VINVAL

EU 5th Framework INCO2 funded research project, contract no.: ICA4-CT-2001-10047

Agricultural and natural production systems in the Ashanti region of Ghana

A Rapid Diagnostic Appraisal in three inland valleys

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Research Report 2003-01

Impact of changing land cover on the production and ecological functions of vegetation in inland valleys in West Africa

Due to several reasons, food shortage problems are a major issue in sub-Saharan Africa. In attempts to solve the shortages considerable effort has been devoted to strategies for increasing agricultural production. This is being achieved by an expansion of cultivated area, as well as by higher productivity per unit. The need for new agricultural land has been a strong argument for the extensive clearing of natural vegetation. This has resulted in widespread environmental degradation. As this is now resulting in serious constraints to sustainable development, there is clearly a need to develop an integrated approach towards land use planning involving and balancing both agricultural production objectives and environmental concerns.

Overall Objective:

The overall objective of the project is to develop a tool for integrated land use planning at watershed scale that contributes to improve sustainable agricultural production systems in inland valleys in West Africa. Inland valleys are the upstream areas of drainage systems. This tool will take into account the balance between production and protection objectives and will assist in making informed decisions on allocating land use activities of small holder farmers across the watershed on both agricultural and natural land. Natural land is here defined as all land that is covered by natural and fallow vegetation. Such decisions are based on knowledge of the productive value of these land use activities and their impact on ecological functions.

Specific Objectives:

- Quantify the production, regulation (water, sediment and nutrient flows) and bio-diversity functions of natural and agricultural ecosystems at farm and watershed scale in three inland valleys in Ghana and Burkina Faso with distinct different land use intensities.
- Assess the economic importance of the tradeoffs and complimentarities between natural and agricultural ecosystems and the different functions they provide.
- Develop a GIS-based tool for integrated, multifunctional watershed-level land use planning for use by extension services and planners. This tool will support the analysis of the impact of different land use development scenarios on the ecological and

production functions. The tool can be used in the decision-making process of land development.

Duration

This project will run from 2001 until 2005.

Location

The project will work in selected inland valleys of West Africa, where land cover ranges from almost natural to intensive agricultural production. The selected inland valleys are located in Ghana (Ashanti Region) and Burkina Faso (Kompienga).

The Participants

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The project outputs are organised in the following report series:

- **WP = Working Paper**

In these reports the most important results of the project activities are presented. These reports have the status of working papers of which some will be published in scientific journals.

- **MR = Mission reports**

These reports present the activities undertaken during missions of the European project partners to China and Vietnam.

- **PM = Project Management reports**

These reports contain information about two important issues, the progress of the VINVAL project and accounts of the official project workshops.

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Acknowledgements

This RDA report is part of the project Valuation of Inland Valleys (VinVal) financed by the European Union (PL ICA4-2000-10338).

The RDA team would like to thank the communities of Attakrom, Dwinyankwanta and Nyamebekyere for their hospitality and enthusiasm in participating in the project, as well as the extension officers who accompanied the RDA team. A video was made of the RDA in the three villages and will be shown to the communities.

Table of contents

Tables, figures and plates

1 Introduction

The VINVAL project focuses on selected inland valleys of Burkina Faso and Ghana, where land cover ranges from almost natural to intensive agricultural production. The project will analyse the production values of natural land (fire wood, medicines, fruits, etc) and agricultural land, and estimate the economic importance of the natural production to farmer's income. Clearing of the vegetation decreases the income from the natural products, and results in degradation of the natural resource base. In low-input production systems, the agricultural production per hectare will decrease if fallow periods fall under a critical duration. Changing the natural land cover into an agricultural cover will also change the hydrological and nutrient flows through the watersheds, resulting for instance in water shortages or excess water (flooding) in downstream areas.

Following a systems approach, the impact of land clearing on the natural resource base can be quantified, and economic analysis on the various system components executed taking into account the production and ecological functions. This system analysis will lead to the identification of the optimal intensity of exploitation of inland valley agro-ecosystems which balances agricultural production and enhanced natural land production. Tradeoffs between these economic objectives and the ecological values provided by natural vegetation areas will also be examined. The aim of the project is to establish and validate criteria, create indicators of sustainability and design a tool for practical use in ecosystem management and land use planning.

A Rapid Diagnostic Appraisal (RDA) was carried out in Ghana (June 2002) and Burkina Faso (August 2002). The objective of the RDA was, broadly speaking, to start the project by doing a joint analysis of the situation with both researchers and farmers. This information will be fed back into the different components of the project. It also serves the purpose to get researchers acquainted with the communities and vice versa. This report describes the information collected for three communities in Ghana: Attakrom, Dwinyankwanta and Nyamebekyere. Chapter 1 gives background information on the area and sites, chapter 2 explains the RDA methodology that was used. Chapters 3-5 are each dedicated to one community. The authors have tried to make the information given for each of the communities as comparable as possible. This was not always possible though. Because an RDA does not used standardised questionnaires, but rather open-ended questions, the information received back from the farmers can be different. However, the topics that were covered in each community are the same. Chapter 6 draws a few conclusions based on the RDA.

1.1 Area and sites

In 2001, in both Ghana and Burkina Faso three inland valleys were selected in one agro-ecological unit. This means that they are formed in the same lithology, have similar climatic characteristics, same morphology, extent, etc. The only characteristic that differs considerably is the land use intensity. The three inland valleys in each country will cover the gradient of low, medium, and high land use intensity. With increasing land use intensity, the area under natural vegetation becomes reduced, and the fallow periods shorter. As a consequence, the production and ecological functions of the natural land will lose their importance compared to the agricultural production function. By using three inland valleys with different land use intensity, it will be possible to establish threshold values for the degree of transformation of the original land cover, which will maintain to

an acceptable capacity the different production and regulations functions in the watershed.

In Ghana, all three inland valleys were selected in the Ahafo-Ano south district, north-west of Kumasi (see mark for Research sites on plate 1). The site with high land use intensity is Attakrom. Dwinyankwanta represents a community with intermediate land use intensity and Nyamebekyere, which is situated on the borders of a Forest Reserve, represents a community with low land use intensity. Attakrom has 460 people.

Plate 1 Location of research sites

Ahafo Ano is derived from the Akan word “ahayo”, meaning hunting. The district formed part of the hunting grounds for the Asantehene (the king of the Ashanti ethnic group). The capital is Mankranso, 32 km on the Kumasi-Sunyani road (which is the only asphalt road in the district). The district is a medium highland area between 500 and 2000 feet asl. The district is drained by 5 main rivers (Abu, Mankran, Bone, Desire and Offin) which are tributaries of the Tano and Offin rivers.

The temperatures range between 24° and 27° C. The mean annual rainfall is 1200 mm. The main rainy season falls between April and July and the lesser rainy season is in September and October.

The vegetation is semi-deciduous forest. There are six main forest reserves (Tinte Bepo in the Northwest, Tano-Offin in the Southwest, Desire River in the North, and Kwamisa, Opuro and Asufufa shelter basin in the East). The rest of the land has been mainly dedicated to agriculture.

The district is mainly populated by Ashantis with settler farmers from the Dagomba, Ewe Gonja and Basare ethnic groups. The population is mainly Christian. Around 30% are Muslim and 25% are animists. The district has 80 primary schools, 30 junior secondary schools and one senior school. There is no district hospital although there are three health centres located at Mankranso, Mpasaso and Sabronum. There are also four private clinics managed by the Roman Catholic and Methodist churches and two village health posts. In many villages there are herbalists and chemical sellers. The European Union and

the French Government have established water projects in the region, which include the District Capitals Water Scheme, the Small Towns Water Scheme, and the Micro Projects that focus on boreholes.

The major agricultural cash crops are cocoa, rice, oil palm and citrus fruit. The main food crops are plantain, cocoyam and cassava and vegetables such as tomato, okra, and garden egg. (Asomaning, unpublished).

2 Methodology

The CRI and LEI (Agricultural Economics Research Institute in The Hague, The Netherlands) conducted a RDA (Rapid Diagnostic Appraisal) in Attakrom. An RDA is part of a PRA (Participatory Rural Appraisal), and consists of the following principles:

- Rapid, progressive learning; RDA is flexible, exploratory, interactive and innovative
- Role reversals; Farmers are the experts instead of the researchers "Hand Over The Stick"
- Triangulation; RDA uses different methods, sources of information and draws upon different disciplines; It uses a wide range of informants in a range of places, cross-checking to get closer to the truth
- Optimal ignorance and appropriate imprecision; Does not attempt to find out more than is needed, measure more accurately than is required, nor be excessively rigorous. We are trained to make absolute measurements, but often trends, scores and ranking are all that needed
- Direct contact; Principal investigators are in the field, face-to-face with the people, working in multi-disciplinary teams
- Critical self-awareness and behaviour; Demands that the investigators question their own values, biases, embrace error

The RDA aims to provide baseline data for the ensuing socio-economic and bio-physical research activities. The main focus, however, is the socio-economic part. The RDA will set the stage for a two-year monitoring survey. This survey will deal with the collection of socio-economic information at the household level, with the quantification of the production functions from both agricultural and natural lands, and with the inventory of farmer's knowledge and farmer's views on land use processes studied scientifically in other work packages of the VINVAL project. The socio-economic survey will focus on the following topics:

1. Estimation of sources of income according to different land use types. Sources of income include agricultural activities and natural resource based activities (hunting, harvesting and processing). Special focus will be on source, quantity, and seasonal variations of household water use.
2. Examination of the relationship between sources of income and household type, as identified in the RDA, and other socio-economic factors such as gender, and age
3. Estimation of a simple quantitative relationship between age since conversion and yields for different soil characteristics and management practices.

With the focus of the study in mind, 11 themes were identified for the RDA, and guiding questions were formulated accordingly.

1. Farming systems and cropping systems.
Relative importance of crop as food cash and special distribution of crops.

- What are the main economic activities in the community?
- What are the crops grown in this community?
- What is the % of farmers who grow these crops?
- Are there some particular groups of farmers who grow these crops?
- What is the importance of the crops in terms of cash? (Paired ranking and give the possible reasons for each ranking)
- What is the importance of the crops in terms of food? (Paired ranking and give the possible reasons for each ranking)

- How much time is allocated for each crop?
- What is the farming system like in the community?
- What are the relative importance of crops, livestock, poultry and fisheries? (Rank 1 for most important)
- How do you cultivate the land?
- Where do you grow these crops?
- Specific crops in the valleys and uplands?

2. Different products both Flora and Fauna from natural land and various socio economic groups involved.

- What are the different products that you obtain from the natural resources?
- Who is involved in obtaining these products (men, women, strangers, settlers, natives, tourist etc.)

3. Description of natural lands with cultural and spiritual value.

- How would you describe your natural lands? Do they have any cultural or religious connotations? (Groves, sacred places, etc.)

4. Uses made of water resources and the socio economic groups involved.

- What are the water resources available in this community?
- What are the uses of these water resources?
- Who uses these water resources?
- What is the quality of the water (i.e. are there any diseases linked to water use)?

5. Land tenure system and land use goals and possible goal conflicts

- What is the prevailing land tenure system in the community?
- How has it changed?
- How has the change affected, conservation practices and other agricultural activities
- What are your land use goals? (Do you have specific lands for some activities such as farming, mining, estate development, recreational, reserve purposes)
- Are there any conflicts in achieving these goals?

6. Identification of farmer groupings if any

- How are farmers grouped in this community? (Men, women. children / girls or boys, special crops cultivated by particular people, absentee farmers etc.)
- How do you differentiate between a wealthy and a poor farmer?
- Incomes/wealth to determine groups?

7. Possible natural resources user groups.

- Who are the hunters / gatherers?
- Who are the processors of natural products?
- Who are the users of specific resources (who collects herbs or fruits, hunters, people from outside areas, tourists, etc.)?

8. Seasonal calendars describing variation throughout the year in importance of various agricultural and natural resources-based activities with respect to labour requirements; production (harvesting); and collection of natural products. Indicate times of bans on hunting or gathering activities and taboos that prevent the use of the natural resources.

- What are the typical activities (agriculture, non-agriculture and natural resources) carried out in this community from January to December?

- What are the labour requirements for these activities? Who does these activities (hired, contract, family or other specify type of labour used for a particular activity or men, women, children -boys or girls and whether indigenous or strangers or settlers)? How is the availability of the labour?

9. Description of decision-making about land use; Who decides on which natural and agricultural areas of land - local government, village authorities, families etc.

- How are decisions made concerning land use for agricultural lands and natural resources?

10. Land use history and the description of land use changes. Specific locations and point in time of conversion of natural areas into agricultural areas. Changes in land use rights and regulations.

- How long have the community being cultivating the land or what is the history of the use of this land?
- Have there being changes in the use of land?
- What are the causes of these changes or change?
- What are these changes?
- Where have the changes occurred?
- When did these changes occur?
- When was the natural lands used for agricultural activities
- Are there any changes in the rights and regulations regarding the use of land?

11. What are the community's constraints to their agricultural activities? Rank in order of importance.

Different techniques were used during the RDA. A more detailed description of these is given in the Annex.

