cush *(Dioscorea trifida)*	8	Ladyfingers *(Hibiscus esculentum)*	3
Sweet potato *(Ipomoea batatas)*	4	Pepper *(Capsicum annuum)*	5
Black potato *(Ipomoea sp.)*	1	Bitter cucumber *(Momordica charantia)*	XX
Yam (Dioscorea cayensis)	3	Antroewa (Solanum macrocarpon)	XX
Taro *(Colocasia esculentum)*	XX	Pigeon peas *(Cajanus cajan)*	XX
Tania *(Xanthosomas sagittifolium)*	XX	Yard long beans *(Vigna unguiculata)*	XX
		Amsoi *(Brassica juncea)*	XX
Fruit crops		Tomato *(Solanum lycopersicum)*	XX
Pineapple *(Ananas comosus)*	11	Cucumber (Cucumis sativus)	XX
Banana *(Musa sp.)*	8	Pumpkin (Cucurbita sp.)	XX
Plantain *(Musa sp.)*	4		
Passion fruit *(Passiflora laurifolia)*	XX	**Other**	
Watermelon *(Citrullus lanatus)*	4	Sugarcane *(Saccharum officinarum)*	XX
		Maize *(Zea mays)*	XX
		Ginger *(Zinggibir officinale)*	XX
		Laos(*Alpinia galanga)*	XX
		Masoesa *(Renealmia exaltata)*	XX
		Cotton *(Gossypium peruvianum)*	

XX: no data

Although not one single field has the same composition and ratio of crops, there are some traditional crops that can be found on a vast majority of the fields. These crops are the indigenous starchy tuber crops cassava (*Manihot esculentum*), cush-cush (*Dioscorea trifida*) and sweet potato (*Ipomoea batatas*) and the indigenous fruit crops pineapple and passion fruit.

The dominant crops on virtually all fields are bitter cassava and pineapple which, in contrast to most other crops, are planted in a regular, “honey cone” fashion. Spacing between individual cassavas and pineapple plants varies from 1.5 to 3 meters depending on soil fertility and on the amount of other crops planted simultaneously.

The most important crop of the two, and backbone of the whole farming system, is cassava. Having its geographical and agricultural origins in the region (Allem 1994; Allem 2001) cassava is (or at least used to be) the single most important staple crop in Arawak society and is also the most important cash crop at present time. Cassava is harvested year round which provides a stable and reliable income base. Cassava is among the first crops to be planted. Spacing is more or less regular but planting density can vary enormously. Planting material is mostly provided by farmer’s older fields although in some cases exchange of

cuttings takes place. Most varieties can be harvested after 9-12 months; however the harvest can be prolonged for a considerable time. After harvesting, cuttings of the harvested plant are replanted in the same spot which will provide the second cassava crop. There is a large number of cassava varieties used in Matta and the highest diversity of cassava varieties is observed on fields of older traditional farmers with up to 30 varieties planted in one field. The vast majority of cassavas are so called bitter varieties, meaning that they contain high levels of cyanogenic glucosides. This means that the harvested products always have to be processed to make them fit for human consumption. Cassava is used for own consumption but the bulk is processed and marketed by most farmers.

Pineapple is planted solely as a cash crop, however when looking at the total income derived from agricultural products, cassava is the most important cash crop. A third important cash crop found in most fields besides cassava and pineapple is passion fruit.

A typical traditional plot also contains cush-cush, sweet potato and black potato[4] distributed unevenly over the field. Cush-cush is planted in small mounds that are sometimes covered by older farmers with some dried sticks and other organic material. The reason for this practice is not clear. Farmers state they do this because their parents also did it. As the cush-cush vines start to develop sticks are placed next to each mound as a climbing frame. Sweet potato plants are left to freely spread their vines over the soil. Some pockets with banana and plantain are created and on the ash heaps where the large logs were burned the more nutrient demanding crops such as peppers, ginger, taro, tania, melons, pumpkins and sometimes leafy vegetables are planted. On the shaded borders of the fields some sugar cane is planted for domestic use as a sweetener or to produce alcoholic beverages. Cotton is still planted by some older farmers.

When analysing crop selection and distribution on the field in more detail and after taking away the differences explained by soil type, the boundaries of roughly 3 different field types become clear:

- Traditional fields

  These fields contain the highest diversity of traditional crops and the highest number of varieties per crop. Farmers cultivating these fields are generally older and have been farming their whole life. Agricultural practices and choice of crops are based on knowledge handed over by previous generations and on long term farming experience. The most important marketed crop is cassava followed by pineapple;

- Market oriented fields with high diversity

  These fields are similar to traditional fields with respect to diversity. However farmers on these fields are strongly market oriented and some other crops besides cassava are more intensively cultivated then on traditional fields. With these fields farmers try to diversify their marketable products with crops like banana, maize, cush-cush, pumpkins and melons cultivated more intensively. On these fields also some farmers have been observed who try to adjust their crop calendar in order to have some products outside the peak harvest periods in order to receive better prices;

- Market oriented fields with low diversity

  These fields are dominated by cassava and pineapple, closely spaced and with few or no other crops.

[4] Black potato is used as a colorant for Kasiri (an alcohol containing beverage brewed with bitter cassava).

Textbox 2

A few full time farmers also maintain fields with a completely different crop composition and management practice, besides their normal fields. Some interesting examples:

- One full time farmer has a large field of several hectares in the savannah on bleached white sand with a pineapple monoculture. He has been cultivating this field for 4 consecutive years, yielding 10,000 pineapples per hectare. He applies leaf fertilizer and states that yields remain good. His strategy concerning pineapple is to produce large quantities with a low profit margin per unit. Other pineapple producers are less happy with this strategy since they fear it affects the prices for their products. A similar field of the same farmer, which was under cultivation for eight years, burned down under mysterious circumstances;
- One full time farmer experiments with vegetable crops and beans in a section of one of his fields. The crops need high maintenance with respect to weeds, sun protection and climbing frameworks. He applies chemical fertilizer and insecticides;
- One full time farmer has a small field with maize and a large number of melon plants of different varieties. He applies chemical fertilizer and the field has been under cultivation for four years.

It will later be argued that these three different field types are directly related to different farmer strategies and are good indicators for deriving a farm typology relevant to the GUYAGROFOR project.

5.6 Cultivation period & cropping calendar

Traditionally a farmer in Matta clears a big field every year, resulting in having two fields under cultivation at any given time – one in its first and one in its second year of cultivation. This allows for a continued supply of cassava throughout the year. Fields are selected and cleared during the long rainy season (April – August) and left to dry during the long dry season (August – November). Burning takes place towards the end of the long dry season and is immediately followed by planting operations. Short growing vegetable crops are harvested after a few months followed by the tuber crops cush-cush and sweet potato after 6 to 9 months. The cassava harvest generally starts after 9 months. Pineapple harvest has its peak during the month of May in the second cultivation year (year 3 in the crop calendar). After the second year of cultivation the field is no longer maintained and will gradually return to fallow. Some late pineapple and second cassava crop might still be harvested and the field will still serve as a source for cassava and pineapple planting material. Table 2 represents the crop calendar for the most common crops and cropping cycle.

Sometimes farmers also clear a plot during the short rainy season (January) which is then burned and planted in April shortly before the long rainy season. These plots tend to be smaller and less divers. The window of opportunity for clearing, drying, burning and planting is much shorter in these cases and explains their smaller size. It is not uncommon that these fields are not burned at all after clearing since the short dry period is less reliable and can still be quite wet. If this is the case these fields are burned and planted during the subsequent major cycle.

Timing is crucial for the slash and burn system practiced in Matta. If clearing operations are not finished in time there might not be enough time left for the cleared vegetation to dry and be burned. Planting needs to be done as soon as possible after burning but if rains don't start

soon enough after planting, crops are negatively affected. Several farmers claim that in recent years the seasons have become less reliable which complicates the timing of agricultural activities. Rains start much too late or to early and dry seasons are too wet whereas wet season are to dry. It is difficult to judge whether these observations are a sign of chancing climatic conditions in the region. Recent annual rainfall data does not suggest a different trend from the past and inter yearly fluctuations are well within the margins of long year averages (Mitchell, 2003). However, it might still be possible that rainfall distribution has become more erratic within the yearly cycle. At this point the data is lacking to draw any conclusions except that farmers themselves are convinced that rainfall patterns are changing and that this development is affecting the cropping cycle.

