



Monitoring report

Asubima Forest Reserve

“Forests for the Future”



Hattem, 22-12-2011



| | |
|------------------|--|
| Elaborated by | FORM International |
| Authors | F. Ogoe, R. Sools & T. Wanders |
| Address | Bevrijdingsweg 3 8051 EN Hattem The Netherlands |
| Telephone | + 31 38 444 89 90 |
| Fax | + 31 38 444 89 91 |
| Email | info@forminternational.nl |
| Website | www.forminternational.nl |
| Document version | 1 |
| Date of document | 22-12-2011 |
| Reference | TW/Asubima/Monitoring |

CONTENTS

| | |
|---|----|
| 1. INTRODUCTION..... | 2 |
| 2. TYPES OF MONITORING | 3 |
| 2.1 Plantation monitoring..... | 4 |
| 2.1.1 Extent and condition of the forest..... | 4 |
| 2.1.2 Biological diversity | 4 |
| 2.1.3 Forest health..... | 7 |
| 2.1.4 Soil protection..... | 10 |
| 2.1.5 Water protection | 10 |
| 2.1.6 Forest production..... | 12 |
| 2.2 Economic aspects | 12 |
| 2.2.1 Social benefits | 12 |
| 2.3 Social evaluation | 13 |
| 2.4 Conclusions..... | 1 |

1. INTRODUCTION

Management is a continuous process. This means that the management will be adapted over time related to changes in the field. To keep track of these changes, FORM Ghana applies a system of monitoring in which annually information is gathered. The process of evaluation and adaptation will lead to further fine-tuning of the management plan.

The current report informs on the various monitoring activities that have taken place the past year, and what has been learned from it. As more knowledge is gained on monitoring activities, these are further refined and the setup of the monitoring system will be adapted.

This report is the first of the annual reports on monitoring. It is public to allow interested persons to be informed on the progress of FORM Ghana and the impact its activities have on the people and the environment in Asubima Forest Reserve

FORM Ghana Ltd.

Willem Fourie

General Manager

2. TYPES OF MONITORING

Monitoring and evaluation of forest conditions and management performance are necessary to assure the sustainability of forest management. FORM Ghana has established a monitoring system to be able to evaluate its performance and adapt its management when necessary. The monitoring system consists of several activities aimed at collecting different types of information, the method of monitoring used depending on what is best suited per type of information.

| Management objectives | Criterion | Indicator | Verifier |
|---|------------------------------------|--|-------------------------------|
| 1 Establish and manage the timber plantation in an ecologically sustainable manner with a maximum of 90% Teak and at least 10% of mixed local species with conservation of natural, riparian forest | 1.1 Extent and condition of forest | 1.1.1 Area planted with Teak | Map |
| | | 1.1.2 Area managed as natural forest (plantation) / buffer zone | Map |
| | | 1.1.3 Changes in planted area | Map |
| | 1.2 Biological diversity | 1.2.1 Extent of area protected | Map |
| | | 1.2.2 Protected areas connected by biological corridors or stepping stones | Map |
| | | 1.2.3. Existence and implementation of procedures to identify / protect endangered, rare and threatened species | Procedures |
| | 1.3 Forest Health | 1.3.1 Check of the growth rate of the plantation | PSP |
| | 1.4 Soil protection | 1.4.1 Procedures to protect soil productivity and avoid erosion | Procedures |
| | | 1.4.2 Effectiveness of activities undertaken to avoid soil erosion | PSP |
| | | 1.4.3 Procedures to avoid impact from work in the forest | Procedures |
| | 1.5 Water protection | 1.5.1 Procedures to protect forest and vegetation along water courses | Procedures |
| | | 1.5.2 Checking of water quality | Sample analysis |
| 2 Guarantee financial and economic sustainability through the generation of income from the produced round-wood and carbon sequestration | 2.1 Forest production | 2.1.1 Harvest of round wood | Tables |
| | | 2.1.2 Comparison of yield with yield tables | tables |
| | | 2.1.3 Calculation of current stored carbon in the plantation | Calculation |
| | 2.2. economic aspects | 2.2.1. Cost benefit of plantation | Table |
| | | 2.2.2 Value of wood sales | Sales data |
| | | | |
| 3 Provide social benefits by offering good economic conditions for employees and the surrounding smallholder community | 3.1 Social benefits | 3.1.1 Number of people (partially) depending on the plantation for their livelihood (employees, inter croppers, out growers) | Table |
| | | 3.1.2 Training and capacity building for employees, inter croppers and out growers | Table |
| | | 3.1.3 Information of the public | Website, stakeholder meetings |
| | | 3.1.4 Worker health / Accidents on work floor | Statistics |