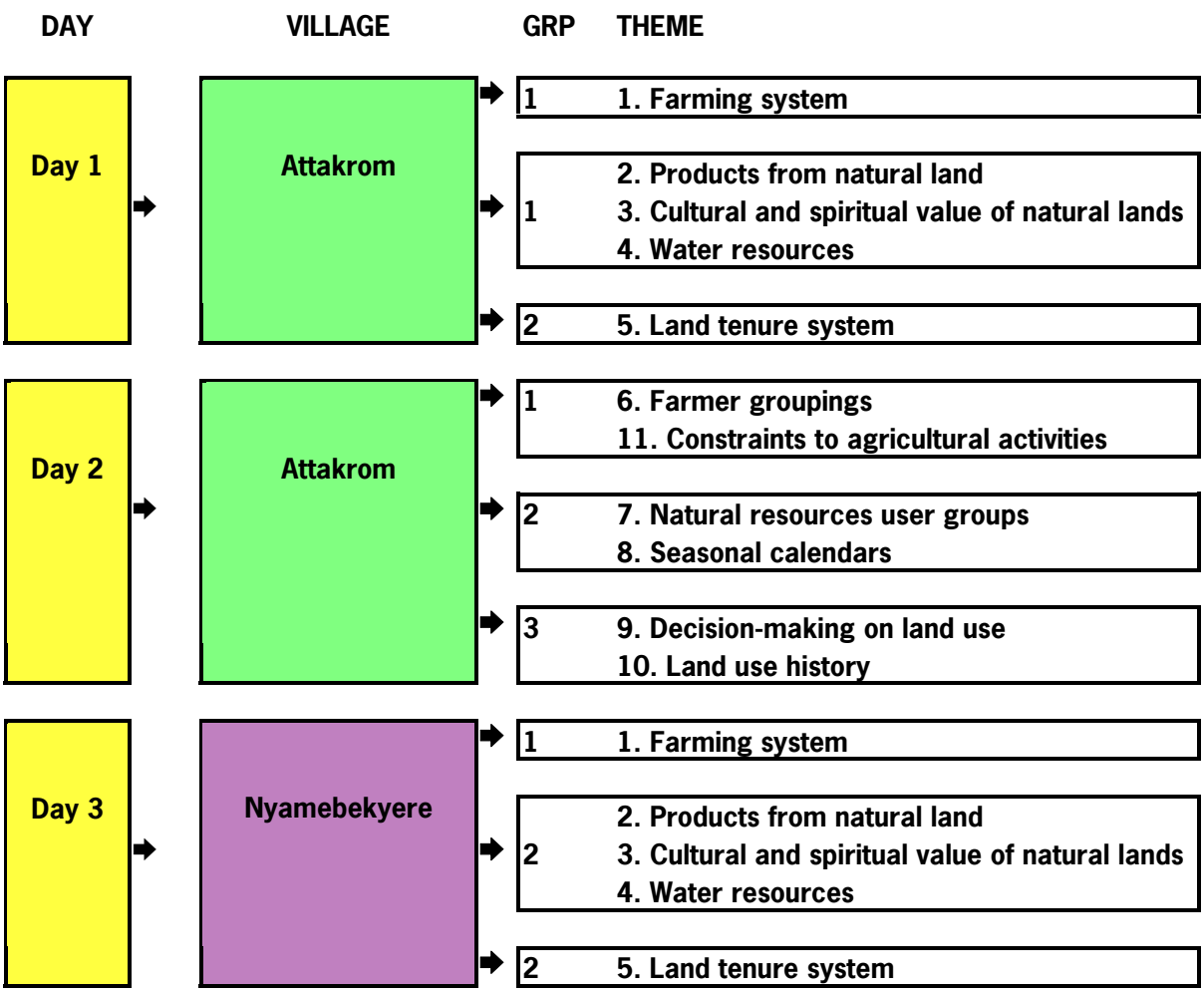
Table 1 Participatory tools used per major theme

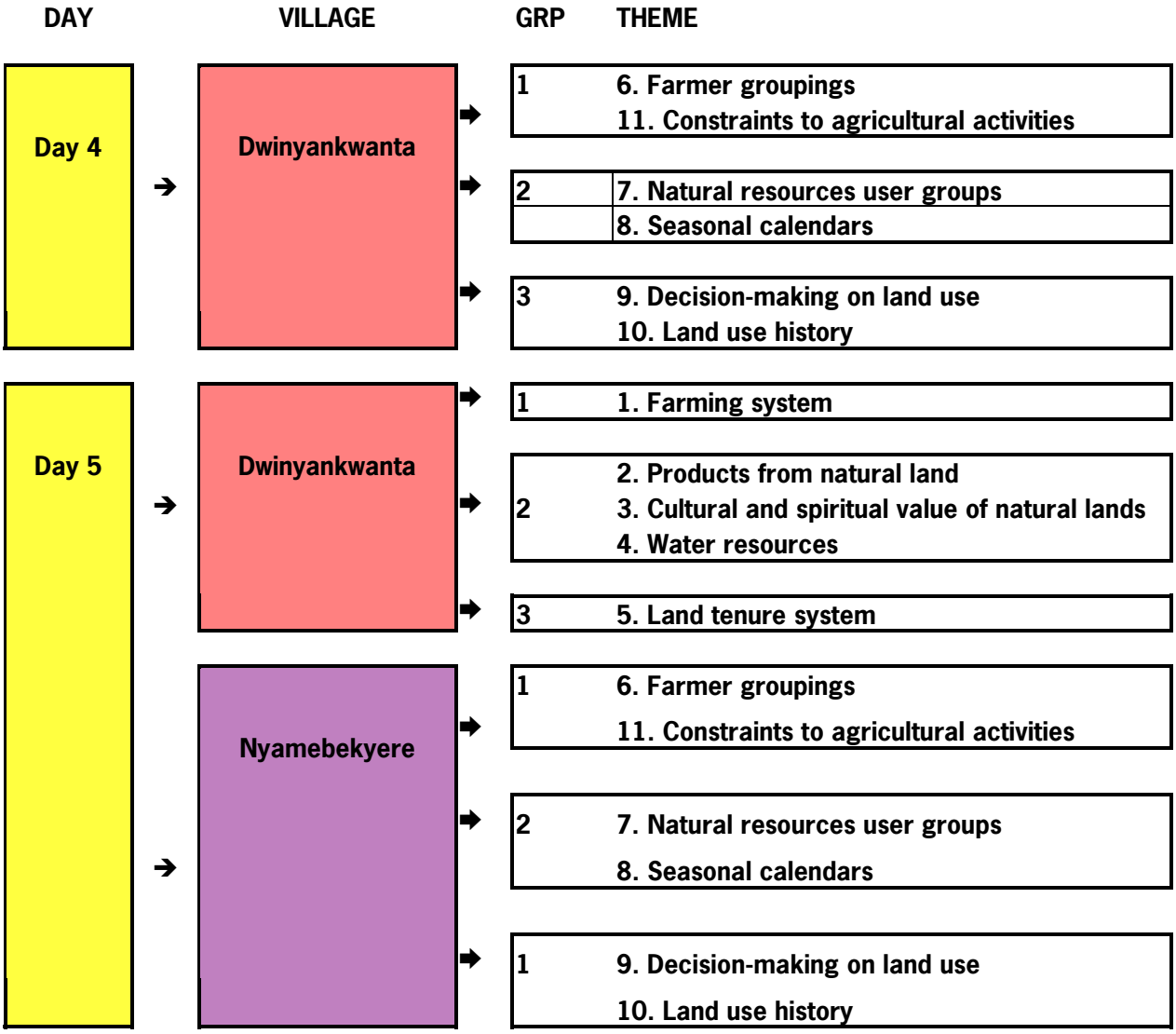
Theme	**Tool**
1. Farming systems and cropping systems.	SSI and pair wise ranking
2. Different products both Flora and Fauna from natural land and various socio economic groups involved.	SSI
3. Description of natural lands with cultural and spiritual value.	SSI
4. Uses made of water resources and the socio economic groups involved.	SSI & resource map
5. Land tenure system and land use goals and possible goal conflicts	SSI
6. Identification of farmer groupings if any	SSI and wealth ranking
7. Possible natural resources user groups.	SSI
8. Seasonal calendars describing variation throughout the year in importance of various agricultural and natural resources-based activities with respect to labour requirements; production (harvesting); and collection of natural products. Indicate times of bans on hunting or gathering activities and taboos that prevent the use of the natural resources.	Seasonal Calendar
9. Description of decision-making about land use; Who decides on which natural and agricultural areas of land - local	SSI

government, village authorities, families etc.	
10. Land use history and the description of land use changes. Specific locations and point in time of conversion of natural areas into agricultural areas. Changes in land use rights and regulations.	SSI
11. What are the community's constraints to their agricultural activities? Rank in order of importance.	Pair wise ranking

Before the RDA, one of the researchers (sociologist) went to the three villages for interviews with the village elders and village chief to collect background information on the village, and its history. The RDA was implemented in two parts in the three communities during mornings. Only in Nyamebekyere the second half of the RDA was done on Tuesday afternoon. On Tuesdays the farmers do not farm in Nyamebekyere. The schedule of the RDA is shown in figure 1.

Figure 1 Schedule of the RDA in three communities



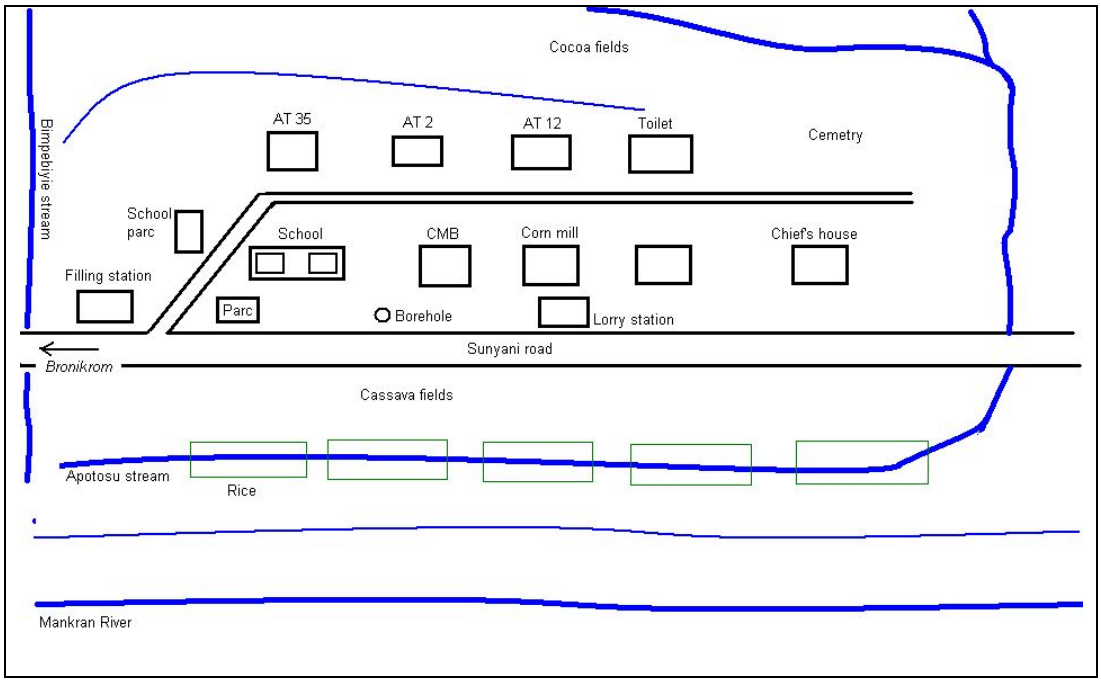

DAY
VILLAGE
GRP
THEME
Day 4
Dwinyankwanta
1
6. Farmer groupings
11. Constraints to agricultural activities
2
7. Natural resources user groups
8. Seasonal calendars
3
9. Decision-making on land use
10. Land use history
Day 5
Dwinyankwanta
1
1. Farming system
2
2. Products from natural land
3. Cultural and spiritual value of natural lands
4. Water resources
3
5. Land tenure system
Nyamebekyere
1
6. Farmer groupings
11. Constraints to agricultural activities
2
7. Natural resources user groups
8. Seasonal calendars
1
9. Decision-making on land use
10. Land use history

3 Attakrom

Attakrom represents a village with high land-use intensity. There are some 460 people in the village. When the current odikrom - Agya Adams came, in 1947, there were only about 13 houses. The school was build in 1979 and is now up to primary six. The children continue normally at Adugyama or Mankranso for the Junior Secondary education. Health facilities include the hospital at Mankranso and a clinic at Adugyama. There are native doctors in the surrounding villages. The main Kumasi Sunyani road passes through the village. There are other motorable roads and footpaths to the sounding villages. There are streams and a borehole, which is currently out of use in this community. There is no electricity in the village.

See plate 2 for a resource map of Attakrom. It must remembered that this is not an exact geographical depiction of the area, but those aspects that are important to those making it.

Plate 2 Resource map of Attakrom



By men's group

3.1 Farming systems and cropping systems.

Farming is the dominant economic activity. Farming techniques are mainly traditional using hoes and cutlasses. A few can afford chemicals and fertilisers for their farming activities. The number of fields per farmer range between 1 and 5. Sizes of fields are not standardised and can range between 3 acres for the smallest farm to over 100 acres for the biggest farm.

The farming system consists of cropping combined with a little livestock (sheep and goats) and poultry. About 70% of farmers have livestock (between 5 and 20 animals) and all farmers have chicken (between 3 and 30 birds on the average).

The major cropping systems are:

- Traditional food crops: Maize/cassava/plantain/cocoyam
- Newly emerging cash crops: Rice (with few stands of maize)
  Vegetables (okra, pepper etc.)
- Tree crops: Cocoa, citrus, oil palm.

The newly emerging food crops are an important source of cash income. One person is involved in all-year cropping of okra and beans, because it grows fast and generates cash relatively fast. The farmers ranked the individual crops according to importance. The farmers were also asked to give estimates for the percentages of farmers growing the crops. Besides this, farmers gave estimates for the share of product that is sold. The results can be seen in table 2.