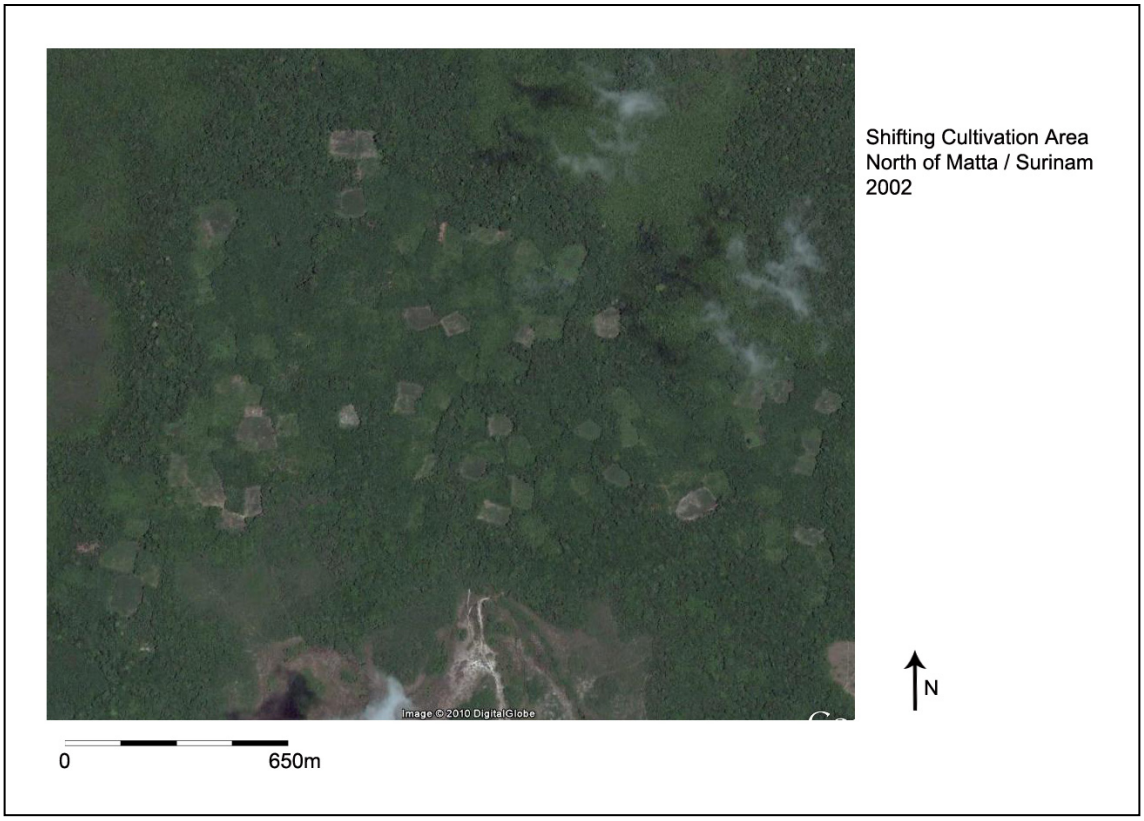


Figure 8: Satellite image of shifting cultivation area North of Matta, 2002

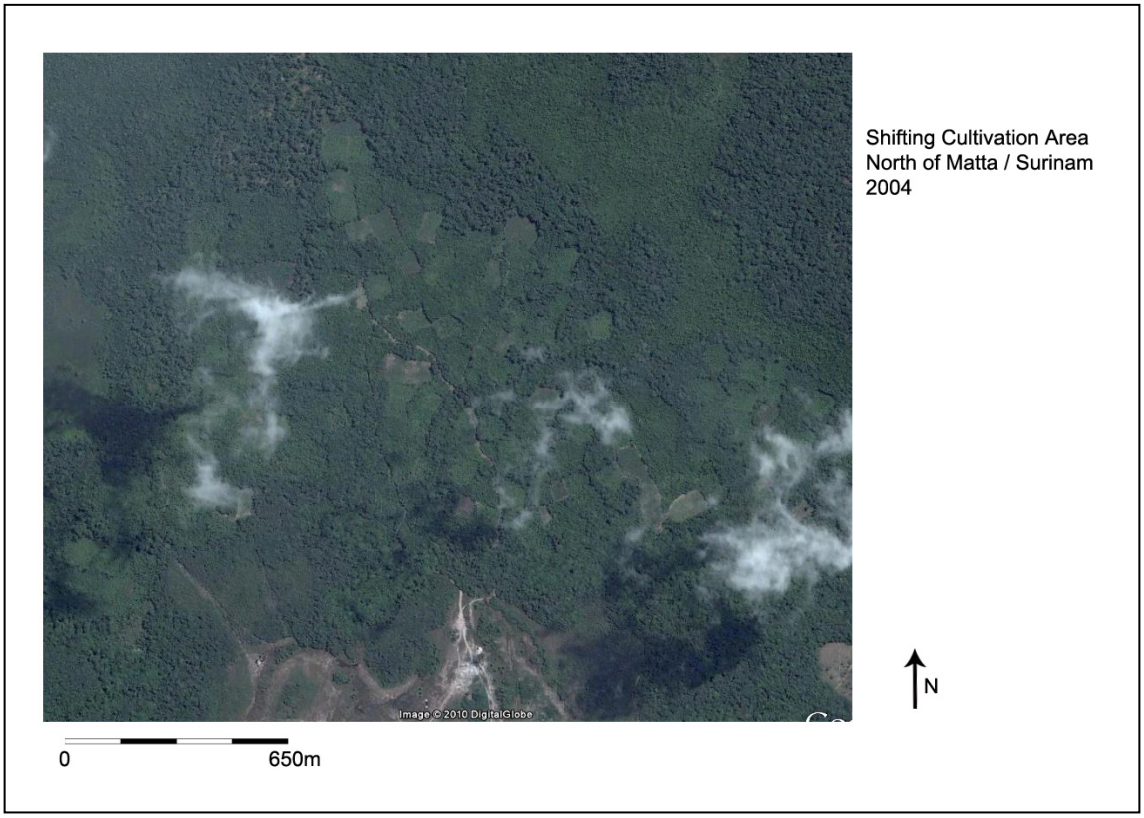


Figure 9: Satellite image of shifting cultivation area North of Matta, 2004

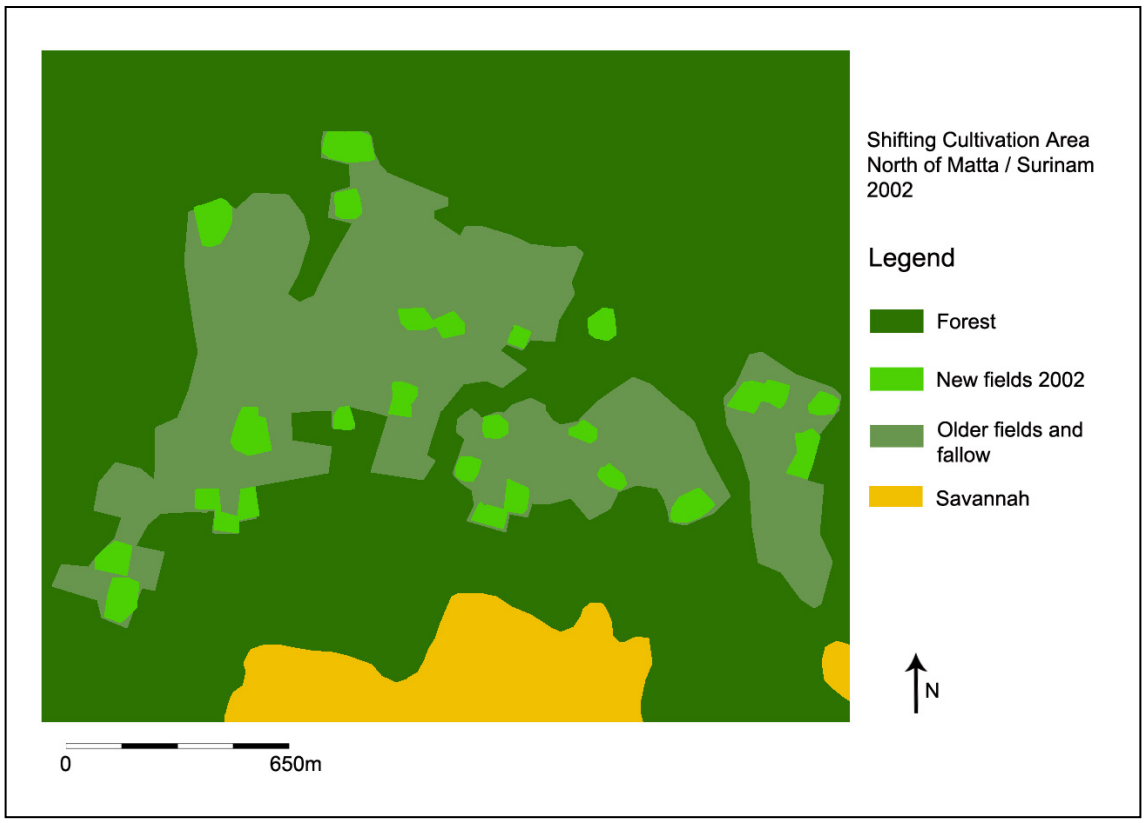


Figure 10: Shifting cultivation area North of Matta, 2002

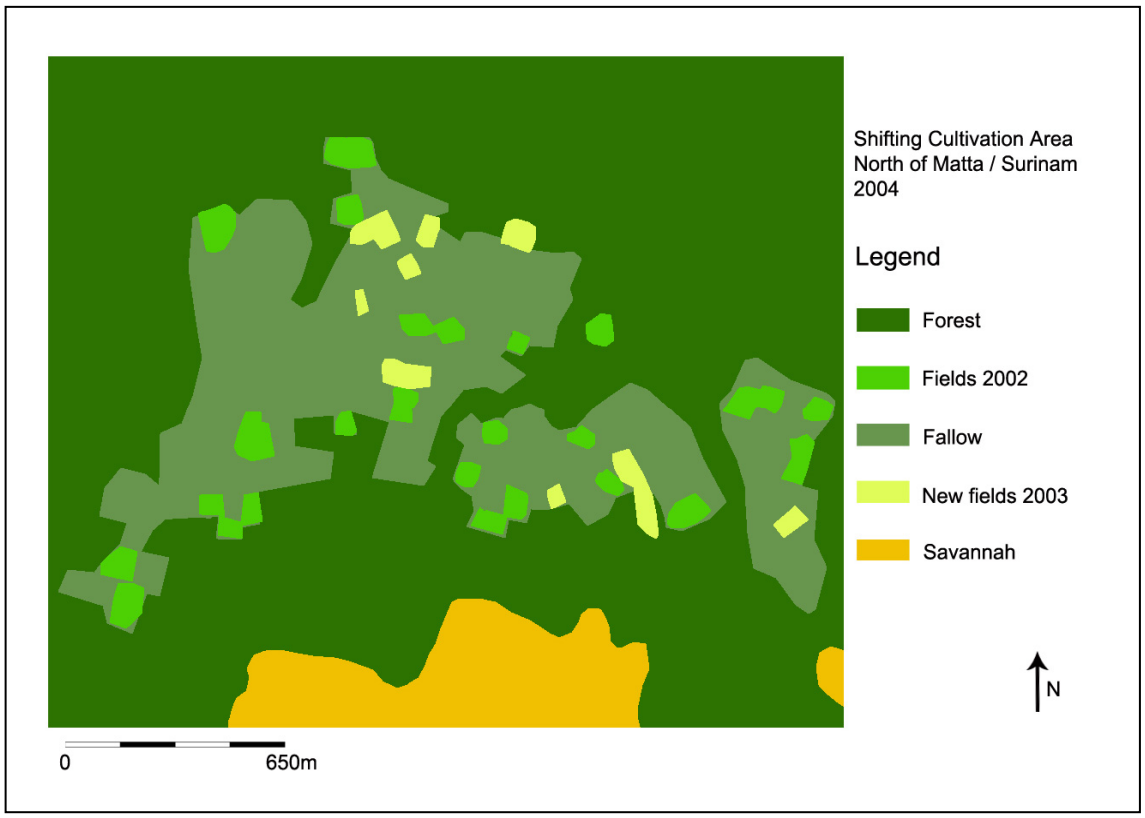
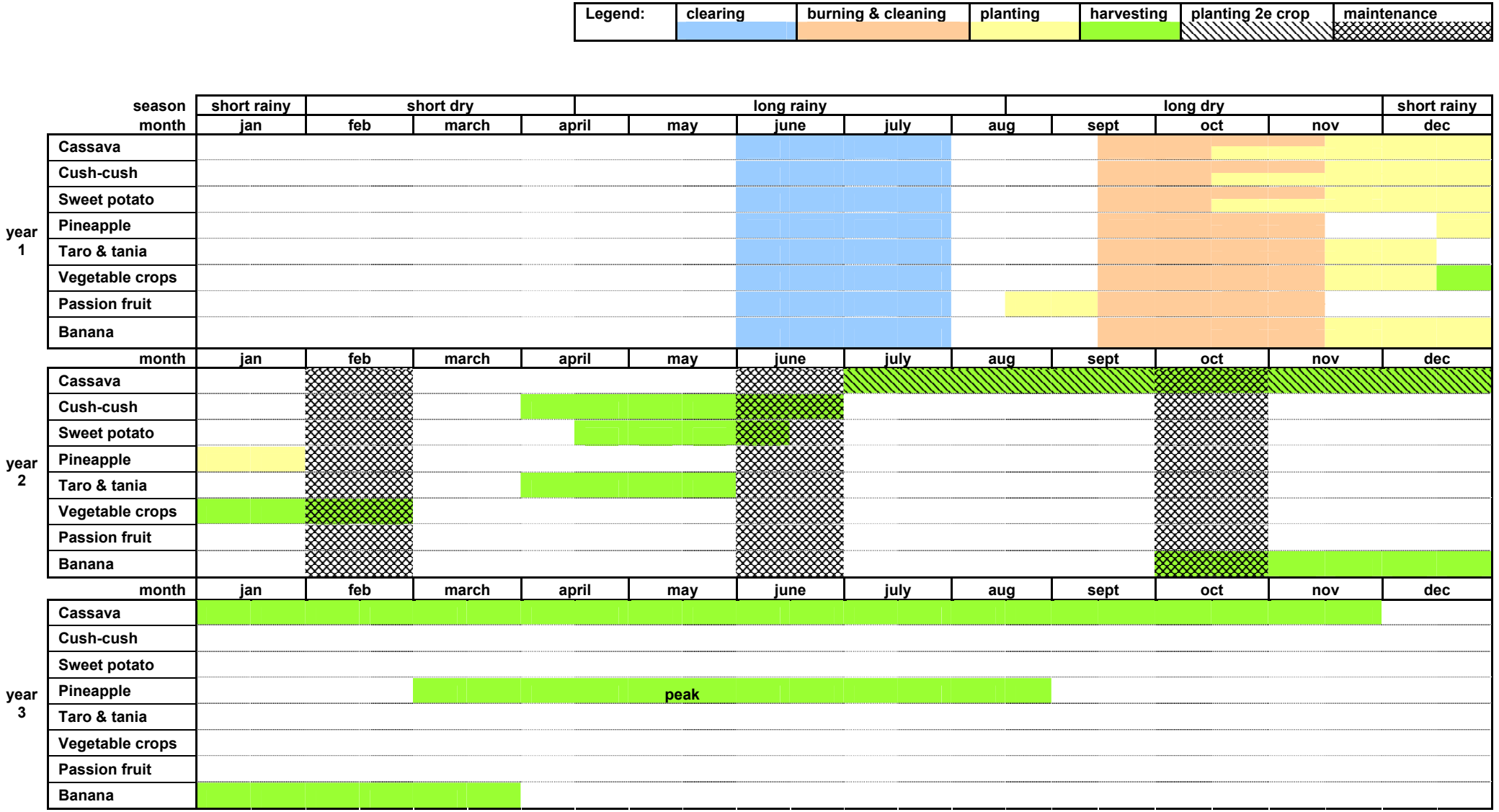


Figure 11: Shifting cultivation area North of Matta, 2004

Table 2: Crop table Matta



Photos chapter 5: Shifting cultivation

Photo 5.1: Clearing the plot

Photo 5.2: Burning

Photo 5.3: The last cleaning and burning activities

Photo 5.4: Planting cassava

Photo 5.5: Planting cush-cush

Photo 5.6: Some farmers experiment with none traditional crops and cultivation techniques

Photo 5.7: A pineapple field that got lost due to water logging

6 Management strategies and constraints

6.1 Soil fertility

Most soils in Matta are obviously not the most ideal for permanent agriculture. Low nutrient availability and very low organic matter content does not favour any form of permanent cultivation. The most important indigenous strategy to tackle this problem is a short cultivation period followed by a long fallow. The burning of al plant material, after a fallow has been cleared, is a way to quickly release nutrients stocked in the biomass and planting is done as soon as possible after burning in order not to lose these valuable nutrients.

Fields that were planted late after burning, show clearly lower yields, according to farmers.

In order for this traditional strategy to work, a sufficiently long fallow period is crucial. Although in general in the Suriname interior fallow periods appear to be shortening (CELOS, 2003) this doesn't seem to be the case in Matta. Farmers indicate that, in order to keep the cycle sustainable a minimum fallow of ten to fifteen years should be observed. Most farmers keep to his rule and many prefer to clear fields which had a much longer regeneration period (15-60 years). There are a few exceptions on this general picture which are discussed further on in this paragraph.

There also does not appear to be a strong trend towards prolonging the cultivation period in contrast to developments elsewhere in the interior (CELOS, 2003; IICA, 2003). Since most farmers do not use any inputs in the form of chemical fertilizer, compost or manure and prolonging the two year cultivation period is simply not worthwhile. Actually weed problems are perceived as more relevant then fertility problems related to longer cultivation periods, which are discussed in the next paragraph.

Virtually all farmers indicate however that they would, in theory, prefer more permanent fields but they don't really see how this could be achieved without the application of fertilizers. Most farmers are not willing to invest in fertilizers since the income that can be generated from the main crops is not expected to cover such an investment. Instead they prefer to invest their own labour by clearing a new field every year.

If we take a closer look at field level we observe some practices that are clearly related to soil fertility and management. Soils can be very heterogeneous within one field and farmers units.

6.2 Pests and diseases

As a general observation it can be stated that most crops on most fields have a healthy appearance. No disease infested fields have been observed and none of the farmers perceived plant disease as a significant problem.

Some pests on the other hand are most definitely experienced as a problem by farmers, with leaf cutter ants as the number one culprits. Problems with leaf cutter ants are not seen as uncontrollable by most farmers. Most farmers have their methods to deal with the ants as soon as infestation occurs (the application of Mirex being the most popular, followed by burning) and these methods appear to be effective enough if conducted on time and with vigour.