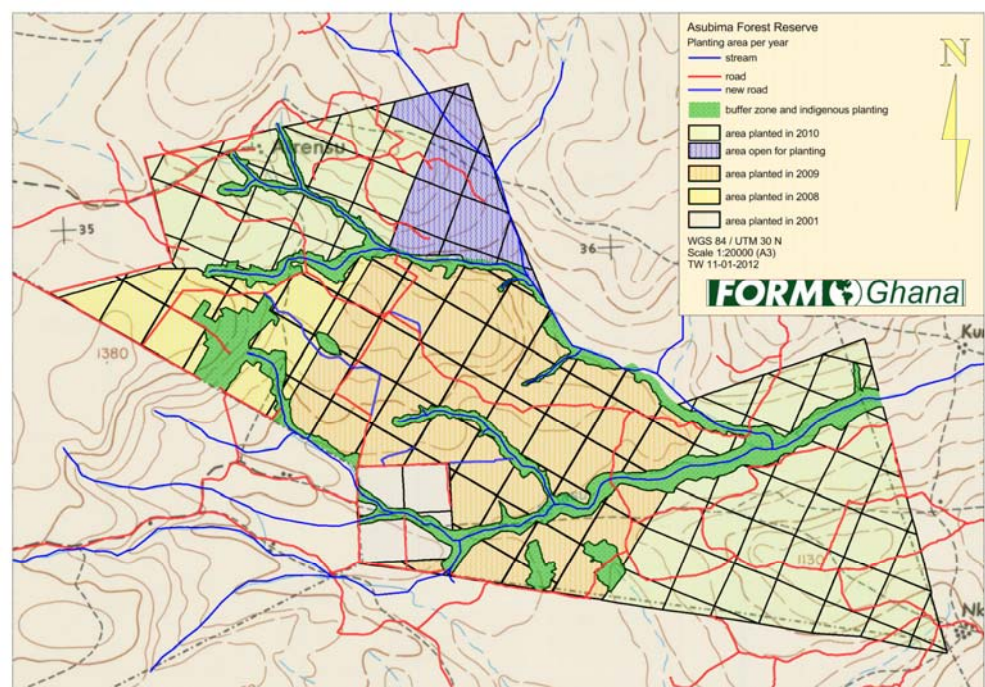
The system is set up in a hierarchical manner to assure that the information collected provides information on the management goals. The hierarchy of the information is shown in the table above.

2.1 Plantation monitoring

The objective set for the plantation is to establish and manage the timber plantation in an ecologically sustainable manner with a maximum of 90% teak and at least 10% of mixed local species with conservation of natural, riparian forest. To know whether this objective is met, monitoring is undertaken in the plantation. It follows from the hierarchical table in chapter 2 that several subjects have to be checked regularly to see if things are progressing as planned. These subjects are treated in detail in the following paragraphs.

2.1.1 Extent and condition of the forest

At the end of 2011 a total of 1,566.4 hectares of Asubima Forest Reserve is under the management of FORM Ghana.



These areas are distributed as follows:

| Planting year | Area (ha) | Portion | Species |
|---------------|-----------|---------|------------------|
| 2001 | 56,40 | 3,6 % | Teak |
| 2008 | 135,70 | 8,7 % | Teak |
| 2009 | 516,00 | 32,9 % | Teak |
| 2010 | 636,20 | 40,6 % | Teak |
| 2008 - 2011 | 222,10 | 14,2 % | Indigenous trees |
| Total | 1566,40 | 100 % | |

From the map and the table it becomes clear how the plantation of FORM Ghana has evolved.