Table 2 Importance of different crops in Attakrom

Crops	**Rank of importance**	**Percentage of farmers engaged**	**Uses**	**Percentage sold**
Important (major) crops				
Cocoa	1	90	Cash	100
Maize	2	100	Cash, food	90
Rice[1]	3[2]	60	Cash, food	90
Cassava	4	100	Cash, food	60
Plantain	5	100	Cash, food	50
Cocoyam	6	100	Cash, food	50
Less important (minor) crops:				
Traditional				
Yam	These crops were ranked lower than 6 and lumped together under "less important crops"			
Groundnut				
Newly emerging cash crops				
Cowpea				
Okra				
Pepper				
Garden egg				
Onion				
Oil palm				
Citrus				

There are specific crops that are cultivated in inland valleys. Most inland valleys are cultivated with rice, with some vegetables and oil palm. The importance assigned to rice (third place) is somewhat surprising, as it is not consistent with general observation. It

[1] From interactions with village elders of Amakrom, the neighbouring village, we learned that rice was introduced by a Haruma Moshi in 1963. A white variety was grown in small parches in the Dwinyan valley with hedges around it. In 1965 another variety *Amala* was grown in large quantities in a valley. The production picked up during the late 70s among many farmers as cocoa trees started to die. Rice is grown with a few maize stands. Rice production had no problem until recently when rice has to be protected against birds right after planting until harvest, which has made rice production very laborious.

[2] The importance assigned to rice not consistent with general observation

would be expected to be lower. Cocoa is only cultivated on the uplands, and intercropped with food crops during its establishment. The different crops are cultivated by different groups, as can be seen in table 3.

Table 3 Crops associated with specific groups for Attakrom

Crop	**Group engaged in**[3]	**Reasons**
Rice	Young men with access to cash	High labour requirement High cash requirement for herbicide
Vegetables	Young men with access to cash	High labour requirement High cash requirement for herbicide
Citrus	Older men who own land and have access to cash	Cropped on land owned High cash requirement for seedlings and other inputs
Staple food crops (plantain, cassava, cocoyam)	Older men Women (old and young)	Major objective to feed household Less labour use

3.1.1 Non-farm activities

Other economic activities are of marginal importance in the community as a whole, though they may be important to those engaging in them. This is because only few individuals engage in each of the activities. For these people, the contribution to household income is typically 30% for women and 23% for men. Women are engaged in selling cooked food. Men are engaged in activities such as masonry, cloth weaving, distillation (alcohol), driving and community health work.

People have access to extension services. An agent of the MoFA lives at Beposo near Mankranso.

3.2 Different products both Flora and Fauna from natural land and various socio economic groups involved

Although Attakrom is a site with a high land use intensity and with little natural areas left, the farmers do use different products from natural areas, which are located at a distance from the village. But other natural products can be found in or near farmers' fields. Some trees and herbs for instance, and many of the wildlife species. The products mentioned by the farmers give an overview of the range of different types of floral and fauna that farmers can still find. More detailed information about the location, quantities, importance etc of these products will be collected in a later stage. What is clear, is that although all natural land around Attakrom has been transformed into agriculture, the people still rely on natural products for a number of uses, ranging from food (proteins), timber, medicinal herbs, and construction material.

[3] Note that under 6 it is stated that mostly Northerners cultivate rice and maize in the lowlands, while the Ashantis cultivate mostly cocoa.

3.2.1 Flora species

The villagers mentioned a number of natural products they use for different purposes. An overview is given in table 4.

Table 4 Flora products collected in Attakrom and their uses

Vernacular Name	Scientific Name	Family	Uses
Ahabayere (wild yam)	*Dioscorea spp.*	Dioscoreaceae	Food
Akata	*Bombax buonopozense*	Bombaceae	Treatment of convulsion
Bese	*Cola nitida*	Sterculiacreae	Beverages
Brofere	*Carica papaya*	Euphorbiaceae	Food and medicinal
Emire	*Terminali ivorensis*	Combretaceae	Timber, for piles
Guarea	*Guarea cedrata*	Meliaceae	Timber, waist pains, stomach aches
Gyama	*Alchornia cordifolia*	Euphorbiaceae	Palm wine collection pot, sores, leaves to improve texture of cassava for fufu.
Kuokuo-ninsuo	*Spathodea ampanulata*	Bignoniaceae	Herbs for lactating women
Nunumnua	*Hoslundia opposita*	Labiatae	Treatment of sore
Onyina	*Ceiba pentandra*	Bombaceae	Leaves medicinal
Pampro	*Bambusa vulgaris*	Gramineae	Housing
Prekese	*Tetrepleura tetraptera*	Mimosaceae	Spice, for high blood pressure, etc
Toantin	*Paulinia pinnata*	Sapindaceae	Medicinal, aphrodisiac
Wawapro	*Cola gigantea*	Sterculiacreae	Bark used for medicine

Farmers collect several kinds of mushrooms, such as *Volvariella volvaceae* (domo), *Pleurotus spp.* (sasee), *Agaricus spp.* (nkankum). All the mushroom species are collected for food at home.

3.2.2 Fauna species

Different animals are hunted or collected, mainly for meat, see table 5:

Table 5 Wildlife species hunted and collected in Attakrom

Local name	Common Name
Akokohwere	Ahanta francoline
Akrante	Grass cutter
Amuokua	Land squirrel
Apese	Brush tail
Dompo	Marsh Mongoose
Kankane	African civet cat
Kokobo	Dwarf mongoose
Koto	Crab
Kusie	Giant Rat
Nwa	Snail
Opro	Squirrel
Owia	Tree hyrax
Oyuo	Black duiker
Wansane	Bush Buck

No bird or snake species were mentioned, as in Dwinyankwanta or Nyamebekyere.

Fishing is done in the river Mankran, by using hooks. The farmers mentioned two types of fish, namely tilapia and mudfish (a type of catfish).

For game, older or grown men (> 25) are involved in night hunting and the young men (< 25) in day hunting with the aid of dogs usually for grasscutter and rats. Snails and crabs can be collected by anybody irrespective of age or sex. Men and boys usually do fishing.

There are female and male herbalists with some specialising in particular ailments (boils, stomach aches, fertility and pregnancy-related diseases, asthma etc). There are those who apply herbal medicine only when the need arises. Others collect the herbs for sale on request usually for people from Kumasi.

3.3 Natural lands with cultural and religious value.

There are no lands with cultural or religious value, except for the cemetery. The secondary forest (Abrewaenko) next to the cemetery is a burial place reserved for the royal ancestors. However, firewood, fruits and other products can be collected from there but the land can never be tilled. There are several religious customs and taboos practised in the area. There is no farming activity whatsoever on Tuesdays which is considered an ominous day. However, palmwine tappers can go in to the fields and vegetable growers could also go and harvest their products but should not use their cutlass. During the dry season, hunting is not permitted. Firewood is usually collected during this season. As there are many Muslims in the village, many also do not farm on Fridays.

3.4 Uses made of water resources and the socio economic groups involved.

There are several sources of water in Attakrom. There is one river (Mankran) and three streams (Apotosu, Bimpebiyie and Nsuansa). The Mankran river is used for domestic purposes, drinking water, fishing (with hooks), and for farming (spraying) vegetables. It dries up from December to March. The streams are used for domestic purposes and drinking water. They also dry up from December to March.

Besides the streams and river, there is a borehole that was established in 1996 near the school. It was used for domestic uses and drinking water until it went out of order. There is a well at the homestead of Yaw Bimpe Akroaa which is used for domestic use and drinking water. It is dry from November to March.

During the dry season when there is no water from the sources described above, the villagers go for water in neighbouring villages such as Bronikrom and Amakom.

There are certain taboos connected to use of water from the Mankran river. Women of menstrual age are not allowed to go into the Mankran on a Tuesday, which is believed to be the day of the river goddess Abena. It is only young boys and girls who go there on Tuesdays. Corpses are not allowed to cross over any river without prior performance of required custom.

The rivers are associated with diseases such as bilharzia, guinea worm[4], and leaches (especially when there is not much water in the stream or river).

3.5 Land tenure system

Officially, land cannot be sold in Ghana. The *Amakomhene* of Kumasi owns all land of Attakrom. A village head (*Odikro*) administers the land on his behalf. Attakrom is a heterogeneous community of settler farmers from near and far (as far as northern Ghana, see under 6). The Unit Committee that handles the village affairs is a well-functioning system. Sharecropping system -*Abunu* - is prominent in this village. The different types of land tenure are presented in table 6.

[4] Note that Asomaning (unpublished) reports that guinea worm has reportedly been eradicated by the District Water and Sanitation Programme and the European Union Micro Projects.

Table 6 Information on tenure systems in Attakrom

Tenure	Importance (% of farmers)	Remarks
Family land: inherited from father or other family member	10	Free to use land as desired. The Amakomhene (chief) has no control over it. For cultivation the family head decides how it is used. It is only when it is for lease where the chief will have to come in with the local council for their concern and signature on the site plan. The chief can only disagree with any lease when the family does not pay the "Nto" which is a token of thirty thousand cedis paid now on every field (regardless of size).
Sharecropping of food crops only	50	Shared between sharecropper and land owner in ratio of 2:1 Available for only non-permanent crops
Share tenancy: food crops to farmer, tree crop (e.g. cocoa) to land owner	30	Tenant plants tree crop for the land owner in exchange for planting food crop for own use
Renting: payment in kind	10	An agreed number of standard measure paid in kind to land owner Specific to inland valley crops (rice, vegetables)
Stool land (i.e. belonging to the Amakomhene or chief)		Land given out for cropping cocoa to be shared in equal proportion after establishment; all food crops from farm belong to the farmer Difficult to access such land because of limited availability
Hiring land in neighbouring village (Bronikrom)		No standard rent, but in the range of 100,000-300,000 cedis per season (for all fields, depending on size). For food crops only

3.5.1 Changes in tenure and land use

There has been no change for cocoa. However, low land use changed in the following ways:

1. Land used to be given out freely (farmer himself gave out token gifts from field to landowner) because production was for food only. With the commercialisation of food crops, payments are requested by landowners.
2. In reality inland valleys had been reserved for the traditional authorities for the purposes of conservation, to protect the source of water for the communities.
3. However if one wants to cultivate it, one has to negotiate with the representative of the chief, the Odikro. Two tins of product (regardless which product) have to be given to the chief at the end of every season. It used to be two small bowls but now it is two big tins (measuring tin used in the market by farmers).
4. Following the degradation of forest and the drying of water bodies due to the cultivation of these low and wet lands, government has given directives to reinforce the laws governing the use of inland valleys.

The changes in tenure have compelled farmers to aim for a certain target production after making payment to landowner. This has affected cultivation in two ways. Firstly, cultivation has intensified to two crops in a year. Also, the acreage per farmer has increased. To maximise benefits, landowners give out land irrespective of its cropping history. This has resulted in an increase in weed infestation with the declining soil fertility. Another change is that the members of the chief's family now have to pay the levy "Nto" whereas they used to be exempted from paying this fee.

3.6 Identification of farmer groups

There is 9 ethnic groups identified in the village:
- Chakwasis - from northern Ghana (Chripone -Saboba area)
- Tantales - from northern Ghana (Baasarifoo)
- Kokombas - from northern Ghana
- Kontokoles - from northern Ghana (Kwai around Tantale area)
- Zuku - from northern Ghana (Tamale area)
- Wangala - from northern Ghana
- Ashantis - from the villages in the Ashanti region (Kwamo, Fumesua, Achiakrom Antoa, Gyaakye and Kumasi Amakom)
- Ewes - from the Volta Region (Ho)

Northerners mostly grow rice and maize in the lowlands, while Ashantis mostly grow cocoa and Northerners serve as caretakers ("apaafoo"). There are a few Ashantis who also serve as caretakers.

Income groups within the community are differentiated by three major criteria:
- Farm size (the major factor accounting for differences). Farmers with large farms achieved this through capital accumulation over time through hard work, or other access to capital. The farmers we interviewed said that a having limited farm size was due to having access to a limited amount of land, not having enough cash to procure more land and labour, or to laziness.
- Type of land. The type of land determined the cultivated crop. Different crops are associated with different wealth groups. Four income groups were identified. First, the group which ranks highest in wealth is the group that cultivates cocoa, oil palm, maize and rice. For instance, owning a cocoa farm with 4 - 5 caretakers was mentioned as a sign of wealth. The crops this group cultivates are mostly cash crops. The second group has large fields with food crops. The third grows inland valley crops such as rice and vegetables. The poorest group in erms of wealth consists of farmers who grow small fields with food crops. This categorisation is clearly linked to the amount and type of land owned by farmers.
- Non-farm income. Farmers with additional source of income are more likely to be wealthy.

Wealth can be recognised by the following criteria
- House in village or elsewhere with good roofing (i.e. aluminium roof)
- Able to take care of children (schooling) and wife or wives

Poverty indicators that were mentioned are:
- Uncompleted houses: especially unable to roof properly (signifying a thatched roof, instead of an aluminium roof)
- Not able to take care of children (e.g. schooling).

3.7 Natural resource user groups

The villagers did not make any difference between ethnic groups where it concerns the use of natural products. However, under sections 3.2 (natural products) and 3.3 (water resources) the farmers describe that there are differences between men and women, and different age groups.

With respect to land the story is different. Here also men and women, and different age groups have different roles, but also between different ethnic groups there are differences. With respect to gender differences, women often do not own land. Although the Ashantis have a matrilineal system, women obtain rights indirectly through the male family members, and generally acquire smaller plots of poorer quality. They are usually involved in vegetable and food crop cultivation.

Regarding age groups, in section 3.1 it was described that young men who have access to cash are involved in labour intensive crops such as rice and vegetables. Older men who own land and have access to cash will grow citrus trees.

In section 3.6 it is described that Northerners (Chakwasis, Tantales, Kolombas, Kontokoles, Zukus, and Wangala) mostly grow rice and maize in the lowlands. The Ashantis mostly grow cocoa while the Northerners serve as caretakers.

3.8 Seasonal Calendar

The seasonal calendar is shown in table 7. Land preparation for planting in the major season is during mid -February to April and in the minor season is during July to August. Land preparation is done by slash and burn or by slash only. Planting immediately follows land preparation. Weeding is done during the whole cropping season, but the activity reaches its peak in June-July.