On some of the more remote fields significant damage can occur by the browsing of agouti and deer. The most common and probably most effective control measure is to wait for the animals at night and shoot them.

Birds (and sometimes opossum and taira) can do great damage when pineapples start to ripen and one farmer estimates a 30% yield loss on average for all fields. The most common control measure is to cover the pineapples with crop residues as soon as they start to ripen in order to hide them from the birds view.

In one case serious problems with banana weevils were observed in the field of a farmer depending entirely on agriculture. In this particular case banana and plantain where planted in high density all over the field (and not in scattered pockets as is the usual practice). The farmer eventually did apply Furadan to control the pest but on application most plants where already in the flowering or even fruit bearing stage. It is strongly advised not to use this pesticide after flowering has started but the farmer was clearing not aware of this. Eventually more than 90% of the crop was lost as well as the entire taro crop. No serious problems with banana weevils were observed in any of the other fields visited and it could well be that this farmers field layout of densely planted banana has added to the severity of the problem.

Hand weeding is the most important control measure against weeds. The burning of new fields also has a weed controlling effect and this is a second reason why crops should be planted as soon as possible after burning in order for the crops to gain a head start over undesired weeds. A third weed controlling strategy is related to the fallow period. Some farmers claim that the most important reason why fallow periods should not be shorter than 8 years is not related to the soil regeneration factor but to the fact that weeds emerge more quickly, more numerous and more vigorously on short fallow fields.

Table 3: Pests occurring in Matta, affected crops and observed control measures

Pests	Crops affected	Control measures
Leaf cutter ants	• Young cassava leaves • Cush-cush • Sweet potato	• Mirex *(pesticide)* • Malathion *(pesticide)* • Aldrin *(pesticide)* • Burning with petrol • Bitter cassava peel
Agouti and agouti paca	Young leaves and tubers	Shooting
Deer	• Cassava and cush-cush leaves • Young plants	• Shooting • “Scare crows”
Pekari	Tubers	Shooting
Birds	Pineapple	Covering pineapple with crop residue
Opossum	Pineapple	?
Taira	Pineapple	?
Banana weevil	• Banana • Plantain • Pomtayer	Furadan *(pesticide)*
Crickets	Mainly cassava	?
Caterpillars	Mainly cassava	?
Weeds *(Rakarokaro, Jente, Kabaja etc.)*	All crops	• Manual weeding • Gramoxone *(herbicide)* • Paraquat *(herbicide)*

Photos chapter 6

Photo 6.1: Birds can do considerable damage to the pineapple crop

Photo 6.2: Leaf cutter ants are the most problematic of all pests, here devouring cush-cush leaves

Photo 6.3: Vegetable crops are grown on concentrated ash heaps

7 Production, processing & market

7.1 Yields

Determining yields in complex intercropping systems like those practised in Matta with ten or more different and unevenly distributed crops is not an easy operation.

Although cassava is evenly distributed in most fields it is still very difficult to get some indication concerning yields due to the prolonged harvest period, varying amounts harvested at each occasion and irregular intervals between harvest operations. The same problems arise when trying to determine yields for the other tuber crops with the extra complication of their uneven distribution in the field. Farmers indicate that they cannot give any quantative yield estimation for tuber crops. Yields are perceived as good or bad depending on tuber size and quality.