2.1.2 Biological diversity

The monitoring of biological diversity has started with the research carried out within the scope of the Social and Environmental Impact Assessment. In 2011 research on birds, small mammals, butterflies

and vegetation in the buffer zones was done. The results of this study are reported in a specific report available on the FORM Ghana Website (www.formghana.com).

The main findings from this first assessment of biodiversity values are presented here below:

Flora

A survey executed in September 2011 recorded a total of 138 plant species belonging to 47 families (Manu, 2011b). This is an increase compared to the study executed in 2010 by de Laat where 138 plant species of 41 families were identified.

All recorded species by Manu were angiospermae to which 83 species were trees, 18, 7 and 1 species were herbs, grasses and rushes respectively. Shrubs and Lianas (climber) recorded 15 species each. The most represented plant families with between five to eight species were the Euphorbiaceae, Fabaceae, Leguminosae, Malvaceae (Sterculiaceae), Meliaceae, Moraceae and Sapindaceae. Fourteen families were represented by only a single species each. The most commonly occurring plant life-form was tree which made up 60% of the total recorded species. The proportional abundance estimate of trees in the sample plots showed high diversity in the plots (Manu, 2011).

Most common species in the area was York (*Broussonetia papyrifera*), a tree species. *Griffonia simplicifolia* a liana was the second most common species followed by *Chromolaena odorata*, a herb species (Manu, 2011b).

In 2009, the Kokrodua tree (*Pericopsis elata*) was observed in the field by staff of FORM Ghana. Consequently, the seed has been used to produce seedlings and more than 1000 individuals were planted within the buffer zone. The Kokrodua tree is a species listed as endangered on the IUCN Red List and also listed on Appendix II of CITES (IUCN, 2011).

Fauna

Biodiversity monitoring in 2010 and 2011 revealed that several species of medium sized mammals, small mammals, birds, reptiles, amphibians and insects are present in the area. These are discussed below.

Medium sized mammals

During a survey undertaken in 2011 by Quansah, ten medium sized mammal species were recorded all of which were recorded using direct count of tracks, dung and feeding signs. Species encountered were: African brush-tailed porcupine (*Atherurus africanus*), Mona monkey (*Cercopithecus mona*), marsh mongoose (*Atilax paludinosus*), African palm civet (*Nandinia binotata*), bush buck (*Tragelaphus scriptus*), tree pangolin (*Phataginus tricuspis*), Maxwell's duiker (*Cephalophus maxwellii*), African civet (*Civettictis civetta*), Togo hare (*Lepus capensis*) and Gras cutter (*Thryonomys*

swinderianus). Most species recorded are listed as least concern (species with no current identifiable risks) in the IUCN's Red data list of threatened species, while the tree pangolin is nearly threatened and the bush buck, and Togo hare are not even mentioned on the IUCN Red List (IUCN, 2011). The Mona monkey is listed on Appendix II of CITES and on Class B of the African Convention on the Conservation of Nature and Natural Resources. The tree pangolin is also listed on Appendix II of CITES.

Three of the species are amongst the wholly protected species for Ghana – schedule 1 of the Wild Life Laws. These are the Tree pangolin; African palm Civet and the African Civet.

Subsequent monitoring by Manu (2011b) later that year resulted in the identification of fourteen medium-sized mammal species. These were observed through both direct and indirect signs: visual observation and sound recording plus tracks, dung, feeding signs/remnants. All species identified by de Laat in 2010 were recorded, except for the marsh mongoose and the African brush-tailed porcupine. In addition the following species were encountered: warthog (*Phacochoerus africanus*), bay duiker (*Cephalophus dorsalis*), common genet (*Genetta genetta*), western tree hyrax (*Dendrohyrax dorsalis*), striped squirrel (*Euxenus erythropus*) and giant pouched rat (*Cricetomys gambianus*). All are classified as 'least concern' by the IUCN Red List whereas the bay duiker is listed on CITES Appendix II (IUCN, 2011).