During the dry season (December to March) farmers spend their time for other activities. Brick-making is done with landcrete (using soil). Activities such as house building and maintenance as well as fuel wood gathering are done all year through, but peak during the dry season. Most non-timber forest products (NTFP) are collected during the wet season. Farmers mentioned crabs, snails and mushrooms. Mangoes and avocados are picked in April to June and January to May, respectively. Children are usually involved in mangoes and avocados picking and selling.

After listing the activities the farmers were asked to put weights to the activities. There was a change of methodology during the exercise and therefore there are no weights for some activities.

Table 7 Seasonal calendar for Attakrom

Activity	J	F	M	A	M	J	J	A	S	O	N	D	Total
Agricultural													
Land preparation		X	X	X									
Planting			18	20	15	14	7	13	13				100
Weeding			6	8	13	22	19	13	9	5		5	100
Harvesting and marketing					15	18	22	22	15	4	4		100
Other													
Making Bricks	X	X	X										
House building and maintenance	14	15	11	19	8	6	8		10	3		6	100
Firewood gathering	X	X	X										
Palm wine tapping			X	X	X	X	X	X	X	X	X	X	
Broom making*			X	X	X	X	X	X	X	X	X	X	
Collecting NTFPs					15	33		31	21				100

* Broom making coincides with palm wine tapping, because the brooms are made out of palm fronds.

Land preparation involves clearing vegetation through slash and burn or slash but no burning before planting. If the vegetation is thick, men mainly do it. However, if the vegetation is light, then some women (mostly unmarried) get involved. Usually it is the unmarried women who hire labour (by day, contract) to do land preparation. Some men hire labour if they have the money or if farm size is large. Sometimes children are engaged in farming, but most children attend school.

Both men and women, and occasionally children are involved in planting and sowing. There is also the “nnoboa” system, where farmers help each other in turns. Harvesting is done by both sexes and but transporting or carting the produce from the farms to the house is mainly the responsibility of women and children. Mango and avocado picking and selling is usually done by children. Everybody can pick snails, crabs and mushrooms. Snails and crabs are mostly harvested during the wet season (August and September). These products are mainly for home consumption.

The town itself does not have a market as such. The farmers normally frequent the markets at Kunsu (Fridays) and Adugyaman (Sundays).

3.9 Description of decision-making concerning land use

The Amakomhene (chief) has no control over family lands with cocoa. For cultivation the family head decides how it is used. It is only when it is for lease where the chief will have to come in with the local council to sign the site plan. The chief can only disagree with any lease when the family does not pay the "Nto", which is a token of thirty thousand cedis paid now on every field.

Wetlands belong to the chief. One has to negotiate with him or his representative, the Odikro for farming in such areas. This negotiation may be possible if the family who owns the upland does not want to cultivate it. The rent or user fee for this agreement is two tins of product at the end of every season. It used to be two small bowls but it is two big tins (measuring tin used in the market by farmers). The local government receives part of the "Nto" and is involved in the signing of the site plans of farmers.

3.10 Land use history

Most of this information is based on interviews with the Amakomhene's representative in the community chief - Odikro-Agya Adams and some elders of the village.

Attakrom and the surrounding area used to be a forest area. The land belongs to Otumfoo (the "Ashantihene" Ashanti King) who distributed the lands after the war (The Ashantis and the British war[5]) to the chiefs who fought in the war around those forest areas. This led to an influx of people from other areas to grow cocoa[6].

This particular watershed and its lands were giving to the chief of Amakom in Kumasi - Nana Amakomhene. He then distributed the land to his relations and other people who wanted lands to cultivate. At the end of every year they pay some money contribution (known as nto) to Lands Department who shares the money with the Amakomhene (the Otumfoo has his share from this one) and the District Assembly. The amount involved now is 30,000 cedis per field. This is a recent development - formerly it was a sheep to be slaughter as a token that one could work on the land as long as one wishes.

The wetland belongs to the Amakomhene. One has to go on terms with the landowner if one wants to use it. The land does not go to the tenant afterwards. The chief gives some money to the "odikro" (caretaker) in the village. Around 1920, after the war the Amakomhene who was a twin himself asked a friend who also was a twin, called Atta ("twin") to establish the community. The community was named after him as Attakrom (literally meaning "village of Atta").

When the current odikrom - Agya Adams came in 1947, there were only about 13 houses but now they are many. The school was built in 1979 and is now up to primary six. The children continue normally at Adugyama or Mankranso for the Junior Secondary education. Health facilities include the hospital at Mankranso and a clinic at Adugyama. There are native doctors in the sounding villages. The main Kumasi Sunyani road passes through the village. There are other motorable roads and footpaths to the surrounding villages. There are streams and a borehole, which is currently out of use in this community. There is no electricity in the village.

3.10.1 Land use goals

In the past when land was not limiting it was used to establish cocoa and food crops Particularly plantain was cropped to provide shade to the young cocoa trees. Now, crop production has become a goal in itself as cocoa yields have declined, and food crops are becoming more profitable. Cocoa was mainly grown until the 1983 bush fires that destroyed most of the cocoa. Food crops have now replaced most of the cocoa plantations. Cocoa has also moved further away from the homesteads, in favour of food crops.

3.11 The community's constraints to agricultural activities

The production of cocoa and food crops have decreased due to:

[5] the Yaa Asantewaa war with the British was in 1900
[6] Cocoa was first introduced in Ghana in 1891 (Dapaah, 1995)

- Termite infestation on fields
- Weed infestation (especially "Acheampong" or *Chromolaena odorata*)
- Unreliable rainfall

The farmers blame tree cutting for the weed and termites infestation. They believe that the termites used to survive on the trees but now that they have been cut, turn to the cocoa trees instead. The main problems that were mentioned by the farmers are listed in table 8. A paired ranking was done to explore the ranking more in-depth.

Table 8 Pair wise ranking of constraints to agriculture cited by men and women in Attakrom

Paired ranking of constraints	**Female (F) Male (M)**	**Land shortage**	**Termites**	**Weeds**	**Unreliable rainfall**	**Rank**
Cash for hiring labour	F	Cash	Cash	Weeds	Cash	2
	M	Cash	Cash	Weeds	Cash	2
Land shortage	F		Land	Weeds	Land	3
	M		Land	Weeds	Rainfall	4
Termites	F			Weeds	Termites	4
	M			Weeds	Rainfall	5
Weeds	F				Weeds	1
	M				Weeds	1
Unreliable rainfall	F					5
	M					3

NB farmers mentioned unreliable rainfall as a constraint, but because they cannot do anything about it, they gave it no weight.

As can be seen from table 8, the cash constraint for hiring labour overrides the land shortage problems, termites and unreliable rainfall. However, the weed infestation is regarded as a bigger problem than cash constraints. The land shortage seems to be higher on the priority list for women than for men, maybe due to the fact that women have more difficulties in access to land. Women ranked the termite infestation after land problems, but men rank it last of all, because they think unreliable rainfall is a bigger problem. Concluding, the weed infestation is regarded as the major constraint to farming. The continuous farming and the fact that most trees have been logged for timber are probably key factors that have contributed to the weed infestation.

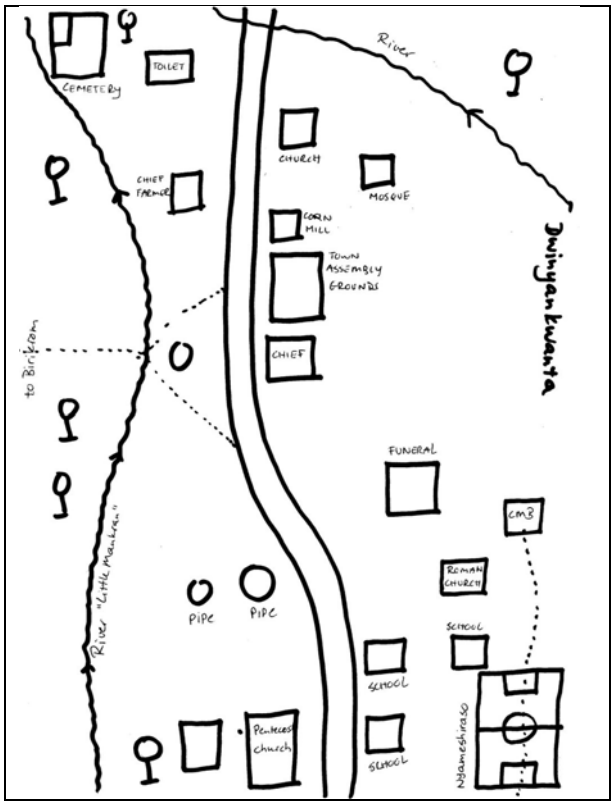
The effects of disappearing natural area were confirmed during a previous interview with a villager, Mr. Adade, who explained that several changes had occurred over the past decades. Specific changes that could be due to the loss of natural areas he mentioned are an increase in weeds (besides Acheampong, he mentioned also elephant grass), wind destroying plantain stands (this could be due to disappearing trees that offer protection against wind), a great reduction in fauna – according to him, only grasscutters can be found in natural areas nowadays, and the disappearance of wild orange trees.

4 Dwinyankwanta

Dwinyankwanta represent a village with medium land-use intensity because it still has relatively ample land reserves. There are some 88 houses in the community.

See for a resource map picture 2. This was drawn by the men's group and is not a geographically correct representation but depicts the main features in the village that the men find important.

Plate 3 Resource map of Dwinyankwanta



By men's group

4.1 Farming systems and cropping systems

Farming is the dominant activity in Dwinyankwanta. All men and women engaged in food crops, while one-third owned some livestock (sheep) and poultry. The number of sheep owned by each farmer ranged from four to 30, with about 12 being the typical.

The major cropping systems are:

- Traditional food crops: Maize/cassava/plantain/cocoyam
- Newly emerging cash crops: Rice (with few stands of maize)
- Vegetables Pepper, okra
- Traditional tree crop: Cocoa
- Newly emerging tree crops: Oil palm
  Citrus

The importance of the particular crops differ for men and women, as is shown in table 9. Cocoa and rice are more important for men than for women, because the men usually own these crops and are entitled to the proceeds. This is also why the men ranked cocoa as number 1, while women ranked it only as 10th (last) in importance. Women ranked cassava number 1. Cassava is an important food crop, which is also sold. Women can

cultivate and sell cassava, which is probably why they ranked it as number 1. Maize was ranked 2nd by both men and women, being that both men and women cultivate and sell. Rice, which is an emerging crop in the area, was ranked 6th by the men. Only 30% of the men cultivate the crop.

Table 9 Importance of different crops in Dwinyankwanta

Crops	Percentage of farmers engaged		Rank of importance, production		Rank of importance, cash		Percentage of output sold	
	F	M	F	M	F	M	F	M
Main crops								
Cocoa	<20	100	10	1	11	1	100	100
Maize	100	100	2	2	2	3	90	90
Rice	-	30	-	6	-	6	-	95
Cassava	100	100	1	3	1	2	67	67
Cocoyam	100	100	4	5	3	5	67	67
Plantain	100	100	3	4	4	4	67	67
Minor crops								
Pepper	10	10	5	11	5	10	95	100
Cowpea	50	50	7	14	8	13	67	67
Garden egg	<10	<10	9	10	9	12	95	95
Yam	<50	<50	8	12	7	14	10	10
Tomato	<10	<10	-	13	10	11	95	95
Okra	10	10	6	9	6	9	95	95
Citrus	-	<5	-	8	-	7	-	100
Oil palm	-	10	-	7	-	8	-	95

Specific crops are associated with specific groups, which is shown in table 10. The newly emerging (cash) crops such as rice and tomato are grown by men (and occasionally women) who have funds to invest in inputs such as herbicides and who can provide the necessary labour. Tree crops such as citrus and oil palm take several years to mature and are therefore grown by farmers who own land (usually being older men).

Table 10 Crops associated with specific groups in Dwinyankwanta

Crop	**Group engaged in**	**Reasons**
Rice	Young men with access to cash	High labour requirement High cash requirement for herbicide
Tomato	Young men or women with access to cash	High labour requirement High cash requirement for herbicide
Citrus	Men who own land and have access to cash	Cropped on land owned High cash requirement for seedlings and other inputs
Oil palm	Mostly men	
Staple food crops (plantain, cassava, cocoyam)	Older men Women (old and young)	Major objective to feed household Less labour use

One of our findings is that the conventional division between cash crops and subsistence or food crops is becoming less appropriate. The importance food crops such as rice, tomatoes and other vegetables are replacing cocoa as the main cash crop. But as can be seen in table 10, even traditional staples such as cassava, maize, cocoyam and plantain are now cultivated purposively beyond household food requirements in order to sell for cash. The farmers reasoned that in contrast to cocoa, which is harvested seasonally, these crops are harvested regularly. Cocoyam in particular is a high cash earner in the lean season. The following crops were ranked in order of importance as food source:

1. Cassava
2. Plantain
3. Cocoyam
4. Maize
5. Rice (not the locally produced)
6. Vegetables

The major food staple, *fufu*, is made from plantain or cocoyam, combined with cassava. Maize produced is sold and foods prepared from maize are normally purchased as a processed food (e.g. *kenkey*). Rice is an important food but the types consumed are purchased from the market. The farmers sell their produce in paddy form and purchase processed rice for food.

As in the other two locations, the method of cultivation is similar for both upland and inland valley bottom fields, the only difference being that the crops in the inland valley bottoms are planted off-season (i.e. before the major rains set in, or in the dry season). The land is first prepared by clearing the bush and felling trees, followed by burning, after which it is ready for crops to be planted.

4.1.1 Time allocation

The typical allocation of time between cropping activities is as shown below. It was not possible to rank the time by crop, because not all farmers grow the crops. It was

possible to allocate time to clusters of crops. The farmers divided themselves into three groups:

1) Those who grow staples and traditional tree crops
2) those who grow staples, traditional and emerging tree crops and cultivate inland valleys
3) and those who only grow staples (3). The time allocation is shown in table 11. Those who are only involved in staples (because they lack the funds or land to invest in other crops) spend only 80% farming compared to the 90% the other two groups spend.