As an example: with a very good harvest 4 cassava plants can yield one full wheel barrel, with a bad harvest up to 12 plants are needed to fill one wheel barrel.

> 1 full wheel barrel = ±3 full matapi[5] = ±18 pieces of lolo ksaba[6] ranging from 1 to 2 kg per piece

To estimate the yield of a particular field the following information is needed: the amount of plants (for the particular field) needed to fill one wheel barrel, spacing between plants and the size of the field. Although figures derived in this way would not be very accurate (yields can vary enormously, even within one field) they could at least give some idea of order of magnitude.

Although cassava is normally planted in a more or less regular fashion, planting density differs enormously from one plot to the other. In order to simplify things we will work with a 2 meter spacing. Another complicating factor relates to the necessity to calculate back from dry matter to fresh weight. Different varieties have different fresh-dry matter ratios ranging 20 to 70%. We will assume 50% dry matter.

This leads to the following figures:

> Good yield: 4 plants yield 72 kg fresh weight → (2,500/4)*72 → 4,500 kg/ha
>
> Bad yield: 12 plants yield 72 kg fresh weight → (2,500/12)*72 → 1,500 kg/ha

With average global yields of about 10 tonnes/ha for subsistence cassava farming, these figures may appear low. However it is important to realize that yields per hectare in a complex intercropping system don't say much about actual productivity. Secondly: a spacing of two meters is quite large; with a one meter spacing the figures could be quadrupled.

For one field, were a section was mono-cropped only with cassava from a sweet variety the yield could be determined more specifically. It yielded eighty bags of cassava of 40 kg each from a plot of 1,500 m^2. This amounts to a yield of 22 tonnes/ha, well above the average global yields for low input subsistence farming.

As a general rule: observed yields on soils 3 and 4 are clearly higher than yields on soils 1 and 2. Soils of type 5 can give very high yields if no losses occur due to water logging. Yields of the second (pour prani or ibia) cassava crop are substantially lower than the first and all farmers indicate that a third crop is not worth the effort.

Yields for pineapple are easier to estimate if spacing between plants and field size are known (each plant theoretically yields one pineapple, however; substantial losses can occur. See pests and diseases). On poor soils it takes longer for pineapple to start bearing fruit.

[5] A Matapi is used to press out all liquid from grated bitter cassava.
[6] Lolo ksaba are blocks of grated and compressed cassava = the dry matter content of the cassava tuber.

With a one meter spacing, 30% losses and an average fruit weight of 1.5 kg annual production is 10.5 tonnes/ha.

Even if all yields for a particular field could be determined, another complication arises, which has to do with the fact that fields are not comparable since the ratio between different intercropped crops is never the same. Some fields have more cush-cush than yam; other fields more sweet potato than cush-cush etc. So extrapolating known yield figures is risky.

It seems important however that GUYAGROFOR obtains some quantative baseline data concerning yields under current agricultural practice in order to correctly interpret and judge results during the field trial experimentation phase.

None of the older farmers in Matta have the impression that there is a decline in yields as compared to former times.

7.2 Product transformation

Virtually all farmers sell at least part of their agricultural production. Except for cassava, none of the farm products are being transformed before commercialization. As discussed previously, bitter cassava cannot be consumed unprocessed due to its cyanogenic potential. The way cassava is processed is still the same as it has been for countless generations and is based on the following methods to reduce toxicity: removing all liquid content and heating. Like the process, also the equipment used to transform cassava has not changed and this makes cassava processing the most labour demanding activity for most households.

The basic process consists of the following steps:

1. Harvest. The farmer harvests as much as can be carried to the homestead and processed, which roughly amounts to one basket (moutete or kourkourou) per person. Depending on the desired end products the farmer selects and harvests a specific combination of cassava varieties;
2. At the homestead the cassava is peeled and washed (see photo 7.1). Some older farmers prefer to peel the tubers when still on the field in order to reduce the weight that has to be carried home;
3. The cassava is grated manually in a hollow wooden trunk (see photo 7.2). Liquid is collected;
4. The grated cassava is placed in a matapi, an elongated, tube shaped press, ingeniously woven from kamina leaves (see chapter 8.2). A stick is placed trough the bottom end of the matapi, which, by sitting on it, is stretched, thus pressing out the liquid fraction of the cassava pulp. The liquid is collected. The result after pressing is a cylindrical, compressed block of dry cassava flour (photo 7.3);
5. The compressed cassava flour is pounded in a wooden mortar and sieved with a manari, a sieve woven from kamina leaves (photo 7.4). These type of sieves are getting rarer nowadays being replaced by a metal gauze on a wooden frame;
6. The flour is spread out on a large flat iron plate over an open wood fire, and baked into flat circular breads (photo 7.6).

The described process results in several processed and half processed end products. All of which are marketed to some degree. Table 4 gives an overview of the cassava products that are produced in Matta.

Table 4: Cassava products

Product	Local name	Description	Shelf life
Compressed cassava flour	Loloksaba	After pressing, the cassava flour is divided into blocks of about 1.5 kg.	Loloksaba needs to be sold or further processed within a few days
Starch	Gomma	The liquid collected from grating and pressing contains a certain amount suspended starch. The liquid is left for some time for the starch to settle and is then decanted. If starch is the main product then grated cassava is "washed "and the starch is collected by running the water trough a cloth. The remaining pure starch is sundried.	If stored well, several weeks to months
Cassareep	Kadekra	The liquid is, after decanting, cooked for a prolonged period of time until it's reduced to at least half the original amount. The resulting cassareep forms the basis for all soups and sauces in the traditional diet.	Kadekra is boiled every day again and fresh liquid can be added frequently. In this way the stock of kadekra can be maintained indefinitely.
Cassava bread	Kali	Cassava bread is prepared solely from cassava flour. No other ingredients are added. Together with cassareep based sauces it forms the traditional Arawak staple food.	If stored well cassava bread can be stored for up to two years
Cassava beer	Kasiri	Kasiri is prepared by baking grounded cassava and adding this to cassava liquid and hot water, sometimes sugar is added. The mixture is then left to ferment. The fermentation process is accelerated by mastication and black potatoes are added to serve as a colorant, giving the grey-brown liquid a more appealing reddish colour.	Kasiri is usually consumed as soon as the fermentation process is finished. It can be kept for a few days but it will turn more and sourer.

The whole process of cassava transformation is a very laborious exercise with the grating of cassava being one of the most time consuming activities. A few farmers have possession of an electric grater but with the absence of a reliable electricity supply for large parts of the month, these machines are not used that often. There are two residents in the village in possession of an electricity generator and they offer the possibility to those who own a grater to use electricity for 10 SRD per wheel barrel cassava that's processed. This option however is not used that often. Most people owning a grater still prefer to grate manually stating that 10 SRD would be too great a reduction of their profit margin.

Besides the amount of labour needed for the transformation process itself, the process of baking bread and cooking cassareep also involves substantial amounts of firewood that needs to be collected and carried to the homestead, which significantly ads to the total workload.

7.3 Market

Most people sell their products on the big Saturday market in the capital. Those with a significant dependency on agriculture go weekly, while those depending less on agriculture go on an irregular basis. Some full time farmers might go more often than once a week. On Saturday there is only a private bus available for transport which leaves at about four in the morning and returns at two in the afternoon. This bus is more expensive then the state bus that runs during weekdays and a sum of 4 SRD has to be paid for each extra piece of luggage.

None of the farmers sell their products on the market itself. Instead most of the products are sold to middlemen that wait for the farmers at the bus endpoint. Quite some people actually have fixed orders from middlemen for certain cassava products which they deliver on Saturday. Those without orders have to find buyers, again middlemen. The prices paid by the middlemen for ordered products are lower than when not ordered but those working on order seem to prefer the certainty of getting rid of the whole stock and the time that is saved. Still the highest prices paid by middlemen to the producers are half of what is subsequently paid by end consumers on the market. After having sold off the stock, the rest of the morning and early afternoon is spend on shopping, social calls and taking care of any formalities that need to be attended to. It has to be noted that the term middlemen would in this case more appropriately be middle women, since the vast majority are maroon women that own a stall in the market.

Not all people sell their products to market stall owners. Some, especially those belonging to any of the two evangelical churches, have their own network in the city from which they receive orders. Prices paid by these buyers tend to be slightly higher than those paid by the market middlemen. There also appears to be a potential market for certain cassava products beyond the national boundaries. Some buyers are involved in export to the Netherlands, providing the Maroon and Amerindian population there with traditional foodstuffs. There also appears to be an increasing demand in the Caribbean region for cassava starch, which is used as a component for a variety of products. Some Matta farmers have actively tried to sell their products in Albina at the trans-border market with French Guyana since prices are considerably higher there. These efforts were abandoned due to the distance and subsequent transport problems.

All in all prices for cassava products appear to be rather fixed and don't fluctuate much over the year. However some Matta farmers claim that overall prices have dropped a bit recently because of increased competition from other indigenous villages. Nonetheless cassava products from Matta are still regarded as highest quality.

It is clear that cassava products constitute the bulk of marketed farm products over the year and form a steady income base. However during the pineapple and passion fruit season a substantial amount of income is derived from the marketing of these fruit crops. The fact that these fruit crops are more season sensitive then the tuber crops results in considerable price fluctuations ranging from 10 SRD per pineapple outside the season to 2 SRD per pineapple at the peak of the season. At the peak of the season some buyers come to the village with pickup trucks to collect the pineapples at very low prices. At this stage it is not worth the effort for farmers to bring the fruits to the market themselves and anyway the amounts that need to be transported surpass the farmer capabilities. The same picture emerges when passion fruit is in season and to a lesser degree for watermelon.

Table 5: Cassava product prices

Product	Unit	Producer price per unit (SRD)	Market Price per unit (SRD)	Unit price in Albina (SRD)
Loloksaba	1.5-2 kg blocks	3-4	6-7	5
Kadekra	Litre	3	6-7	10
Gomma	Kg	4-5	?	-
Cassava bread	Pack (containing 3 breads)	2.5-4.5	7-8	-
Kasiri	Litre	?	?	-

Table 6: Non cassava product prices

Product	Unit	Season price (SRD)	Off-season price(SRD)
Pineapple	Medium sized fruit	2-3	7
	Large fruit	3-4	10
Passionfruit	Large bag (150-200) fruits	50	200
Sweet cassava	40 kg bag	15-20	40-50
Cush cush	Pack	3.50	---
Coton	Kg	50	---

It is difficult to give any figures on the income that is earned by the selling of farm produce. For some people going to the market is more a social event. Some products are sold but the money earned is also immediately spent on shopping and drinks on the way back. For other people it's their only source of income and a dead serious business. Most people find themselves on a gradual scale in between these two extremes.