Small mammals

During a survey conducted by Manu (2011a) three small mammal species of the family Muridae were recorded in the forest reserve: soft-furred mouse (*Praomys tullbergi*), Multimammate rat (*Mastomys natalensis*) and the Rusty-bellied rat (*Lophuromys sikapusi*).

A subsequent survey in September 2011 by Manu (2011b), showed that in total 12 species were recorded in the area consisting of 6 rodent species, 4 shrew species and 2 bat species: multimammate rat (*Mastomys natalensis*), African pygmy mouse (*Mus minutoides*), soft-furred mouse (*Praomys tullbergi*), typical striped grass mouse (*Lemniscomys striatus*), *Malacomys edwardski*, rusty-bellied rat (*Lophuromys sikapusi*), West-African long-tailed shrew (*Crocidura muricauda*), Crosse's shrew (*Crocidura crossei*), Jouvenet's shrew (*Crocidura jouvenetae*), Olivier's Shrew (*Crocidura olivieri*), Franquet's epauletted fruit bat (*Epomops franqueti*) and little colored fruit bat (*Myonuclearis torquata*). Conservation status of all species is 'least concern' and none are listed under CITES (IUCN, 2011).

Birds

Over the last few years, there seems to be an increasing trend in the number of bird species observed in Asubima FR. The SEIA, executed in 2007, recorded 47 bird species (Abeney et al., 2008). During a survey conducted in 2010 (de Laat, 2011) 77 bird species, belonging to 30 different families, were encountered in Asubima FR. Nearly all birds were typical for savannah vegetation or open woodlands. Five bird species were indicated as uncommon, thinly distributed or endangered: the Bearded barbet, Black face firefinch, Gambaga flycatcher, Ibadan malimbe and Togo paradise wydah.

In 2011, Manu (2011b) found 94 bird species belonging to 32 different families. These are typically savannah species. Five uncommon species were recorded: Togo paradise-whydah (*Vidua togoensis*), Tit hylia (*Pholidornis rushiae*), Western Violet-backed Sunbird (*Anthreptes longuemarei*), black coucal (*Centropus grillii*) and African baza (*Aviceda cuculoides*).

Reptiles: snakes

During a snake survey by Hodoli in 2011, six species were recorded: the grass snake (*Phsammophis sibilans*), the green mamba (*Dendroaspis viridis*), the green snake (*Philothamnus* sp.), the blind snake (*Ramphotyphlops braminus*), the royal python (*Python regius*) and the African rock python (*Python sebae*). Out of these six species, none are red-listed (IUCN, 2011) and the royal python and the African rock python are listed in Appendix II of CITES. This means “they are not necessarily threatened with extinction, but trade must be controlled in order to avoid utilization incompatible with their survival” (CITES, 2011).

Insects: butterflies

Butterflies were surveyed in 2011 by Manu in the Asubima FR and the Afrensu Brohuma FR. In total, 75 butterfly species were encountered of 5 different families. In Asubima FR 61 different species were found.

Conclusion

From these data it becomes clear that species composition in Asubima is more representative for a savannah than for closed forest. With the restoration of the buffer vegetation along the water courses it is hoped this situation will change to a species composition representative for both high forest as well as savannah / teak forest. Through regular annual monitoring data will be collected to follow this development and to eventually change tactics if for example the vegetation in the buffer zones does not change.

2.1.3 Forest health

Analyses of forest health as well as soil erosion are based on measurements taken in the plantation. These measurements are taken in permanent sample plots (PSP), which are established in every compartment. Every year after planting, additional plots are created in the newly planted compartments. The number of plots will therefore increase yearly.

The basic shape of a PSP is a circular plot with a pole in the centre. GPS coordinates of the pole determine the site location. Each sample plot has to contain at least 20 trees. After each thinning the tree spacing changes, therefore the plot size is variable. A plot will have a size of 200, 250, 400 or 500 m². These sizes are chosen for calculation purposes because they are easy to convert to a hectare.

Spread over the plantation a network of circular permanent sample plots will be laid out randomly. The plots will attain a cumulative surface of at least 0.2% of the plantation.