Table 11 Relative time allocated to crops (in %) in Dwinyankwanta

	Economic group		
	1	2	3
Staple food crops: Plantain Cocoyam Cassava Maize	60	30	80
Traditional tree crop: Cocoa	30	30	-
Emerging tree crops: Oil palm/citrus	-	10	-
Inland valley bottom food crops: rice/vegetables	-	20	-
Non-farm/leisure	10	10	20

In the inland valley bottoms, specific crops are grown, the main being rice. Oil palms are also grown in in-land valleys. During the dry season, the in-land valley bottoms are used to cultivate early season maize (i.e. February-March planting; normal maize planting is in April) and dry season vegetables (i.e. tomato, pepper, garden egg, okra, cabbage).

4.1.2 Non-farm activities

Non-farm activities are more important here than in the other two sites, perhaps because of its location on the major Mankraso-Tepa road. Women are largely responsible for non-farm economic activities, and it covers trade in foodstuff, smoked fish and cooked food. It was reported that 20% of the women engaged in one form of trade or the other. Artisan work is carried out on a negligible scale (two carpenters and three masons in the community). For the women who engaged in non-farm activities, about 25% of their total imputed income came from non-farm activities.

4.2 Different products both Flora and Fauna from natural land and various socio economic groups involved

4.2.1 Flora species

The farmers in Dwinyankwanta do not have a forest reserve nearby, but the land use intensity is not very high, and the farmers have relatively ample land compared to those living in Attakrom. The farmers use many plants species including shrubs and trees. An

overview is given in table 12, which also presents the possible uses that farmers mentioned.

Table 12 Flora products collected in Dwinyankwanta and their uses

Local Name	**Scientific Name**	**Family**	**Uses**
Bese	*Cola nitida*	Sterculiaceae	Leaves for enema
Emire	*Terminalia ivorensis*	Combretaceae	Timber
Esa	*Celtis spp*	Ulmaceae	Pestle (pounding stick)
Esia	*Petersianthus macrocarpus*	Lecythidaceae	Timber, bark for bleeding at pregnancy
Framo	*Terminalia superba*	Combretaceae	Timber, firewood
Guarea	*Guarea cedrata*	Meliaceae	Bark for waist pains
Gyama	*Alchornia cordifolia*	Euphorbiaceae	Firewood, leaves for improvement texture of cassava for fufu
Kakapenpen	*Rauvolfia vomitoria*	Apocynaceae	Firewood, roots for sore dressing
Konkroma	*Morinda lucida*	Rubiaceae	Bark for impotency, mortar
Kuokuo-ninsuo	*Spathodea campanulata*	Bignoniaceae	For gonorrhoea
Mahogany	*Khaya grandifolia*	Meliacreae	Timber, bark for stomach aches
Mango	*Mangifera indica*	Anacardiaceae	Bark for treating poultry diseases
Nyamedua	*Alstonia boonei*	Apocynaceae	Bark for measles, stomach ache, sap for sore mouth
Nyankyerene	*Ficus exasperata*	Moraceae	Firewood
Odum	*Milicia excelsa*	Moraceae	Timber
Okro	*Albizia zygia*	Mimosaceae	Firewood
Onyina	*Cieba pentandra*	Bombaceae	Timber
Opam	*Macaranga barteri*	Euphorbiaceae	Firewood
Otie	*Pycnanthus angolensis*	Myristicaceae	Bark to stop pregnancy bleeding
Pepea	*Margaritaria discoidea*	Euphorbiaceae	Firewood
Pepediewuo	*Solanum erianthum*	Solanaceae	Firewood
Prekese	*Tetrapleura tetraptera*	Mimosaceae	Stomach ache, spice for soup
Sesemasa	*Newbouldia laevis*	Bignoniaceae	Bark for soup for breast milk
Tonton	*Raphia hookeri2*	Palmaceae	Cure for shingles
Tweneboa	*Cordia spp*	Boraginaceae	Timber, drums
Wawa	*Triplochiton scleroxylon*	Sterculiacea	Timber
Wonton	*Morus mesozygia*	Moraceae	Pestle (pounding stick)

Specific trees can also be found on the farmlands. Table 13 presents these.

Table 13 Farm land tree products collected in Dwinyankwanta and their uses

Local Name	Scientific Name	Family	Uses
Nyamedua	*Alstonia boonei*	Apocynaceae	Bark for measles, stomach ache, sap for sore mouth
Otie	*Pycnanthus angolensis*	Myristicaceae	Bark to stop pregnancy bleeding Bark for stomach pains Sap for sore mouth
Guarea	*Guarea cedrata*	Meliaceae	Bark for waist pains
Sesemasa	*Newbouldia laevis*	Bignoniaceae	Bark for soup for breast milk
Tonton	*Raphia hookeri2*	Palmaceae	Cure for shingles
Bisidua	*Cola nitida*	Sterculiacreae	Stomach pain
Kakapenpen	*Rauvolfia vomitoria*	Apocynaceae	Firewood, roots for sore dressing
Konkroma	*Morinda lucida*	Rubiaceae	Bark for impotency, Bark for bilharzia
Tweneboa	*Cordia spp*	Boraginaceae	Timber for building, drums
Prekese	*Tetrapleura tetraptera*	Mimosaceae	Bark for stomach Fruits for diabetes Seeds for eye problems
Awobe			Treatment for kwashiokhor
Nyankyerene	*Ficus exasperata*	Moraceae	Treatment for tetanus, fodder for goats

Besides these flora products also different types of mushrooms are collected for food. The farmers mentioned the following types:
Besides these flora products also different types of mushrooms are collected for food. The farmers mentioned the following types:

- *Vovariella volvaceae* (Domo)
- *Termitomycetes spp.* (Sibre)
- *Agaricus spp.* (Penpena)
- *Pleurotus spp.* (Sasei)
- *Coprinus spp.* (Atrokum)
- *Termitomycetes spp* (Twiaworodo)

4.2.2 Fauna species

Besides flora products, the farmers also hunt several animal species. An overview is given in table 14. The night-hunting is done by older men while the day-hunting is done by young men. Crabs are collected by all people. Day-hunting is also done by outsiders and the villagers complained that this was very destructive to the area.

Table 14 Wildlife species hunted and collected in Dwinyankwanta

Local name	Common Name
Wansane	Bush Buck
Akrante	Grass cutter
Kusie	Giant Rat
Oyuo	Black duiker
Apese	Brush-tailed duiker
Otwe	Maxwell's duiker
Adowa	Royal Antelope
Aprawa	Giant-ground pangolin
Opuro	Squirrel

Amuokua	Land squirrel
Akyekyere	Tortoise
Mampam	Nile monitor lizard
Nwa	Snails
Koto	Crabs
	Birds
Abuburo	Wild dove
Akyenkyena	Crested guinea fowl
Asee	Brown canary
Asirewa	Yellow-green Canary
Asokwa	Grey-head guinea fowl
Local name	**Snakes**
Okyireben	Green mamba
Onanka	Royal python
Onini	African python

4.3 Description of natural lands with cultural and spiritual value

There is one sacred grove, which is used for burial of the royal ancestors. This secondary forest can be used for collecting natural products, but cannot be tilled. There are several customs and taboos that are respected in the village. Tuesday is considered a taboo day and on this day there is no farming. If a person dies on a Tuesday the body has to be purified by certain rituals. No one is allowed to grieve or wail until the next day. If these Tuesday taboos are broken, a sheep must be sacrificed.

4.4 Uses made of water resources

There are three boreholes in the village that were constructed in the early 1980s. These boreholes have water all year round and are used for domestic water use. The main stream is the Mankran Kuma ("Mankran Kuma") that joins the main Mankran River. The Mankran Kuma has 5 tributaries: Ayiwora, Adjuku, Senai, Amapenso and Danyame. The Mankran Kuma starts flowing in June and dries up in December. Interestingly, one of its tributaries, the Ayiwora never dries up. Before joining the Mankran Kuma it probably goes underground. Although the villagers of Dwi do not use the streams for domestic water use, the Mankran Kuma has cultural and religious significance in Dwinyankwanta. All rituals are performed there. There are several taboos related to the streams. Menstruating women should not go near the river and no one is allowed to defecate near or in the river. During the rainy season, children are reported to have traces of blood in their urine. It is believed that this is because they have broken the ban on swimming and are subsequently punished by the gods. However, it is more probable that they have been infected by bilharzia.

4.5 Land tenure system

90% of the community has family or own land. They pay their "Nto" every year and have right to transfer ownership through inheritance. They have rights to give out the lands for sharecropping, hiring and renting or lease.

The wetlands are the chief lands. The land belongs to the Hiahene whose caretaker is the Odikro of the village. These lands are mostly for the production of rice, maize, tomatoes, cabbage, water-melon, garden eggs and sugar cane

Around 30% of the community is involved in sharecropping, hiring in land. For cocoa the farmer will be given land to grow cocoa responsible for all inputs in the production. They will share the proceeds on two thirds for farmer and one third for landowner. After some time the cocoa land is shared into half and finally the land goes to the farmer who will begin paying "Nto" on the land. The enforcement of this system depends on the landowner's discretion but the chief will have to serve as a witness with his signature on the agreement. For food crops the shares are depicted in table 15.

Table 15 Information on tenure systems in Dwinyankwanta

Crop	Share of farmer	Share of landowner
Maize	2/3	1/3
Cassava	1/2	½
Cocoyam	1/2	½
Orange	2/3	½
Oil Palm	2/3 (similar to cocoa but land does not go to the farmer when the trees die).	1/3 (Landowner takes over land after felling the trees)

Between 20 - 30% of the community hires or rents in land. Usually land is hired during one season and mainly used for rice, vegetables, maize and other annual food crops. The farmer negotiates with the landowner who decides on the fee, which depends on the size of land and his/her relationship with the landowner.

Around 10% of the community is involved in the Taama system, which is considered as outright sale of land. However, legally land is not to be sold in Ghana. The Taama system therefore comes down to a long-term lease for up to 100 years. The price is negotiable with the landowner but the chief will have to be a witness to the agreement.

Between 50 - 60% of the community is involved in the *Do fa wa duane* ("farm and take your food") system. In this system, farmers grow some cocoa for the land owner who has the right to claim back his/her land if the farmer refuse to grow the cocoa and food crops grown belongs to the farmer.

4.5.1 Changes in tenure and land use

The cocoa system has been the major cropping system since time immemorial but share cropping is a new development and has increased recently. The reasons for this increase are that the cocoa trees are dying and landowners do not have the resources to replant the cocoa. When the lands are given out for sharecropping tenants share with the cost of re-establishing cocoa. The population has increased so landowners give out more lands for sharecropping for increased cocoa production.

Another change is that wet lands that were part of family lands have being transferred to the chief five years ago. Thus the chief now have control over all wetlands. The reason for this shift is that family land owners where not paying levies on the wet lands. Any land that levy is not paid on belongs to the chief.

Sharecropping has increased production of food and tree crops. Often the landowners did not have sufficient resources to invest in the land. However, if they can combine their resources with those of the sharecroppers, sufficient investments can be made to increase the productivity of the land. Besides this advantage, sharecropping allows for more people to go into farming.

In the past decades, the forest area has diminished. Also other crops have replaced the cocoa farms, which used to cover all the lands. The cocoa farms are now located far away from the homesteads.

The main goal for land use is farming activities. There are conflict with construction of the road that was ongoing during the RDA. The villagers complained about the little pay the labourers were receiving.

The elders of Dwinyankwanta recounted that nowadays one has to go deep into the forest and look for a long time before one can find game. Timber species have also reduced a lot. Some of them include Sida, Fubodedwo (Etra), Sapela, Tamatama (Edinan), Framo, Emere, Kyenkyen, Kusuaa, Wawa, Mahogany, Danta, Nyemedua, Onyina, Awaduwa, Onhyina Nufo. They also stated that the lands have become "dead", not fertile any more because of the lumbering activities

4.6 Identification of farmer groups

Two thirds of the population is Ashanti and one third is from northern Ghana and the Volta region. The ethnic groups include the following:

- Ewes
- Moshie
- Hausa
- Baasari
- Grushie
- Kontonkori
- Kusasi

Grushies are mostly caretakers of cocoa farms, the others are usually hired labourers (apaafo) who have their own cocoa or food crop farms.

For stratification according to natural area user groups see 2.

4.7 Natural resources user groups

As in Attakrom, the villagers did not make any difference between ethnic groups where it concerns the use of natural products. However, under sections 4.2 (natural products) and 4.4 (water resources) the farmers describe that there are differences between men and women, and different age groups.

With respect to land the story is different. Here also men and women, and different age groups have different roles, but also between different ethnic groups there are differences. With respect to gender differences, women often do not own land. Although the Ashantis have a matrilineal system, women obtain rights indirectly through the male family members, and generally acquire smaller plots of poorer quality. They are usually involved in vegetable and food crop cultivation.

Regarding age groups, in section 4.1 it was described that young men who have access to cash are involved in labour intensive crops such as rice and tomato. Older men who own land and have access to cash will grow citrus trees. Oil palm production is an activity taken on by men.

In section 4.6 it is described that Grushies are mostly caretakers of cocoa farms, the other ethnic groups (besides Ashanti) are usually hired labourers (apaafo) who have their own cocoa or food crop farms.

4.8 Seasonal calendar

A seasonal calendar was drawn up by first listing the agricultural activities and activities relating to natural lands and then the timing of the activities (per month) were registered by asking who does a specific activity during a specific month. The results are presented in table 16. The numbers therefore represent numbers of farmers and can be read as relative importance. Some activities that did not have any peak periods, but were ongoing during a period of time were marked with an X.