In order to give some idea of what order of magnitude we can think about I will work out a few examples, taking into account only the major cash crops cassava and pineapple.

Example 1

Example 1 refers to a farmer, with good entrepreneurial skills, who depends entirely on agriculture. The farmer is strongly market oriented and has a prominent position within one of the evangelical churches, with a network of buyers in the city. Wife and children are involved in the production process.

This farmer also cultivates 10,000 pineapples annually. Assuming a 30% loss by pest damage and the lowest price per unit we arrive at 1,4000 SRD earned on pineapple per year. In total the farmer has a gross income from cassava and pineapple of 42,000 SRD per year or 3,500 per month. In this figure costs are not taken into account but neither is the income derived from other farm products and crops. Net income is difficult to determine but given these figures it seems safe to state that this fulltime "subsistence" farmer is doing rather well. Especially when keeping in mind the average monthly wage for a higher educated desk worker in Suriname of 900 SRD per month.

Table 7: Cassava earnings

Products	Weekly amount sold	Unit price (SRD)	Yearly average (SRD)
Cassava bread	25-30 packs	4.5	6,500
Loloksaba	25-30 pieces	3.5	5,000
Kadekra	40-50 litre	3.5	16,400
		Total	**28,000**

Example 2

The second example also concerns a person who depends entirely on agriculture. This farmer sells for about 300 SRD cassava products weekly and produces some 18,000 pineapples annually (with losses already accounted for). These figures amount to a gross annual income from these two products of about 20,000 SRD or 1,700 SRD monthly.

Example 3

An older farmer that sells on an irregular basis so no annual income can be derived. When he does go to the market he sells for about 150 to 200 SRD.

These examples are clearly very crude estimates and by no means pretend to represent actually income levels. They do, however give some idea of what is possible and the picture that emerges from them is not altogether negative. It seems that at least some Matta farmers are able to earn a reasonable living from agriculture.

7.4 Market constraints

The major constraints, as perceived by the people from Matta, always relate to bad infrastructure, lack of electricity and lack of unity amongst villagers.

Matta is located at a reasonably convenient distance from the market in the capital. Unfortunately the dramatic condition of the road, as discussed in chapter 4, still makes transport of farm products to one of the major constraints. The village is not easily accessible for personal vehicles and Matta villagers who tried to arrange their own transport by private or collective means got confronted with such high maintenance and repair costs that the exercise became unrewarding. This leaves the daily bus as the only means to transport farm products to the city.

The lack of electricity supply in the village greatly hampers any efforts to modernize and intensify the cassava transformation process. It also reduces the storage possibilities for perishable products.

The prices producers from Matta get for their products are considerably lower than prices paid by end consumers at the market. Shortening the market chain by cutting out middlemen and selling directly on the market could greatly improve revenues on farm products.

The lack of collective action and cooperation weakens the position of Matta farmers towards the market and reduces their capabilities to take more control over the market chain.

Photos chapter 7: Cassava processing

Photo 7.1: Peeling cassava

Photo 7.2: Grating cassava

Photo 7.3: Cassava is pressed with a *matapi*

Photo 7.4: The sieving of cassava flour

Photo 7.5: Compressed cassava flour: loloksaba

Photo 7.6: Cassava bread is one of the most important products. In the background a bucket with cassava juice waiting for further processing

Photo 7.7: Sun drying of cassava starch

8 Other income earning activities outside farming

8.1 Timber

In chapter 4 it was mentioned that Matta holds two woodcutting permits which together constitute some kind of community forest (Figure 6, page 22). The decision right on the exploitation of forest resources lies with the village council. Since the community itself lacks the knowhow and resources to effectively exploit its timber permits the council has handed out two concessions to private logging companies, enabling these companies to log on Matta territory. In return the village is supposed to receive a particular sum per cubic meter of wood and per wood species carried out of the forest. All removed timber has to be accounted for before leaving the village territory and officials from the forestry department have to take care that logging is done according to the forestry act and that no protected species are removed. Additionally the logging companies agreed with the village council that local people would be employed and that the road leading to the village should be maintained.

In practice, the reality of the situation appears to be quite problematic and gives rise to strong discontent among many villagers:

- There is serious doubt if all the carried out timber is accounted for and controlled by the forestry department. Heavy wood trucks can often be heard leaving the village territory in the middle of the night;
- Not one Matta resident has found employment with the logging companies;
- The road leading to Matta is suffering serious damage due to the heavily loaded wood trucks. No efforts have been undertaken by the logging companies to execute the promised maintenance;
- There are some difficulties concerning the transparency from the village council with regard to the earnings received. This is not to say that this lack of transparency is deliberately created. But it is at least an indicator of the council's lack of control and authority;
- Heavy logging equipment can do serious damage to soil structure and some people indicate that certain areas that could be used for agriculture have now been damaged;
- The logging activities have had a considerable impact on the traditional hunting grounds with wildlife disappearing from the vicinity of the village.

All in all it seems that Matta is losing a valuable and not easily renewable resource, without gaining much from it.

8.2 Non timber forest products

8.2.1 Plant products

Traditionally a vast range of non-timber forest products (NTFP) were used in Arawak society, serving numerous purposes. Plant fibres, leaves and vines were used to produce hammocks, cloth, rope, baskets, fish traps and for building and roofing purposes. Many fruit species were used for consumption and a vast array of plants had medicinal and/or religious purposes.

At present many NTFP are still important for the community. Fruits, especially from several palmea species, are regularly consumed and probably constitute an import vitamin source in people's diet. Some fruits are also marketed to a certain degree. Especially maripa *(Maximiliana maripa*) and awarra *(Astrocaryum vulgare)* appear to be important in this respect.

The traditional baskets woven from certain leaves and vines (table 8) are still regularly used and produced in the village, as is the *matapi*, which cannot be replaced by any modern

product. The leaves of the truli palm *(Manicaria saccifera)* are still the most appreciated roofing material. However truli has become rare in the vicinity of the village and the collection and transport of truli leaves has become a rather costly exercise, resulting in the more frequent use of galvanised plates for roof construction.

Despite the still common use of a variety of NTFP there is a clear decline in knowledge and skills concerning NTFP and their uses. Despite the still frequent use of traditional carrier baskets and the *matapi* being indispensable, there are only a few men left who are able to produce them. Young people are not willing to learn the time consuming and highly skilled craft of basket weaving. The same goes for the production of traditional hammocks. Only three women are left in the village that still have the skills to produce hammock and all are of an considerable age.

The loss of indigenous knowledge concerning NTFP is most obvious concerning medicinal plants. The village does not have a traditional healer or shaman anymore, already for several decades. All villagers agree that allot of traditional knowledge is lost. It seems that some of the new churches play an active role in the acceleration of the loss of this type of knowledge. They associate indigenous knowledge with heathen practices and backwardness and actively discourage making use of traditional medicine.

Some older people, not belonging to any of the new churches, still practice traditional medicine to some extent and have some knowledge about the uses of medicinal plants. However, they uniformly agree that those who "really knew something" have all passed away.

Table 8 presents some off the major non-timber forest products and their uses that were frequently observed in Matta.

Table 8: Non-timber forest products observed in Matta

Species	Parts used	Products and uses
Mauritius palm *(Maurisi flexuosa)*	• Fruit • Leave shoots • Stem fluids • Beetle larvae	• Consumption • Manufacturing rope and hammocks (tisirie) • Alcoholic beverage • Consumption (korishiro)
Maripa *(Maximiliana maripa)*	• Fruit • Leave stems	• Consumption and market • Fish traps
Awara *(Astrocaryum vulgare)*	• Fruit • Leaves	• Home consumption and selling • Production of juice (awarra okko) for the market • Fans
Trulie *(Manicaria saccifera)*	Leaves	Roofing material
Warimbo *(Ischnosiphon gracillis)*	Vines	• Baskets for men (moutete) • Attaching material (roofs)
Kamina *(Heteropsis jenmanuii)*	Leaves	• Baskets for women (kourkourou) • Cassava press (Mattapi) • Cassava sift (manari)
Kumbu *(Oenocarpus bacaba)*	• Inflorescence • Fruit	• Broom • Consumption and juice
Kunana *(Astrocaryum paramaca)*	Fruit	Consumption
Podisirie *(Euterpe oleraceae)*	Fruit	Consumption and juice
Tarate *(Odontadenia macrantha)*	Fluid from vines	Glue for bird traps
Medicinal plants, many species	All	Numerous

8.2.2 Hunting and fishing

Hunting is still an important activity for many men in the village and most men have possession over a shotgun. The much appreciated pekari (pingo) and “hals band” pekari (pakira) are not found easily in the close vicinity of the village anymore and hunters walk considerable distances through the swamp forest to reach the areas where these species can still be found. The same story goes for the appreciated monkey species: Capuchin monkey (keskesi), red howler monkey (baboon) and spider monkey (Kwatta). Closer to the village the men mainly hunt for agouti, agouti paca and deer which appear to be quite numerous still. All villagers agree that game is much less abundant than it used to be and most people regard the ongoing logging activities on the village territory as the mayor reason for this decline. Some people also claim that recreational hunters from the city have a negative impact on the game stock. These hunters come with four-wheel drive cars and hunt with semi automatic rifles and spotlights and “shoot at anything that moves”.

Still bush meat is on the menu several times a week in many households and is definitely an import source for animal protein in people’s diet. Most men hunt occasionally and meat that cannot be consumed within the household is sold mostly within the village. There is also a small number of men who hunt on a more regular basis and one could regard them as professional hunters in the sense that they try to sell outside off the village regularly, Transport and storage are important constraints for these hunters and they are often forced to sell their catch for low prices in the village of Zanderij.