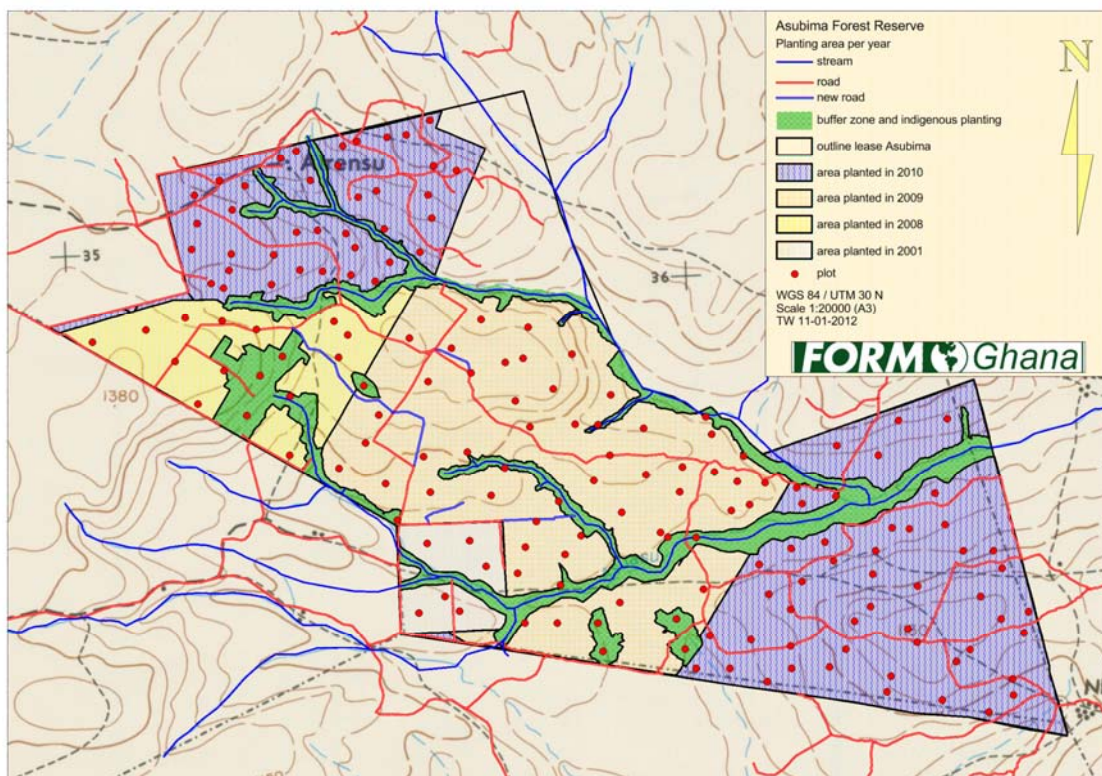
For other commercial species similar activities will be conducted, but the density of the plots will depend on the total surface planted per species.

A total of 168 PSPs have been randomly selected for monitoring plantation growth and performance throughout this area, covering 0.25% of the plantation area for all forest types. In teak plantations the sampling density is 0.26% (see the map below).

Annually, height and DBH (diameter at breast height) of the trees in the plots as well as overall health of the plantation will be measured / assessed.

The measurements to be taken in these plots are:

- Date of measurement
- Tree girth: The circumference of each tree is measured **at breast height** with measurement tape.
- Height: The height of all trees is measured as accurately as possible with a clinometer or a measurement pole;
- Tree health, pests and diseases: it is recorded whether the measured trees are healthy or affected by disease.
- Soil erosion: any visual sign of erosion will be noted (rills, gullies, splash erosion, crusting);
- Undergrowth: A note is written on the amount of undergrowth and the type of undergrowth.