Table 16 Seasonal calendar for Dwinyankwanta

Activity	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**Total**
Agricultural													
Land clearing	12	9	9	1									31
Land clearing minor season							23	5					
Planting			4	18	12		8	13					55
Weeding				8	19	10	7	4	14	8	8	14	92
Vegetable gardening				2	1		6	12	4	2			27
Drying cassava and maize	10		9	1			1	1					22
Harvest yam/cassava	7		5					2		2	5		21
Harvest maize						3	3	13	1				20
Harvest vegetables/citrus	1	3				X	X	X	X	X	X	X	4
Harvest cocoa			12	12	12				15	21	23	18	113
Other													
Fishing		8	1	1								9	19
Firewood gathering													
Hunting/traps				X	X	X	X	X	X	X			
Palm wine tapping, broom making, plantain wrappers		X	X	X	X	X	X	X	X	X	X	X	
Mushroom gathering										X	X		
Harvesting of cola										X	X		

NB there were approximately 26 farmers present

4.8.1 Labour inputs

Land preparation is mainly by men either by themselves or hired labour (by day, contract). Both sexes are involved in planting and occasionally children above ten years. Most children are at school. Men, women and children do weeding. Some use herbicides. Both sexes and even children do harvesting, but transporting or carting of the produce from the farms to the house is mainly the preserve of women and children.

Men and women do fishing. Men set the traps (they build two dams in the river) and women then collect the fish. This system is called *ahwee.* Palm wine tapping is by men. Snails, crabs and mushroom can be picked by anybody. It is mostly for home consumption. Plantain wrappers gathering and broom making are by women. Men make baskets. However, the men are reported to also engage in plantain wrappers gathering and broom making if they need the cash. The town itself does not have a market as such. They normally frequent the markets at Kunsu (Fridays)

4.9 Description of decision-making about land use

Regarding decisions made related to land use, it is the family head who takes the decision, but the chief will have to serve as a witness to all land negotiations. However, individual landowners can give out lands for food crop production without the concern of the chief. Decisions on wetlands are taken solely by the chief.

Local authorities come into land issues only when there is conflict and also for the collection of "Nto" which is thirty thousand cedis for all fields. The elders and the royals do not pay "Nto" but they pay a token called "Gyansika".

4.10 Land use history

The people of Dwinyankwanta settled at the place long ago. There are oral accounts of the village that date as far back as the time of King Osei in the 17th century. It was well-known as a resting-place for farmers carrying their cocoa to Akropong and Adugyama. The name literally means “junction of Dwinyan”. In the earlier days, the river Dwinyan diverged near the village.

The area used to be completely covered by forest. Most forest was cleared when farmers came in to grow cocoa, plantain, cocoyam, yam and other food crops. The 1983 fire destroyed most of the cocoa farms. After this fire, the farmers have gone in for the production of cassava, maize, rice and other food crops. Cocoa farms were initially closer to the village but now they are located far away. Termites (which are affecting all crops) are destroying most of the cocoa farms. Black ants and weeds are also affecting cocoa production. The farmers mentioned also the cutting of timber and the long dry season as reasons for the decline of cocoa destruction.

4.11 The community's constraints to agricultural activities

The farmers in Dwinyankwanta mentioned several constraints to agriculture. Farmers said that they needed money for labour, storage facilities, and school fees. So there is some replication as the need for storage facilities were also mentioned. The pair wise ranking is presented in table 17.

Table 17 Pair wise ranking of constraints to agriculture in Dwinyankwanta

	Money (M)	Soil Fert (SF)	Fertiliser (F)	Weed (W)	Farm Impl (FI)	Pests (P)	Storage (S)	Mark't (Ma)	Plant Mat (PM)	Extension (E)
Money		SF 13	M 22	M 19	M 20	M 17	M 23	M 24	M 25	E 9
Soil fertility			SF 18	SF 30	SF 30	SF 30	SF 28	SF 24	SF 30	SF 16
Fertiliser				W 0	FI 0	P 0	S 4	M 3	PM 0	F 20
Weeds					W 26	W 20	S 8	W/Ma 15	W 18	W 24
Farming implements						P 13	FI 25	FI 28	FI 25	FI 25
Pests and diseases							P 17	P 17	PM 8	P 24
Storage facilities								S 17	S 25	S 24
Marketing									PM 10	Ma 22
Planting material										PM 20
Extension services										

NB the numbers represent the votes for the item in the left-hand column

Soil fertility is the most pressing problem according to this ranking, (mentioned 9 times), closely followed by lack of money (cash, mentioned 8 times). Weeds were mentioned after this (6 times), followed by lack of farm implements, occurrence of pests and lack of good storage facilities (all mentioned five times). However, according to the ranking, the order of these problems is pests, farm implements, and then the lack of storage facilities. Lack of plant material was mentioned next, and lastly problems of marketing.

Other problems were cited by farmers in one of the other groups:

- Dead cocoa
- Plinthite or laterization[7] (*Atwere*). One third of all the farm lands are affected by this, and this problem is related to low soil fertility.;
- Drought
- Money to hire labour

[7] This is hardening of the soils through erosion. It is an irreversible process and inhibits cultivation of crops

5 Nyamebekyere

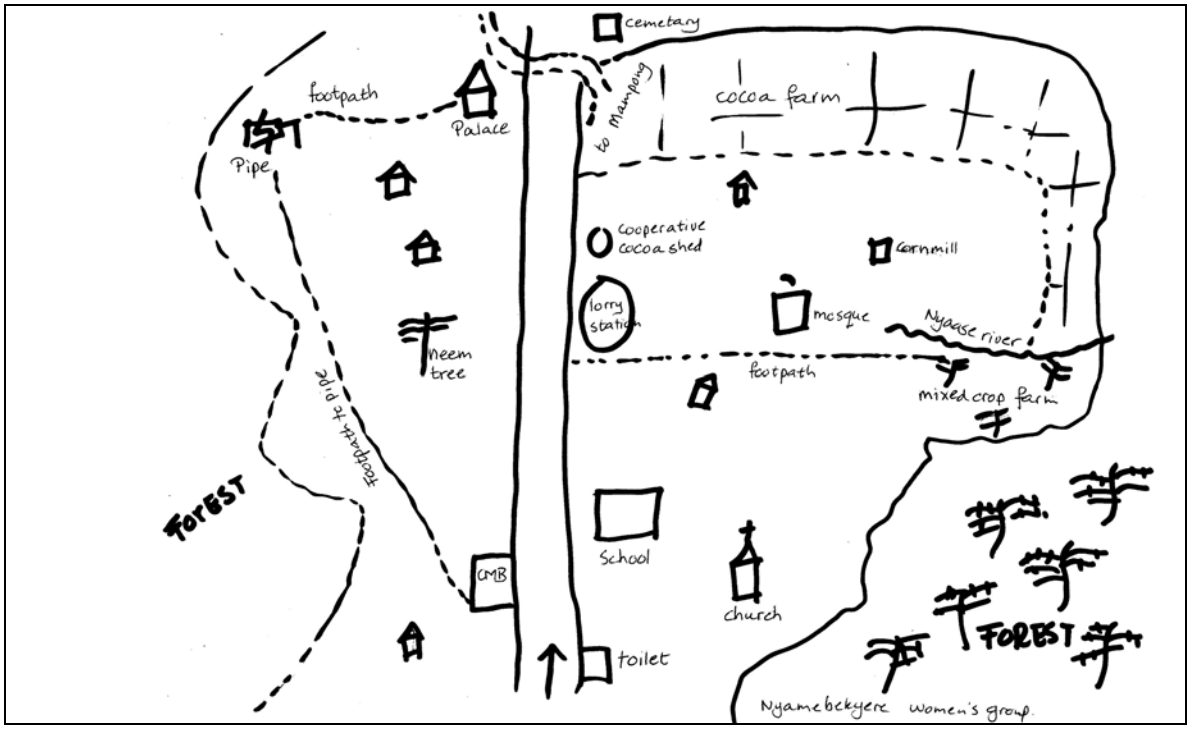
Nyamebekyere represents a village with low-intensity land use (see picture 3). It borders on the Tano Ofin Forest Reserve. Only recently (some 50 years ago) the area was opened up for agricultural purposes. From 1958 - 1960 a timber contractor (Owusu Amankwatia) was given consignment in the forest reserve and he constructed the road. The bridge was constructed in 1968. There is no electricity. On Fridays vehicles come to the village because of the Kunsu market.

Primary school is up to class six with only one teacher because the children are not many to qualify for more that one teacher. They attend JSS at Barniekrom and SSS at Mankranso or Tepa. Health facilities are at Mankranso, which is a hospital, and at Domeabra, which is a Catholic Clinic. Herbs are also used.

The fact that the village is remote entails quite some constraints for the villagers. The elders listed several of these problems, including:

- Lack of extension and technical knowledge
- Dependence on rain-fed farming – there are no wells for irrigation (the same applies for the other two villages)
- Health facilities are very remote
- The road is not in good condition.
- Lack of transportation –cars come in only on Fridays.

Plate 4 Resource map of Nyamebekyere



By women's group

5.1 Farming systems and cropping systems

The main economic activity is farming and is similar to that of Attakrom and Dwinyankwanta. Crop production is the dominant activity to the extent that animal production (livestock and poultry) is not even classified as farming by the farmers. There is no fishing, as the rivers dry up in the dry season. The major cropping systems are:

- Traditional food crops: Maize/cassava/plantain/cocoyam
- Newly emerging cash crops: Pineapple
- Rice
- Vegetables Tomato, garden egg, pepper
- Traditional tree crop: Cocoa, citrus
- Newly emerging tree crops: Oil palm

The original goal of the farmers was cocoa production to earn cash. Staple food crop (plantain, cassava, cocoyam maize) production was added in the course of establishing cocoa to protect the young plants (in this case, plantain), or to provide food. With the decline in cocoa resulting from pest and disease, and bush fire, staple food crops was produced beyond subsistence requirements. Table 18 shows the importance of (food) crops as cash crops.

Crop production practices and order of importance of crops was similar for both men and women. Women farm together with their spouses, except in cases where they are single.

Table 18 Importance of different crops in Nyamebekyere

Crops	**Rank of importance**	**Percentage of farmers engaged**	**Uses**
Major crops			
Cocoa	6	70	Cash
Maize	4	100	Cash, food
Rice	8	<10	Cash, food
Cassava	3	100	Cash, food
Plantain	1	100	Cash, food
Cocoyam	2	100	Cash, food
Citrus	5	50	Cash
Minor crops			
Cowpea Pepper Garden egg Oil palm Pineapple	These were all ranked below the major crops		

To probe more in-depth a pair wise ranking was done. The results are presented in table 19.

Table 19 Paired ranking of most food important crops as source of cash for women and men in Nyamebekyere

Crop	**M/ F**	**Plantain**	**Cocoyam**	**Cassava**	**Pineapple**	**Maize**	**Rice**	**Rank**
Plantain	M F		Plantain Plantain	Plantain Plantain	Plantain Plantain	Plantain Plantain	Plantain Plantain	1 1
Cocoyam	M F			Cassava Cassava	Cocoyam Cocoyam	Maize Maize	Cocoyam Cocoyam	4 4
Cassava	M F				Cassava Cassava	Maize Cassava	Cassava Cassava	3 2
Pineapple	M F					Maize Maize	Pineapple -	5 5
Maize	M F						Maize -	2 3
Rice	M F							6 6

NB M = Male, F = Female

Plantain, cocoyam, cassava, pineapple, maize and rice were mentioned as the important sources of cash, in addition to cocoa, the traditional cash crop. Plantain dominated all the other food crops as cash source. Cassava, maize and cocoyam were also identified as important. It appears, therefore, that the inland valley crops are currently not important cash crops although the bulk of these crops are sold. This is explained by their high input and management requirement. Women ranked cassava higher than maize but for the rest the ranking of men and women were similar.

Traditional staples such as plantain, cassava, cocoyam and maize have become important as cash crops. The reasons the farmers gave were:

- These are the major crops grown, and purposively beyond household food requirements to sell
- They are harvested regularly, in contrast to cocoa which is harvested seasonally
- Cocoyam in particular is a high cash earner in the lean season

Pineapple is sold by only a few farmers in Nyamebekyere. It is important as a cash crop for them because it can be harvested regularly, even in the lean season. The importance as food of crops were ranked as follows:

1. Plantain
2. Cassava
3. Cocoyam
4. Maize

The major staple food, *fufu*, is made from plantain or cocoyam, combined with cassava. Maize is normally sold in a processed form (e.g. *kenkey*).

Like in the other two villages, there are specific groups engaged in different cropping activities. Table 21 shows the specific groups involved in crop production.

Table 20 Crops associated with specific groups in Nyamebekyere

Crop	Group engaged in	Reasons
Rice	Young men with access to cash	High labour requirement High cash requirement for herbicide
Tomato	Young men with access to cash	High labour requirement High cash requirement for herbicide
Citrus	Mostly older men who own land and have access to cash	Cropped on land owned High cash requirement for seedlings and other inputs
Oil palm	Mostly men	Farmer should own land High cash requirement for planting materials
Pineapple	Elderly men and women	Farmer should own land; landowners refuse to give out land to other farmers for pineapple because of the perceived high rate at which its production degrades the land

5.1.1 Non-farm activities

There are not many non-farm activities in Nyamebekyere. The village is small and isolated and is not well connected to other villages and towns,. Therefore, the villagers are almost completely concentrated on farming. The non-farm activities consist of trade in farm produce by women and distillation of local gin from palm tree by men.

5.1.2 Time allocation

Given the limited importance of non-farm activities, and also the negligible time spent on livestock, the time allocation refers to crop production only. There are two types of economic groups defined by crops produced. There are those producing both staple food crops and traditional or emerging cash crops (1), and those producing only staple food crops (2). The latter make all their cash in crop farming from the sale of part of the staple food crops. The typical allocation of time between these activities is presented in table 20.