Fishing used to be common during the times before the road was constructed and people still depended on the river for transport. Matta used to have a small canoe fleet at the creek leading to the Sarramacca river. These days no one possesses a canoe anymore and the creek leading to the river has overgrown with impenetrable creek forest. Due to these developments fresh fish is a very scarce commodity indeed in the village and if fish is on the menu it’s mostly dried fish brought in from the capital.

8.3 Off- farm labour

Off farm labour constitutes a major source of income for a large part of the Matta population. In fact the number of true subsistence farmers depending entirely on agriculture is very low. With modern education being regarded as very important in Matta society, the majority of people in Matta have a reasonable education level and quite a few people work in the capital in a variety of jobs mostly in the governmental sector. Most people working in the capital stay there during the week and come back to the village during the weekends.

Traditionally the army has been the biggest employer for men from Matta and it still is. Already during colonial times Matta men were used as trackers, scouts and guides by the army and they still serve this function in the present day army of Suriname. Most men are based as soldiers at the military camp some ten kilometres from the village which gives them the possibility to frequently return to their families in the village.

At the time of this research quite some young men were employed to build a “traditional” looking camp on the banks of the Sarramaca river that was to serve as the base for a jungle training of Dutch commando troupes. Some senior trackers of the village work as instructors in training programs for several foreign armies on a regular basis.

Besides those people working in the capital and for the army there are also some people working in the forestry sector, tourism and as guards in the gold mining sector.

Many senior inhabitants of Matta have worked outside the village, often in governmental services, and have returned after retirement. Most senior people receive at least a basic state pension. One can sometimes get the impression that Matta has the function of a

retirement home with young people leaving to the capital for employment and pensionados returning to the peace and quiet of village life.

The majority of people in Matta have direct relatives overseas in the Netherlands. Financial support from these relatives constitutes a significant contribution to especially the income of senior people. Although it is impossible to give figures, based on my own observation, it is safe to state that the relative wealth of many people greatly depends on these contributions.

Photos chapter 8

Photo 8.1: Only a few older women still have the skills to produce the traditional style hammock

Photo 8.2: The preparation of juice from awarra *(Astrocaryum vulgare)*, an important non-timber forest product

Photo 8.3 & 8.4: Sometimes an individual resident of Matta logs a commercial tree species for commercial purposes. This however is an uncommon practice and officially

Photo 8.4: See description above

Photo 8.5: Walaba posts are sometimes marketed by villagers.

Photo 8.6: Deer are still reasonably abundant in the area

Photo 8.7: Collared peccary…

Photo 8.8: Tapir have become rare

Photo 8.9: …and white lipped peccary are only found at considerable distance from the village

9 Farm typology and relevance for GUYAGROFOR project

An important objective of this study has been to develop a farm typology for the farming systems that occur in the indigenous village of Matta and to explain the reasons behind the occurrence of these different farm types (chapter 1). During the previous chapters we observed, through the purposive and iterative approach, as discussed in chapter 3, the gradual emergence of the boundaries of several distinct classes of farmer types in Matta.

9.1 The farm types

The following indicators emerged as important for the distinction between categories of Matta farmers: age, labour input, other inputs, plot type, crop selection, inter and intra specific crop diversity, knowledge type, degree of market involvement and dependency, market strategy, innovativeness and off farm income. On the basis of these indicators farmers can be categorized into three or four groups. Table 9 presents an overview of how these indicators relate to the respective farm type group and as such describes each category of the farm typology. When combing all indicators we arrive at a typology consisting of three major farmer types:

- Full time farmers;
- Part time farmers;
- Traditional farmers. This category can be split up into two subcategories:
    - Type A traditional farmers who depend substantially on farm income;
    - Type B traditional farmers who do not strongly depend on farm income for subsistence.

Table 9 represents the description and background of each farm type. However, for the sake of illustration I will present for each group a characteristic type, which constitutes at the same time a real live example.

Full time farmer: A 32 year old farmer, married, with young children. He has spent some years outside of the village but now he is back and agriculture is his only source of income. He has some large plots at a considerable distance from the home stead since longer fallow and better soils make these plots more productive. He grows all the traditional crops and has good knowledge of the traditional system and crop varieties and he actively selects volunteer cassava seedlings. At the same time he tries to adapt the traditional system by not only focusing on cassava and he, for example, creates sections that are dominated by other tuber crops. He tries to change the crop schedule in order to have products outside the peak off the season. He also cultivates non-traditional crops and vegetables for the market. The farmer makes regular use of chemical fertilizers for certain high value crops and applies pesticides and herbicides when he thinks they are needed. He has a pro-active approach towards the marketing of his products and tries to find different buyers and offers a variety of products. The farmer is able to make a reasonable living and states that the secret is “not only to work hard but to work smart”.

Part time farmer: A 36 year old farmer, married, with a young child. He works as a soldier for 15 years now, and is stationed at the army base located 10 kilometres from the village. He has two relatively small plots (first and second year) which, besides a few taro and banana plants, contain only cassava and pineapple. The plots had a relatively short fallow of 5 and 8 years, previously cultivated by his father-in-law and are at an intermediate distance from the homestead. The farmer tries to reduce labour input to the minimum, hence the smaller size, short fallow and low crop diversity. He does not make use of any inputs. He goes to the market when he and his wife have enough time to harvest and process cassava, which is not every week. The income generated by his plots is important. It allows him to pay off a bank loan with his soldier's salary. He does not regard himself as a very skilled farmer and he thinks that his fields "do not look very pretty", but they serve their purpose.

Traditional Farmer: Both subcategories of traditional farmers share the following characteristics. They are all older than 50 with the majority having passed the pension age of 60 years. They have a basic income derived from a (state) pension and/or receive financial support from children and grandchildren. They have been working in agriculture for most of their lives and they focus on traditional crops and practices on which they have good knowledge that was passed on to them by previous generations and has grown with years of experience. Besides some pesticide use against leaf cutter ants, no other inputs are used by this farm type. The distinction between the two subcategories is based on the degree to which they still depend on agriculture to make a living.

- **Type A:** A 62 year old widow. She receives a small state pension and has to take care of several grandchildren. The pension does not suffice to make ends meet and her own children are not in a position to financially support her on a regular basis. She receives some support from the church she is member off. She maintains some medium sized traditional fields and tries to go there as often as possible. The care for the grandchildren and her physical condition make her agricultural efforts less productive as she would like them to be. She focuses on the marketing of half processed cassava products since they are less time and energy consuming.
- **Type B:** A couple, 72 and 78 years of age. They receive a state pension and financial support from children working in the Netherlands and in the capital Paramaribo. They still maintain two fields and clear a new one every year. Due to their physical condition they depend on the traditional *majuri* group work for clearing operations. The fields are at a considerable distance from the homestead since they prefer to have good soils and old fallows; however the distance is becoming a problem. Especially the transport back of harvested products is getting more difficult. They visit their fields every day and take pride in maintaining a good-looking plot with high diversity. Even some flowers have been planted, for purely ornamental reasons. The couple mainly markets cassava products but on an irregular basis and only when ordered. They also provide relatives in the village and in the city with their products.

With regard to the amount of farming units contained within each group I conclude that from the 39 observed units 5 could be categorized as full time farmers, 12 could be categorized as part time farmers and 15 as traditional farmers. The 2 remaining units fall outside these categories since they abandoned agriculture within the period that this research was conducted.

9.2 Relevance of the farm typology for the GUYAGROFOR project

One important use of the developed farm typology for the GUYAGROFOR project would be for the selection of potential partners for the on farm field trials and development phase of the project. Based on the typology developed in this study I conclude that the full time farmer category has the biggest potential with regard to finding suitable partners. Full time farmers are intensively involved in agriculture and have a good traditional knowledge base but at the same time have an open mind towards new crops, cultivation methods and techniques. They express a clear interest in any developments that could potentially increase production or reduce workload. Most full time farmers already conduct experiments on their own in order to adjust the traditional system in such a way that it suits their personal objectives better. GUYAGROFOR's objective of developing more permanent forms of agro forestry farming systems based on an integration of indigenous and formal scientific knowledge (GUYAGROFOR, 2004) would in theory coincide with the objectives and strategy of this farmer category. Care should be taken however when involving these farmers in the field trials phase. Full time farmers economically depend entirely on their agricultural activities and any reduction in yields or increase in workload resulting from participation should somehow be compensated.

With regard to knowledge on the indigenous farming system and crops, the category of traditional farmers is clearly the richest source. Research efforts aimed at unfolding this knowledge would best concentrate on traditional farmers of sub category B (paragraph 9.1) for the following reasons. First of all, the fact that some very old farmers in this group still cultivate despite the fact that they don't really need to, indicates that they have a strong affinity with agriculture and agricultural knowledge. Secondly, since these farmers continue farming, at least partly, as a pass time, we can assume that time is less of an restricting issue. Thirdly, most farmers in this category are of an considerable age, meaning that this group of farmers is gradually diminishing and with them the knowledge they posses.

With the prediction that the group of traditional farmers will reduce considerably in the near future, the part time farmers emerge as the largest category of farmers. This category will be the most difficult one to reach for the GUYAGROFOR project. It is inherent to the part time farmers' strategy to reduce labour input to an absolute minimum. Participation in project initiatives will be difficult to realize since time is usually a scarce asset for these farmers. Neither can it be expected that they will show great interest in innovations if these would imply an increased workload. Part time farmers would be interested in the eventual project outcomes and especially in a system that would make a longer cropping cycle possible since this would reduce the workload needed for clearing new plots. However, if this more permanent form of agriculture would involve much more intensive maintenance and management strategies, adoption would probably not be worthwhile from a part time farmer's point of view.