The data from these plots are entered in an Excel sheet.
A summary of the plots for this monitoring activity is presented below:

| Forest type | Plant year | Plantation Area (ha) | PSP Area (ha) | # PSPs | Sampling density |
|-------------------------------------|-----------------|----------------------|-----------------------------|------------|------------------|
| Teak plantation | 2001 | 56.4 | 0.15 | 6 | 0.26 |
| | 2008 | 135.7 | 0.27 | 11 | 0.20 |
| | 2009 | 516.0 | 1.27 | 44 | 0.25 |
| | 2010 | 636.2 | 1.87 | 82 | 0.29 |
| | <i>Subtotal</i> | <i>1344.3</i> | <i>3.55</i> | <i>143</i> | <i>0.26</i> |
| Indigenous plantation | 2008 | 10 | 0.04 | 1 | * |
| | 2009 | 7 | 0.00 | 0 | * |
| | 2010 | 205 | 0.27 | 8 | * |
| | <i>Subtotal</i> | <i>222</i> | <i>0.31</i> | <i>9</i> | <i>*</i> |
| Buffer zone | | | <i>Monitored separately</i> | | * |
| Buffer zone + indigenous plantation | | 222 | | 0.31 | * |
| Total | | 1566.3 | 3.86 | 152 | 0.25 |

In the graph below the average height is compared to the height at various plantation ages taken from the yield table. This allows a comparison of growth speed. It must be noted that the height growth as presented in the yield table is a top height (highest trees from a plantation). This makes the comparison with averages difficult.

| Plant year | N/ha ¹ | % survival | Hdom (m) ¹ | D mean (cm) ¹ | G (m ² /ha) ¹ | V (m ³ /ha) ^{1,2} |
|------------|-------------------|------------|-------------------------|--------------------------|-------------------------------------|---------------------------------------|
| 2001 | 679 (+-181) | | 18.1³ | 16.7 (+- 2.5) | 14.7 (+- 4.4) | 93.0 (+-28.8) |
| 2008 | 1155 (+-236) | 70 | 5.9 (+-0.8) | 3.9 (+- 2.0) | 1.8 (+- 1.7) | 4.1 (+-4.5) |
| 2009 | 925 (+-142) | 84 | 4.0 (+-1.9) | 2.1 (+- 1.8) | 0.6 (+-0.6) | 1.1 (+-1.4) |
| 2010 | 886 (+-178) | 80 | 1.4 (+-1.0) | 0.3 (+- 0.7) | 0.0 (+-0.3) | 0.1 (+-0.7) |

1: The values between brackets are standard deviations of the mean value.

2: V is calculated as $V=N*Hdom*G*formfactor$. Form factors are based on FORM Ghana yield tables for yield classes 2 and 3 (0.36 for plant years 2008-2010, 0.40 for plant year 2001)

When comparing the average growth with the data from the yield tables we see that the growth of the younger plantations seems low. It has to be noted however that estimating the growth of plantation at a very young age is not very accurate. When comparing the mean growth with data from the yield tables it becomes clear that the best performing sites are growing at a speed of 17 m³ / ha / yr. The worse performing parts are growing at a speed of 10 m³ / ha / yr.

Height measurements are currently not reliable, especially for planting year 2001, which needs to be taken into account.