Table 21 Relative time allocated to crops in Nyamebekyere (in %)

	Economic group	
	1	2
Staple food crops: Plantain Cocoyam Cassava Maize	60	100
At least one of the following: Cocoa Pineapple Oil palm Citrus Rice	40	0

Specific crops are grown in the inland valley bottoms. The farmers mentioned the following crops:

- Rice
- Vegetables: tomato, pepper, garden eggs, okra, cabbage
- Oil palm

5.2 Different products both Flora and Fauna from natural land and various socio economic groups involved

5.2.1 Flora species

An overview of the flora products is given in table 22.

Table 22 Flora products collected by farmers in Nyamebekyere and their uses

Local Name	Scientific Name	Family	Uses
Akasa	*Chrisophyllum albidum*	Sapotaceae	Timber
Apuro/danta	*Nesogordonia papaverifera*	Sterculiaceae	Timber
Asanfena	*Aningeria robusta*	Sapotaceae	Timber
Baku	*Tieghemella heckelii*	Sapotaceae	Timber
Doma	*Ficus sur*	Moraceae	Firewood
Duamoko	*Drypetes aubrevilei*	Euphorbiaceae	Firewood
Emire	*Terminalia ivorensis*	Combretaceae	Timber
Esia	*Petersianthus macrocarpus*	Lecythidaceae	Timber
Framo	*Terminalia superba*	Combretaceae	Timber
Gyama	*Alchornia cordifolia*	Euphorbiaceae	Firewood
Hotrohotro	*Hannoa klaineana*	Simaroubaceae	Timber
Hyedua	*Daniiella ogea*	Caesalpiniaceae	Timber
Kakapenpen	*Rauvolfia vomitoria*	Apocynaceae	Firewood
Kotreanfo	*Ficus spp.*	Moraceae	Firewood
Mahogany	*Khaya grandifolia*	Meliacreae	Timber, bark for stomachaches
Mansonia	*Mansonia altissima*	Sterculiaceae	Timber
Nsokodua	*Garcinia afzelii*	Guttiferae	Chewstick
Nyamedua	*Alstonia boonei*	Apocynaceae	Medicinal, measles
Nyankyerene	*Ficus exasperata*	Moraceae	Firewood, fodder
Odum	*Milicia excelsa*	Moraceae	Timber
Odwuma	*Musanga cecropioides*	Moraceae	Firewood
Onyina	*Ceiba pentandra*	Bombaceae	Timber
Opam	*Macaranga barteri*	Euphorbiaceae	Firewood
Pepea	*Margaritaria discoidea*	Euphorbiaceae	Firewood
Pepediewuo	*Solanum erianthum*	Solanaceae	Firewood
Tweapia	*Garcinia kola*	Guttiferae	Chewstick
Wama	*Recinodendron heudelotii*	Euphorbiaceae	Firewood
Wawa	*Triplochiton scleroxylon*	Sterculiacea	Timber
Wawabema	*Sterculia rhinopetella*	Sterculiaceae	Timber
Wawapuo	*Cola gigantean*	Sterculiaceae	Firewood

Specific trees can also be found on the farmlands. Table 23 presents these.

Table 23 Farm land tree products collected in Nyamebekyere and their uses

Local Name	Scientific Name	Family Name	Uses
Cocoa	*Theobromae cacao*	Sterculiaceae	Roots for chest pains
Doma	*Ficus sur*	Moraceae	Firewood
Framo	*Terminalia superba*	Combretaceae	Timber, Firewood
Gyama	*Alchornia cordifolia*	Euphorbiaceae	Firewood
Kakapenpen	*Rauvolfia vomitoria*	Apocynaceae	Firewood
Wama	*Recinodendron heudelotii*	Euphorbiaceae	Firewood
Nyankyerene	*Ficus exasperata*	Moraceae	leaves for livestock feeding
Oil palm	*Eleaies guiniensis*	Palmaceae	the lead frond is used to stop bleeding from cuts or wounds
Onyina	*Ceiba pentandra*	Bombacea	
Opam	*Macaranga barteri*	Euphorbiaceae	Firewood
Orange seeds (quantity of 3)	*Citrus spp*		Treatment of stomach aches and diarrhoea.
Pepea	*Margaritaria discoidea*	Euphorbiaceae	Firewood
Pepediewuo	*Solanum erianthum*	Solanaceae	Firewood

There are no specialised herbalists in the village. Anybody with herbal knowledge applies his or her knowledge when the need arises.

Mushrooms are collected by anyone and are not restricted to a certain area. The mushrooms are mainly collected for food. The farmers mentioned the following types:

- *Vovariella volvaceae* (Domo)
- *Termitomycetes spp.* (Sibre)
- *Agaricus spp.* (Penpena)
- *Pleurotus spp.* (Sasei)
- *Lentinus spp.* (Chichirichi)
- *Auricularia* spp. (Ntosua)
- *Coprinus spp.* (Atrokum)

5.2.2 Fauna species

The farmers hunt different species of fauna. Most animals enter the farmlands at night to forage and this is when farmers (usually older or adult men) will hunt them. At day-time hunting is also possible by young men or boys accompanied by dogs. They usually hunt for grasscutter and other rodents. Table 24 presents the types of animals hunted or collected by the farmers at Nyamebekyere.

Table 24 Wildlife species hunted and collected in Nyamebekyere

Local Name	**Common Name**
Akrantee	Grasscutter
Kusie	Giant Rat
Wansane	Bush Buck
Oyuo	Black duiker
Otwe	Maxwell's duiker
Apese	Brush-tailed
Owia	Tree Hyrax
Aprawa	Giant-ground pangolin
Kokobo	Dwarf mongoose
Akokohweree	Ahanta francoline
Amoakua	Land squirrels
Koto	Crabs
Nwa	Snails
	Snakes
Okyireben	Green mamba
Pamire	Black cobra
Onanka	Royal python
Onini	African python

Everybody collects snails and crabs irrespective of age or sex. In Nyamebekyere the farmers also mentioned different types of snakes.

5.3 Natural lands with cultural and religious value

There is a forest reserve that surrounds the village. Firewood, fruits and other minor products can be collected from the forest, but hunting and logging are prohibited. The forest reserve has no cultural or religious value for the farmers in Nyamebekyere, and there is no sacred grove. However, there are several taboos and local customs linked to natural areas. There is no farming activity on Fridays which is considered a taboo day. Also, if someone dies suddenly in the farm or the forest without any ailment ("atafu") then nobody goes to the farm until certain rituals are performed.

The streams are also important religious places. One does not cross any river with a dead body unless certain rituals are performed. There are other taboos connected to the streams. This is explained in section 4 on water resources.

5.4 Uses made of water resources and the socio economic groups involved

Water is a serious constraint in Nya. There are three streams that are located in the Forest Reserve: the Nyasi, the Anikokoo and the Aseka. The last two are now extinct, i.e. they do not flow anymore. Only when it has rained will there be water for a few days. The Nyasi stream starts flowing in June and dries up in November.

There is also a borehole in the valley of the Anikokoo stream. Water for domestic uses is very scarce, especially in the dry season. There has been water management for sustained supply. The village is divided into two groups. Whilst one group fetches water from the well, the other does so from the hand-dug wells in the in-land valleys. These wells

are in the Nyasi stream in the in-land valley and are about 15 feet deep. They alternate the groups every day.

The farmers have assigned several reasons for this decline. The first is linked to not observing the taboos that are linked to fetching water from the river. Women are not supposed to go near the river when in menstruation, or fetch water with black pots or pots covered with soot. Nobody is supposed to defecate near the river. Because these taboos have not been observed, the gods have been made so angry that they reduced the rainfall in that area. Others however, attribute it to the changes in the rainfall pattern over years.

The water seems to be of good quality, because the farmers did not report any water borne diseases.

5.5 Land tenure system

All land belongs to the Hiahene. His representative in Nyamebekyere is the Wioso chief. There are several land tenure systems that exist in the village. In table 25 the different tenure systems (per crop) and their shares are indicated.

Table 25 Information on tenure systems in Nyamebekyere

Tenure system	**% of the community**
Family or own land	90%
Share cropping	50 - 60%
Hiring or renting for season	30%
Lease for 50 - 100 years	10%
Do fa wa duane system or taungya system: release of the forest for farmers to grow food crops for their own consumption but they are obliged to plant trees also.	100%

Crop	**Share of Tenant**	**Share of landowner**
Maize	$^2/_3$	$^1/_3$
Cassava	½	½
Cocoyam	½	½
Orange	½	½
Oil Palm	½ (similar to cocoa but land does not go to the farmer when the trees die).	½ (Landowner takes over land after felling the trees)

Family lands are inherited or owners came to work on it with permission from the Wioso chief. They pay their "Nto" every year and have right to transfer ownership through inheritance. They have the right to give out the lands for sharecropping, hiring and renting or lease.

There are different types of sharecropping. Sharecropping for cocoa is a specific type. The farmer will be given land to grow cocoa and is responsible for all inputs for the production of cocoa. The initial proceeds are shared on a 2:1 basis. The farmer keeps two thirds and the landowners receive one third. The agreement can last up to five years. After the 5th year the farmer and landowner share the land equally and the farmer will own the land afterwards. The enforcement of the agreement depends on the landowner's discretion.

The other type is share tenancy is called *koyo ma yen di* ("cultivate anything but cocoa belongs to the landowner"). It is not very common. The farmer pays for the inputs for growing cocoa and other food crops but the cocoa belongs to the landowner and the food crops belong to the farmer.

The taungya system is a new system and has been introduced as an agro-forestry scheme. As it means that farmers are allowed to cultivate new (forest) lands, it is very popular. The farmers are obliged to cultivate the area they requested. Cultivating cassava is not permitted as it degrades the soil. Most farmers intend to plant plantain and cocoyam. However, several of them were complaining that they did not have sufficient planting materials (especially young plantain suckers). The sharecropping system for food crops and tree crops is shown in the second half of table 25.

5.5.1 Changes in tenure and land use

There has been a shift in the land tenure system. All area was formally family land but over the years, there has been increased trend that most farmers have shifted to the sharecropping system. The cause of the change is basically the same as in Dwinyankwanta. Farmers are unable to replace them due to lack of funds. Some caretakers[8] did not take care of the land. Sharecroppers however have invested considerably in the land (e.g. by high labour input, and new planting materials) and this has increased productivity of the land.

The elders of Nyamebekyere, in an earlier interview described some of the effects of the change of land use. The mentioned the following:

- Game reduced drastically.
- No wild yam.
- Fewer snails and mushrooms.
- No more pestles and chewing sticks (nsokodua).
- Streams all dried up.
- Now a secondary forest due to bush burning.
- During the dry season problems with termites.
- Reduction of nutrients in the soil.
- Plantain takes longer to grow and it's harvested only once.
- Cocoyam dead and low yields

5.6 Identification of farmer groups

There are different ethnic groups in Nyamebekyere, with Ashantis and Brongs being the minority, composing 30% of the total. The other ethnic groups, such as the Busuga, Grushie, Wangara, Frafra, Ewe, Baassari (dominant group), Gruma and Mamprusi comprise 70% of the total community. Apart from Ewes from the Volta Region the rest of the 70% are from Northern Ghana who have come in as caretakers of cocoa farm. Now that most of the cocoa trees are dead the caretakers have taken over the land and are working on their own.

The wealth indicators that were given by the farmers in Nyamebekyere were as follows:
The rich are characterised by:

[8] Caretakers cultivate the family lands. A caretaker should not be confused with a sharecropper.

- Large farm size
- Are a help to the village
- Can lend out money
- Are self-reliant
- Can build

The poor are characterised by:
- Poor dressing
- No money
- Cannot afford planting material
- No shelter (i.e. house)
- Cannot afford to educate their children

5.7 Natural resources user groups

As in Attakrom and Dwinyankwanta, the villagers did not make any difference between ethnic groups where it concerns the use of natural products. However, under sections 5.2 (natural products) and 5.4 (water resources) the farmers describe that there are differences between men and women, and different age groups.

With respect to land the story is different. Here also men and women, and different age groups have different roles, but also between different ethnic groups there are differences. With respect to gender differences, women often do not own land. Although the Ashantis have a matrilineal system, women obtain rights indirectly through the male family members, and generally acquire smaller plots of poorer quality. They are usually involved in vegetable and food crop cultivation.

Regarding age groups, in section 5.1 it was described that young men who have access to cash are involved in labour intensive crops such as rice and tomato. Older men who own land and have access to cash will grow citrus trees. Oil palm production is an activity taken on by men. Elderly men and women who own land are engaged in pineapple production.

In section 4.5 it is described that the Northerners (Busuga, Grushie, Wangara, Frafra, Baassari, Gruma and mamprusi) used to be caretakers of cocoa farms, until the cocoa died. Now they have taken over that land to cultivate other crops.

5.8 Seasonal calendar

A seasonal calendar was developed by listing the activities for the major cropping season (during the main rains) and for the minor cropping season (minor rains). The results are presented in table 26. The numbers represent the number of farmers who are involved in a specific activity during a specific month. An X signifies that all farmers are involved in this activity.

Table 26 Seasonal calendar for Nyamebekyere

Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOT	Male	Female
Major season															
Land preparation		7	16	6									**29**	X	
Planting	1		17	7	20	17	19	23	1	4		1	**110**	X	X
1st. Weeding			21	26	23	27	28	28	27	13	2	1	**196**	X	X
Harvesting	7	4	19	28	21	13	15	27	22	16	15	13	**200**	X	X
2nd Weeding													**0**	X	X
Minor season													**0**		
Land preparation							24	15	4				**43**	X	X
Planting								18	2				**20**	X	X
Weeding								9	13				**22**	X	X
Harvesting									1	4	9		**14**	X	X
Hunting	X	X	X	X	X	X	X						**0**	X	
Transport food from the farm to the house													**0**	X	X
Firewood gathering	X	X	X	X	X	X	X	X	X	X	X	X	**0**	X	X
Other activities													**0**		
Fire protection	X	X	X	X						X	X	X	**0**	X	
House maintenance				X	X	X	X	X	X	X	X	X	**0**	X	
Palm wine tapping	X	X	X	X	X	X	X	X	X	X	X	X	**0**	X	
Broom production	X	X	X	X	X	X	X	X	X	X	X	X	**0**		X
Palm oil production			X	X	X	X	X	X					**0**		X
Palm kernel oil production	X	X	X	X	X	X	X	X	X	X	X	X	**0**		X
Mushroom gathering			X						X	X	X		**0**	X	X
Soap production (from cocoa pods)													**0**		X
Local gin (Akpeteshie) brewing	X	X	X	X	X	X	X	X	X	X	X	X	**0**	X	X
Gari (Tapioca) production	X	X	X	X	X	X	X	X	X	X	X	X	**0**		X

NB There were around 32 farmers present

Land preparation is done twice a year, once during the major season (mid -February to April and once during the minor season (July to August). Like in the other villages, land preparation involved clearing vegetation either by slash and burn or by just slashing. Planting follows land preparation.