Table 9: Farm types main characteristics per indicator

	Age	Labour input	Other inputs	Plot type	Crop selection	Crop diversity
Full time farmer	30-50	Very high	Frequent use of pesticides and some chemical fertilizer on specific crops	Large traditional type plots, long fallow. Heavier soil type at long distances from the homestead. In addition often some a-typical semi permanent plots, often monocropped	Traditional crops and new crops, mostly vegetables	High
Part time farmer	30-50	Low	No other inputs	Small traditional type plots. Often below average fallow and relatively close to the homestead. Often also low yielding and maintenance cassava and/or pineapple plots on savannah close to homestead	Traditional crops	Low, with a focus on cassava and pineapple
Traditional farmer A	50-70	Medium to high	Some use of pesticides	Large traditional type plots. Medium to long fallow	Traditional crops	Medium to high
Traditional farmer B	60-80	Medium	No other inputs	Small-medium traditional type plots. Long fallow	Traditional crops and some vegetable crops for home consumption.	Very high for traditional crops

	Knowledge type	Market involvement & strategy	Market dependency	Innovativeness	Off farm income
Full time farmer	Good traditional knowledge combined with some ”modern” knowledge	Very much market involved. Actively searching for opportunities outside regular markets and products. Diversification of farm products.	Completely market depended	Actively experiments with crop selection, rotation, new techniques and ideas	Agriculture is by far the major source of income
Part time farmer	Often imperfect agricultural knowledge. Mostly traditional	Market involvement mainly focuses on cassava and pineapple. Agriculture also serves as a basic food supply	Not depending on market for basic income	None. Maybe interested but not if it increases workload	At least one member off the nuclear family has an off farm job
Traditional farmer A	Good traditional knowledge	Strong market involvement. Mainly cassava products and traditional crops	Medium to high market dependency	Interested in innovations but not actively experimenting	Pension and/or family support do not suffice to make ends meet. Income from agriculture is indispensable.
Traditional farmer B	Very good traditional knowledge	Market involvement on an irregular basis. Provide family in the village and capital with traditional foodstuffs	Low market dependency	Enjoys a good looking and skilfully maintained traditional field	Pension and/or family support would suffice to provide a basic income. The extra earnings from agriculture are a welcome addition, but not indispensable

10 Conclusions and recommendations

Besides the development of a farm typology, this study also aimed at providing a basic description of the entire system at village level with paying special attention to the interaction between traditional human activities and the natural environment in which they occur. In this chapter I briefly present the main findings and based on these findings I will formulate some recommendations concerning possibilities for the GUYAGROFOR project.

The basic assumption that, in the Suriname interior, traditional shifting cultivation farming systems are getting less sustainable due to decreasing fallow periods and the tendency to prolong the cultivation period, does not seem to hold for the case of Matta. There is no overall decline in fallow periods and yields are perceived as stable. The pressure on fallow land has actually decreased instead of increased. There are fewer fields now than there were in the past since most farmers are only partly involved in agriculture nowadays. Those who do depend entirely on agriculture still work with the basic traditional system as the framework for all farm operations and this framework includes the maintenance of a high inter and intra specific crop diversity, one of the main factors determining the systems resilience with regard to pests and diseases. The impact of the agricultural activities on the environment and on the diversity of natural vegetation and wildlife can be regarded as minimal, especially if compared with the ongoing logging activities in the area. Logging clearly has a much more profound and further reaching impact on vegetation, wildlife and the ecosystem as a whole then shifting cultivation in this area and it sometimes seems a bit awkward and futile to focus on shifting cultivation when discussing environmental degradation in the context of the Suriname interior.

In short, I conclude that agricultural practices in Matta appear to be sustainable and do not pose a serious threat to the natural environment.

This is not to say however that the situation cannot change in the near future. A few developments can be observed which could have an unsettling effect on the system as it is now:

- Those who are involved only partly in agriculture, tend to be less committed to stick to the traditional duration of the fallow period. Since their main strategy is to save time and effort, they will settle for lower production levels if this goes together with a significant decrease in labour input. The category of part time farmers appears to be a growing one and on the long term this development could have a destabilizing effect on the system;
- Indigenous farm system knowledge is disappearing fast. The number of young people that are completely involved in agriculture and could take over this knowledge is very low and the number of the older farmers is naturally dropping. Indigenous knowledge is crucial in order to maintain the diversity and complexity of the system and the diversity of the system is crucial for its long term sustainability with respect to yields, resilience against pests and diseases and agro-biodiversity.

After having concluded that the system, as practised still by the majority of farmers in Matta, is sustainable, we can raise the question what contribution the GUYAGROFOR project could provide to improve agricultural practice and income in Matta. The answer lies in anticipating on the two predicted, potentially destabilizing developments that were described previously and by putting high priority on improvement of the market chain.

In its essence one of the major objectives of the GUYAGROFOR project is to develop more permanent and sustainable forms of agriculture for the Suriname interior. GUYAGROFOR states, and correctly so, that it is an explicit wish from the indigenous and Maroon farming communities to move in the direction of permanent fields since it becomes ever harder to maintain a true shifting cultivation system.

Most Matta farmers would state the same, especially those with a part time involvement in agriculture. They would prefer to have permanent fields if this were to be possible. However much care should be taken when trying to develop and introduce more permanent forms of agriculture, especially in the specific context of Matta:

- Several research activities conducted on the possibilities of permanent cropping on the low fertility savannah soils in Suriname have shown that these possibilities are limited (Poels, 1987; Coense, 1987) Even if depleting nutrient levels were to be tackled with fertilizer application, the low organic matter content and structural instability of the soils pose serious problems over time with regard to fertilizer application efficiency and soil workability and structure;
- One of the major reasons why a field is not cultivated for more than two years under the traditional system is the increasing infestation with weeds over time. After two years of cultivation weeds have become so vigorous that further cultivation becomes impossible;
- A short cultivation period also has a suppressive effect on diseases. Prolonged cultivation periods will result in an increased incidence of pests and diseases as they will have time to reproduce, accumulate and spread;
- Permanent fields would greatly reduce the possibilities for the traditional practice of in situ selection of volunteer cassava seedlings and hybridization in order to maintain a high genetic diversity and crop variety. This could result in genetic erosion and decreasing crop resistance towards diseases.

I am not arguing that no efforts should be made in the direction of more permanent cultivation practises, it is clear that for many non traditional and part time farmers this could constitute an improvement. But I would like to stress that any such efforts should be assessed critically and that somehow sustainable answers will have to be formulated to tackle the potential negative effects of permanent cropping systems in Matta and similar environments. The traditional system is there for a reason and the indigenous knowledge component of the GUYAGROFOR project should therefore be taken very seriously.

With regard to market and market chain development there appears to be much room for improvement. Here GUYAGROFOR could play a facilitating and information providing role. Improved processing and transformation techniques for other crops besides cassava, the opening up of new markets, nationally and internationally for specific niche products and a more collective organization of Matta farmers are some developments that could help to improve people's livelihoods and where GUYAGROFOR could direct its attention to.

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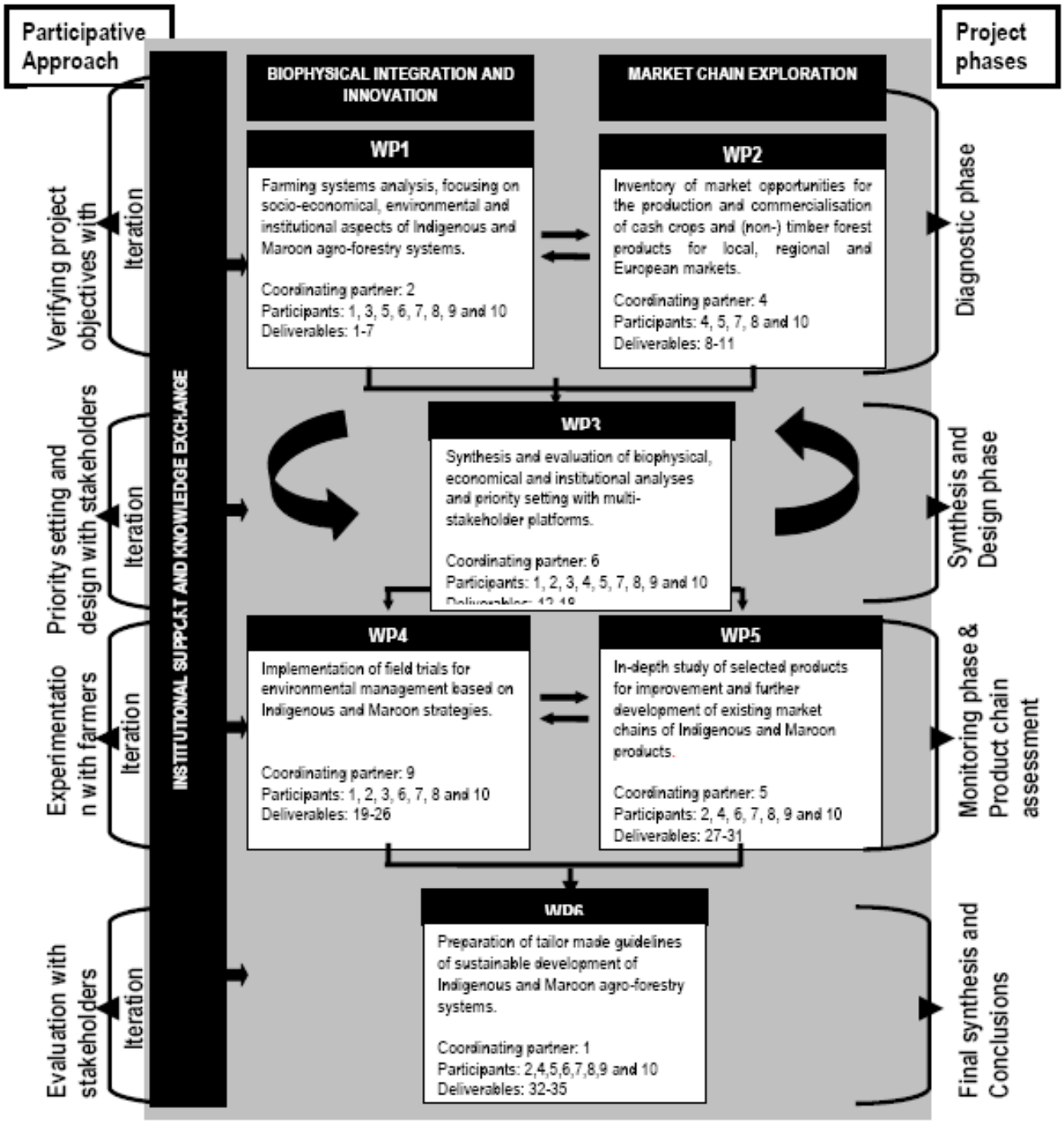
12 Appendices

12.1 Guyagrofor project structure



Interrelationships between project work packages, project phases and participatory approach.
Source: CELOS/ALTERRA

12.2 Methodology for fieldwork

Diagnostic appraisal and household survey:

Methodology for fieldwork in Matta

Oemar Idoe

Step 1

Reconnaissance survey

The first step for the thesis research in Matta will be an informal reconnaissance survey of one week. During this period the objective is to:

- Get to know the people outside a more formal setting;
- Get to know the village territory;
- To gain insight in the village's social and economical structure;
- To gain insight in the village history with an emphasis on agriculture and forest products;
- To identify important aspects, concepts and constraints of today's agricultural practice;
- To identify the type and importance of today's forest products for the community;
- (Market relations, marketed products, organization)

During the reconnaissance survey no pre-developed interviews are used and "aggressive" questioning is to be avoided. The approach is based on participating with people in their daily practice and a checklist of important indicators and variables is kept in mind while discussing with people and joining them with their activities. Housing is arranged with a villager which should facilitate the process, as described above.