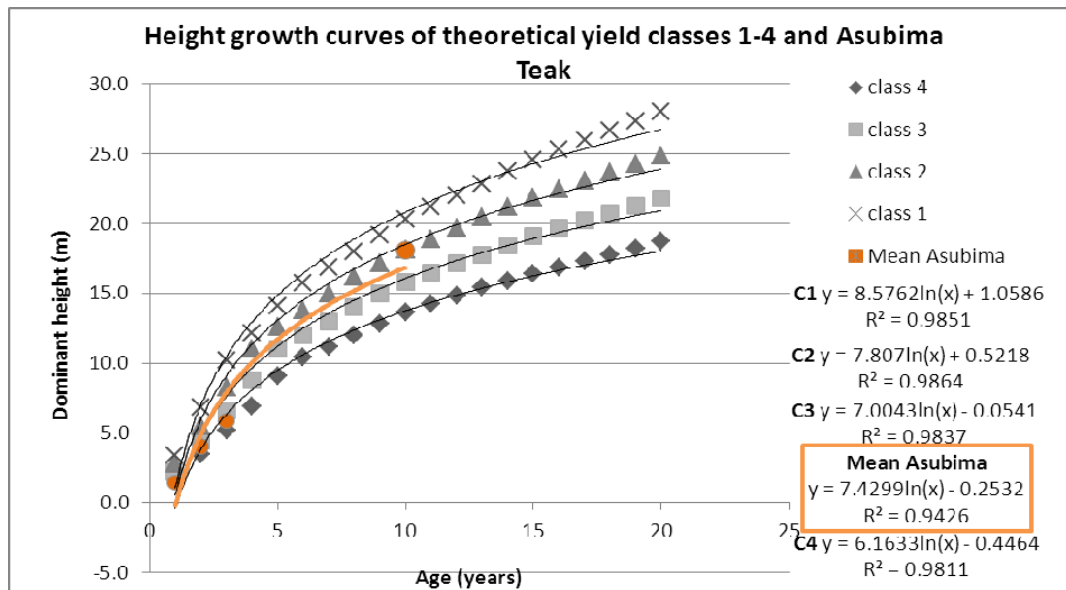


Figure 1: Height growth curves of theoretical yield classes and Asubima teak

2.1.4 Soil protection

On sloped terrain erosion can be a problem, especially on the more sandy soils of Asubima. For this reason we pay special attention to erosions on our roads and in the plantation. Especially in older plantations, erosion can become a problem as the dense crowns can create shade that few understory plants can survive in. By regular and timely thinning this erosion can be kept in check as it stimulated undergrowth.

In the permanent sample plots erosion is checked every time the plot is measured. In February 2010 no evidence of erosion was found in the plantation. Some evidence of erosion was found on the roads and this was stopped by building special culvert ditch runoff breaks.

2.1.5 Water protection

An effort is made to restore the riparian forest. As this forest is now degraded the filtering and protection function of this forest is no longer optimal.

In the table and on the map in paragraph 2.1.3 it is visible that the area managed as natural forest or buffer zone is now increased to about 222 hectares.

During the social en environmental impact assessment water samples were taken and analysed. These samples showed that all water was polluted to a certain extent with silt and pesticides. Now that all agricultural pesticides except round-up are banned and the vegetation restored this situation is expected to change quickly.

The water quality was assessed again in 2011 at strategic points where streams enter and leave the plantation. This way we can see whether the activities of FORM Ghana have an influence on water quality.

Water quality parameters that are measured are:

- pH, Turbidity (FAU)
- Dissolved Oxygen/(m/l)
- Conductivity (µs/cm)
- Dissolved solids
- Alkalinity
- Hardness
- Calcium Hardness
- Magnesium Hardness
- Calcium
- Magnesium
- Chloride
- Nitrate
- Phosphate
- Iron

The data found were compared with maximum values according to the WHO for safe drinking water.