5.8.1 Labour inputs

Land preparation is mainly by men but if the vegetation is not heavy then some women mostly the unmarried ones do get involved. Usually women hire labour (by day, contract). With the men some hire labour if they have the money or if farm size is large. Some children are engaged. Both sexes are involved in planting. There is also the "nnoboa" system (farmers help each in turns) when children are in school. Harvesting is done by both sexes of all ages but transporting or carting produce from the farms to the house is mainly by women and children. Snails, crabs and mushroom can be collected by anybody. It is mostly for home consumption. The farmers frequent the markets at Kunsu (Fridays) and Adugyaman (Sundays).

5.9 Description of decision-making concerning land use

The lands are mostly family lands and so the decisions on land use are taken by the family head in consultation with other family members. The main land use goal is agricultural production. Conflicts may occur among family members on the crops to grow or the system of tenure. It is only when there is a 50 -100 years lease that the Wioso chief has to be involved in the decision making.

5.10 Land use history

A hunter from Wioso once came to the demarcation of the reserve line. He realised that the forest behind the demarcation line was not part of the Forest Reserve and could be cultivated. He came in to cultivate cocoa with permission from the Wioso chief. One woman mentioned that during the cropping season the farmers would sleep in a big tree trunk located at the spot where the river is located in the village. They would return to their own villages after the cropping season. Other farmers joined the first settlers until in 1950 when they all decided that they would settle permanently and trust God to provide for them. Hence the name Nyamebekyere which literally means "God will provide".

The place was initially planted with cocoa. Until 1962 there were no roads, only foot paths to the other villages. In 1962 a timber contractor (OT) was given a concession in the Reserve and constructed the main road. The farmers' cocoa co-operative built a cocoa shed in 1963 and the Cocoa Marketing Board (CMB) built a larger one in 1967.

Like the villagers of Attakrom and Dwinyankwanta the villagers of Nyamebekyere mentioned the effects of the 1983 fire. They reported that it did not affect their cocoa, but it did destroy the Forest Reserve. However, after 1983 the cocoa productivity started declining. The farmers mentioned a number of reasons. Some of these are weeds and termites infestation as well as the refusal of the elders to perform some rituals for the gods due to the entry of Christianity and the church into the village. Cocoa is now being replaced by food crop production. It is very possible that the destruction of the Forest Reserve by the 1983 fire has had a negative impact on the cocoa production in the village, and maybe even the drying up of the streams, which was reported in section 4 on water resources. These are issues that should be further investigated.

5.11 The community's constraints to agricultural activities

The farmers mentioned several constraints. The results are presented in table 27.

Table 27 Pair-wise ranking of constraints to agriculture in Nyamebekyere

	Ter	**Ld**	**Lab**	**Water**	**Road**	**Soil**	**Plt.**	**Weeds**	**Rank**
Termites (Ter)	X	Ld 23	Lab 23	Water 36	Road 19	Soil 26	Ter 17	Weed 22	7
Land (Ld)		X	Ld 23	Water 26	Ld 20	Soil 20	Ld 21	Ld 18	3
Labour (Lab)			X	Water 36	Lab 20	Lab 20	Lab 36	Lab 25	4
Water				X	Water 36	Water 36	Water 36	Water 36	1
Bad Road (Road)					X	Road 21	Road 21	Road 20	5
Soil infertility (Soil)						X	Soil 24	Soil 36	2
Planting Material (Plt)							X	Weeds 24	8
Weeds[9]								X	6
Total participants (36)									

The ranking is not quite consistent. This may be due to the fact that farmers voted so the ranking is a result of majority votes, reflecting individual opinions. However, it is clear that water comes out overwhelmingly as the main constraint.

[9] Especially the weed "Yaa Asantwaa" was mentioned. It is called after the unyielding Ashanti queen who battled against the English, because it keeps growing, even after being pulled out.

6 Conclusions

The RDA was done in three communities in the Ashanti Region, containing inland valley bottoms and representing land use of increasing intensity. Nyamebekyere is a village that was established relatively recently and is demarcated on one side by a National Forest Reserve. Its land use intensity is relatively low. Dwinyankwanta is a community that has been established centuries ago, but which still possesses relatively ample land and can be characterised by a medium land use intensity. Attakrom is a well-established community with high land use intensity.

The purpose of the RDA is to collect baseline data that will be used for the different workpackages of the VINVAL project, with a special emphasis on the work package 4, on socio-economic aspects. The RDA also provided the opportunity for the communities and researchers to meet and to exchange information about the VInVal project. This turned out to be very valuable because several of the community had questions abut the research activities that had been going on in their area – such as taking soil samples. The purpose of these activities was explained and led to a greater understanding within the communities. Vice versa, the communities could put forward several problems they were coping with to the researchers (such as problems with certain weeds, problems related to water availability and quality). In some instances the researchers were to offer advice, in other instances the researchers referred the problem to other authorities.

Several interesting results were obtained from the RDA. In general, the cocoa productivity is declining. One strategy is to turn to other crops. This has led to the declining importance of cocoa as the main cash crop and consequently, some traditional food crops are now also used as cash crops. It has also led to a greater interest in new crops such as rice and several vegetables (which are mostly used as cash crop) and also some tree crops that are used as cash crops such as citrus and oil palm.

Share-tenancy seems to be used as another strategy for the decline of cocoa productivity. Tenants provide extra labour and other (financial) resources to invest in ailing cocoa stands, thus reversing the downward trend of cocoa productivity.

Crop cultivation is stratified, i.e. there are different groups who cultivate specific crops. The main criteria are available resources (cash or labour) and the access to (wet) land. Related to this are gender divisions, as women have less access to cash and land. For instance, older men who have sufficient cash resources grow tree crops. Young men, who have the necessary labour power and who have access to wetlands (inland valley bottoms) cultivate rice.

An incidence that affected all three communities was the 1983 bush fire that destroyed many farmlands and (part) of the Forest Reserve.

The degree of land use intensity seems to have effect on various factors, but the conclusions are tentative and should be substantiated in further research that will be part of the different workpackages. First, the community with low land use intensity was established relatively recently (some 50 years). The recent settlers are a mixed group and seem to have fewer cultural and religious customs and taboos. They appear to be more outward looking and have more progressive ideas. The communities with high and medium land use intensity have been established long ago, and therefore honour more

cultural and religious customs and taboos. They seem to hold on to more traditional ideas and ways of doing things.

With respect to water availability and quality, the community with low land use intensity: was apparently not affected by water-borne diseases. However, this may also be due to the water resources being very scarce (many water resources dry up during the dry period).

The community in the low land use intensity are mentioned a greater diversity of animal species hunted than those in the medium and high land use intensity.

As expected, there is a clearer difference between the low land use intensity area and the medium and high land use intensity area, than between the high land use intensity area and the medium land use intensity area. The differences found in the RDA between these two areas are not very large.

7 References

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8 ANNEX 1 RDA techniques used[10]

8.1 Semi-structured interviewing (SSI)

SSI is central to a participatory rapid appraisal. SSI entails a guided interview in which the topics are predetermined but where new questions arise in response to answers. An SSI appears informal and conversational but is controlled by the interviewers, who use a prepared checklist or interview guide (but not a formal questionnaire). The interviewers pose open-ended questions and pursue new avenues of questioning as the SSI develops. Responses are probed on particular topics, thus getting beyond standard, superficial answers and responses are carefully judged (on fact, opinion or rumour). Probing questions and comments can include "But why?"; "Please tell me more..?"; "Anything else?"; Like an onion, layer by layer is peeled off.

The interviewers take a neutral attitude and pay special attention to non-verbal signals and record interviews (including these non-verbal signals) during or immediately after talking with the respondents. "Saboteurs" are people who disrupt the process, e.g. by being dominant and giving all the answers, or by correcting, commenting on answers given by others. Dealing with these "saboteurs" is crucial but can be tricky.

Picture 4 shows a SSI on natural products in Dwinyankwanta. Farmers are mentioning different products they collect and the facilitator (a researcher in agroforestry) asks probing question such as the use of the product, who collects them etc.

Plate 5 SSI on natural products in Dwinyankwanta

Gerdien Meijerink

[10] This section is based on Thompson and van Wijk trainer of trainers for RDA, unpublished

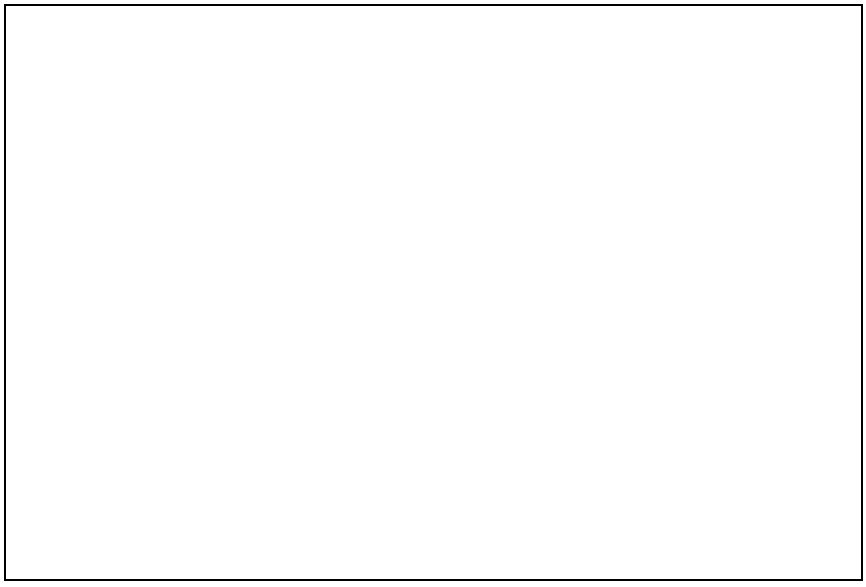
8.2 Physical/resource maps

The aim of such maps is to monitor information that has a geographical distribution.
First an insight into the area of the community is obtained by a reconnaissance for instance. This way, the location of the main resources are discovered, or the location of the richest and poorest soils etc. Then people from the community are asked to draw a map of their farm/neighbourhood/community. They decide how they want to represent it, on paper, on the road with chalk, in the sand with local materials. Maps can be used for other topics as well, such as:

- Historical change,
- Pest and disease map,
- Soil type map,
- Land use map

Later on the maps can be used to compare with existing maps (or GIS) of the region. It helps to do another reconnaissance and compare the elements identified on the map with the region to understand the map better. The map may not have been drawn in scale!
Plate 5 shows farmers in Attakrom drawing a resource map of their village. This map is presented to the others later on. Sometimes the help of a researcher is requested to help with the drawing. Especially older people and women often feel restrained in drawing with pens on paper.

Plate 6 Drawing a resource map in Attakrom



Gerdien Meijerink

8.3 Seasonal Calendar

The aim of a seasonal calendar is to identify various activities (which may be limited to farming activities but may also include a broader scale) as well as the temporal aspects of these activities. The people from the community are asked to list activities they are involved in, in sequential order. One may start at the beginning of the year – e.g. in January, but also at the beginning of a season (e.g. land preparation). The seasonal calendar may be divided into months, but this is not necessary-it may also be divided into other time units.

The timing of the activity is scored against the month it takes place. Weights representing workload, or number of people involved, or number of hours put into the activity may be added. To do this, for instance 60 stones can be used that are divided over the year per activity, or a number of stones divided over all activities over the year.

Because there were many farmers present who cultivated different crops at different times, the researcher facilitated and drew the calendar by asking for a show of hands of those involved in a specific activity in a specific month. This way a seasonal calendar was established with weight for the share of farmers involved in a certain activity and the spread of farmers doing the activity over time (some farmers start early, others late).

8.4 Wealth ranking/identifying social groups

Wealth ranking and identification of social stratification of a community lie very close to each other and wealth ranking can be used to identify different groups according to wealth status. Because individual wealth ranking is often a sensitive issue, aggregate wealth ranking can be used, especially if the aim is to identify different social groups and not to classify individuals into wealth categories.

The aim of aggregate wealth ranking is to identify the distribution of wealth classes in a village. The following steps are involved:

1. Identify the unit you want to analyse (household, compound etc.)

2. Identify how many classes you want to distinguish (e.g. poor, average, rich)
3. Discuss how to define the classes with a group of villagers (i.e. discuss which factors characterise each group)
4. Ask the group to give percentages to each group (or alternatively, divide 50 stones amongst the groups)

8.4.1 Pair-wise ranking

Pair-wise ranking is a method to rank certain items, such as crop production problems, or importance of crops. First, all items are listed (e.g. all crops cultivated in the village). Then a table is made with the items written both in the columns and the rows:

	1	2	3	4
1	■			
2		■		
3			■	
4				■

Per item, the farmers are asked which one is more important. Only half of the table (the upper or lower half) needs to be filled out. In our case, the farmers voted with a show of hands, because not all farmers agreed on the same item. This way we got an indication of the share of farmers who felt that for instance item 1 was more important than item 2.