The following activities should form part of the reconnaissance survey:

- An introductory walk through the village and its surroundings;
- Joining farmers when going to work on their plots (at least three visits=three days);
- Visit the HKV (= Hout Kap Vergunning, which can be seen as the community forest, Matta has two HKV);
- Speak with village elders;
- Join in the unexpected ;-).

Step 2

Agro-ecological map or village resource map

Preferably two group sessions, one for men and one for women with a minimum of five participants for each group and a maximum of ten. The reason for having separate groups is the possibility that men and women do not place the same emphasis on certain resources and niches. In a combined group some information might get lost or not given enough attention.

Materials:

- Large sheets of paper;
- Markers in different colours;
- Checklist.

Procedure:

- Objectives and expected output of the exercise are explained;
- People are asked to place the sheet of paper in the length direction of the village territory;
- The group should appoint someone who will do the drawing;
- The aim is not to influence the group process to much in the beginning. However some facilitating questions might be useful to get the group started. (Can you indicate: roads, paths, their destination, important landscape features, watercourses etc. See checklist);
- If it seems that after a while important aspects are missing, it can be asked to place them on the map if possible. For this see the checklist.

It is very important to take good note of discussion that takes place during the exercise. Information revealed during these discussions might prove to be more valuable than the actual map produced.

Step 3

The agro-ecosystems transect

Based on the maps one or two transects (covering most important features defined during the mapping exercise) are decided upon, which will be walked with a few informants. The transect informants could come from the map drawing group but not necessarily so. It is important however, that it concerns people with good knowledge of the territory.

Materials:

- GPS or compass;
- Camera;
- Large sheets of paper;
- Markers in different colours;
- Checklist.

Procedure:

- Objectives and expected output of the exercise are explained;
- If the area shows a clear relief it is normal procedure to start at the highest point and walk down to the lowest;
- During the walk all important aspects along the transect are discussed (for this purpose a checklist is developed) and notes are taken.

Depending on time left and the willingness of the informants they could be asked to draw up their version of the transect and discuss the result (see points 3, 4 and 5 of the checklist).

Some other tools that could be useful are ranking and scoring exercises and timeline sessions. These could also be used during a later stage of the fieldwork (alongside the household survey).

Ranking and scoring:

- Different farming strategies, identified and ranked for numbers in each group;
- Wealth ranking;
- Soil types/constraints;
- Crop preferences;
- Etc.

There are different methods that can be used depending on the purpose of the exercise all methods however are a group exercise.

Timeline:
For this activity some village elders should be among the participants.

The aim of the exercise is to identify:

- Important passed events and impact on present day situation;
- Socio-economical development, passed to present and cultural changes;
- Changes and development of agricultural over time;
- Changes in forest use and products;
- Reasons behind identified changes.

Step 4

Purposeful and iterative sampling

Based on the first three steps a provisional typology is formulated and suitable indicators for differences chosen.

Step 5

Formal household survey

The questionnaire was developed on the basis of the first three steps.

12.3 Checklists

1. Checklist reconnaissance survey

When engaging in activities and discussion it is important to keep the following list of variables and indicators in mind. The same indicators and variables will be dealt with in a more quantative fashion during the household survey.

Farming practice:

- Amount of land cultivated;
- Soil type (local?);
- Property;
- Type of crops, varieties;
- Crop calendar;
- Yield/crop type/ unit of area, development over time;
- Cultivation period, fallow period;
- Management strategies concerning soil fertility, biodiversity, pests and diseases;
- Chemical inputs;
- Technology;
- Labour availability/calendar;
- Changes in farming practice, reasons.

Forest:

- Timber;
- NTFP;
- Game and fish;
- Products marketed.

Income:

- Marketed crops, agricultural products;
- Artisanal/handycraft products;
- Prizes and price fluctuations;
- Market constraints;
- Off farm income/type/time;
- Purchased products.

Social:

- Level of engagement in ngo's, social groups etc.;
- Historical profile;
- Farmers broad objectives, perspectives and choices.

2. Checklist agro-ecological map or village resource map

1. Indicate specific features bordering the territory (such as watercourses, roads, etc.);

2. Mark and name neighbouring villages (these will probably be outside the map so mark direction);

3. Show the main roads and major footpaths, including those leading to neighbouring villages;

4. Indicate the village(s) centre(s), schools, churches, important shops, etc.;

5. Distinguish and demarcate any *territory units* inside the village(s) territory:
   - what are the names of these units? (note on the map)?
   - what are the criteria for distinguishing between the units?

6. Distinguish and demarcate different *soil types* inside the territory:
   - name them;
   - show them on the map;
   - what is their relative importance in terms of their area?
   - what criteria have been used to distinguish the different soils?
   - what are the characteristics of the different soil types?
   - is there any relationship between the different types and their position in the territory? (Are they near a river, on a slope, etc?);
   - what are the specific advantages and constraints associated with each soil type?

7. Does land use vary according to distinct soil types? (For example, are some soil types used more for cash crops, food crops, fodder crops, trees, communal areas, or other non-farming activities?) If so, why?

8. Are management practices different for the distinct soil types or territory units: crop rotation, use of fertiliser, preparation of land, weeding, etc.? If they are, explain why?

9. Distinguish and demarcate areas with good soil fertility and with poor soil fertility or land degradation/soil erosion:
   - what are the causes of these soil fertility (or land degradation) niches?
   - do they relate to the identified territory units or soil types?

10. Discuss the distribution of farm plots within the territory, and the reasons for this pattern *(Adapted from KIT 1997).*

3. Checklist agro-ecosystems transect.

1. Use the agro-ecological map to decide on a transect route that will reflect the diversity of the landscape. This route should cover:

- The major land units and soil types;
- High and low ground or territory units;
- Areas that are degraded/eroded, areas with good soil fertility, etc.;
- Any communal areas that still exist;
- Diverse farm lands (fallow land, mixed farming, agro-forestry, etc.).

2. Start walking and stop at each distinct land unit or soil type identified by the farmers. Discuss:

- Characteristics of the land unit and/or soil type: what criteria do farmers use to distinguish land units or soil types?

- The relationship between these characteristics and the position/location of the unit/soil type;
- The dominant form of land use (forest, planted trees, pasture, density of homesteads/farms, size of the farms);
- The crops and crop rotation, cultivation and fallow period;
- The management practices, including soil fertility management;
- Soil conservation and agro-forestry practices;
- Soil fertility status;
- Major soil constraints;
- Pests and diseases;
- Specific opportunities/solutions for improving soil fertility, soil conservation, agro-forestry, etc.

3. On returning from the transect walk, let the participants draw the details of the transect on a large sheet of paper and help them to present the information in a matrix.

4. Discuss the specific characteristics distinguishing the land units; e.g. slope, soil, vegetation, etc.

5. Discuss diversity in land use, management practices, the soil fertility status and constraints of each land unit: compare the distinct units (if it is difficult to be precise a ranking tool could be used)

6. Identify potential improvements in management practice.
(Adapted from KIT 1997)

12.4 List of farming units

#	Name	Fields visited	Dependency	Intensity
1	Eline Sabajo	Yes	Medium-low	Medium-low
2	Rinaldo Salman	No	XXX	XXX
3	Edna Sabajo and Renee	No	XXX	XXX
4	Toon Jubitana (Antoon)	No	XXX	XXX
5	Fransisco Karwofodi	Yes	High	High
6	Letuina Karwofodi	Yes	Medium	Low
7	Betsy and Philippe Jubitana	Yes	High	High
8	Steven Jubitana	No	stopped	Stopped
9	Bernard Jubitana	Yes	Medium-low	Medium-low
10	Romeo Jubitana	No	XXX	XXX
11	Trees popke and husband	Yes	Medium	Medium
12	Richard and Lilian Karwofodi	No	XXX	XXX
13	Tilly Sabajo	Yes	Low	Medium
14	Steven and Joyce Sabajo	Yes	Medium	Medium
15	Edmund Jubitana	No	XXX	XXX
16	Jerry Karwofodi	No	XXX	XXX
17	Roi Popke	No	XXX	XXX
18	Norma Karwofodi	Yes	Medium	High
19	Ronald Biswane	Yes	Medium	Medium-low
20	Glen and Elvina Karwofodi	Yes	Medium	Low
21	Ricardo Jubitanana	Yes	High	High
22	Joyce Karwofodi	Yes	Low	High
23	Captain	No	XXX	XXX
24	Oma Tina	Yes	Low	High
25	Jan Biswane	No	XXX	XXX
26	Robert Jubitana	No	XXX	XXX
27	Mildred Biswane	No	XXX	XXX
28	Freddy Jubitana	Yes	High	High
29	Paulinus Jubitana	No	XXX	XXX
30	Leo and Alice Karwofodi	Yes	Low	High

#	Name	Fields visited	Dependency	Intensity
31	Koert Sabajo	Yes	High	High
32	Oma clemi and Frank Sabajo	No	High	High-Medium
33	Bertina (Tante Beer)	Yes	XXX	Medium
34	Tante Martha	No	Stopped	Stopped
35	(Gerardus and Sjane jubitana) Rizette	Yes	Low	Low
36	Mephis Karwofodi and Frans Monsanto	No	XXX	XXX
37	Lucia Sabajo	No	High	High
38	Bennie Karwofodi	No	XXX	XXX
39	Bakker	No	More or less stopped	More or less stopped