| Characteristic | A | B | C | D | E | F | G | H | I | J | K | L | M | WHO |
|-----------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---------|
| pH | 6.67 | 6.7 | 6.76 | 6.72 | 6.71 | 6.68 | 6.66 | 6.37 | 6.53 | 6.49 | 6.62 | 6.63 | 6.77 | 6.5-8.5 |
| Turbidity (FAU) | 8.75 | 9.36 | 14.58 | 20.54 | 30.32 | 24.52 | 15.10 | 31.50 | 18.43 | 38.26 | 25.01 | 15.31 | 13.45 | 5.0 |
| Conductivity (us/cm) | 68.6 | 74.9 | 74.0 | 74.6 | 71.8 | 71.1 | 80.5 | 67.4 | 44.4 | 49.0 | 66.3 | 75.3 | 51.7 | |
| Temperature C | 26.5 | 26.3 | 26.7 | 26.1 | 25.8 | 26.2 | 25.5 | 25.9 | 25.9 | 25.9 | 27.7 | 25.7 | 25.3 | |
| Apparent / True colour (Hz) | 123.0 | 136.0 | 134.0 | 144.0 | 143.0 | 169.0 | 108.0 | 175.0 | 167.0 | 284.0 | 172.0 | 114.0 | 43.0 | 15.0 |
| Suspended solids | 11.0 | 18.0 | 19.0 | 21.0 | 18.0 | 22.0 | 16.0 | 23.0 | 12.0 | 23.0 | 21.0 | 13.0 | 7.0 | |
| T. dissolved solids | 50 | 50 | 50 | 50 | 50 | 50 | 60 | 50 | 30 | 30 | 40 | 50 | 40 | 1000 |
| Total solids | 61.0 | 23.0 | 24.0 | 26.0 | 23.0 | 72.0 | 76.0 | 73.0 | 15.0 | 53.0 | 61.0 | 63.0 | 47.0 | |
| Dissolved oxygen | 68.2 | 75.0 | 73.8 | 74.8 | 71.9 | 71.1 | 80.6 | 67.5 | 44.5 | 49.1 | 66.3 | 75.2 | 51.9 | |
| Total Alkalinity | 20.0 | 24.0 | 28.0 | 20.0 | 20.0 | 20.0 | 8.0 | 16.0 | 16.0 | 12.0 | 16.0 | 20.0 | 8.0 | |
| Total Hardness | 36 | 20 | 20 | 20 | 16 | 24 | 24 | 20 | 20 | 16 | 24 | 28 | 16 | 500 |
| Caesium Hardness | 8.0 | 8.0 | 8.0 | 4.0 | 4.0 | 8.0 | 8.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 12.0 | |
| Magnesium Hardness | 28.0 | 12.0 | 12.0 | 16.0 | 12.0 | 16.0 | 12.0 | 16.0 | 16.0 | 12.0 | 20.0 | 24.0 | 4.0 | |
| Calcium | 3.2 | 3.2 | 3.2 | 1.6 | 1.6 | 3.2 | 3.2 | 1.6 | 1.6 | 1.6 | 1.6 | 1.6 | 4.8 | 200.0 |
| Magnesium | 6.72 | 2.88 | 2.88 | 3.84 | 2.88 | 3.84 | 2.88 | 3.84 | 3.84 | 2.88 | 4.8 | 5.76 | 0.96 | 150.0 |
| Chloride | 8.0 | 8.0 | 16.0 | 16.0 | 20.0 | 16.0 | 20.0 | 8.0 | 16.0 | 20.0 | 12.0 | 16.0 | 16.0 | 250.0 |
| Nitrate | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.1 | 1.0 | 0.9 | 0.2 | 0.1 | 0.2 | 0.4 | 0.1 | 50.0 |
| Phosphate | 0.38 | 0.40 | 0.30 | 0.40 | 0.72 | 1.00 | 0.26 | 0.32 | 0.30 | 0.40 | 0.42 | 0.36 | 0.51 | 400.0 |
| Iron (total) | 0.2 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.3 | 0.4 | 1.0 | 2.4 | 0.6 | 0.3 |

The data show that the water in the streams is of drinking quality (according to WHO standards) for all factors except iron, colour and turbidity. It shows that the contamination of the water is minimal.

Among the other measures undertaken to maintain water quality, are the upgrading of the old log bridges by replacing them with permanent concrete structures and the change of the road drainage to stop the runoff from going into the streams.

2.1.6 Forest production

The annual cut is determined by the yield models that have been developed for FORM Ghana. To monitor whether thinning and harvesting go according to plan, every year a comparison is made between the planned volumes for thinning and final felling and the realised volumes. Data for all species and quantities are gathered and analysed.

Due to constraints after the initial planting in 2001 of the first pilot piece of plantation, the first thinning which was due in 2004-2005 did not take place. The plantation has continued to grow and trees that could not support the stiff competition have died naturally. The density of the plantation went down from 1111 to a mean density of 790 trees per hectare.

In 2010 a light thinning of misshapen trees has taken place and in 2012 a catch-up thinning will take place to reduce the stem density to about 450 - 550 trees per hectare in the higher growth areas. This way the shock of the thinning is not too big at once.

2.2 Economic aspects

This year only investment has taken place. No sales of timber have been done.

2.2.1 Social benefits

The company has continued to improve the working conditions for the staff. This has resulted in the acquisition and adaptation of more trucks and trailers for the transport of personnel.

FORM Ghana has signed an agreement with the national Health Insurance Company of Ghana, insuring all permanent workers of free access to medical care.

The number of people in permanent employment has risen from 127 in 2010 to 172 in 2011.

The number of people finding casual / contract employment was 400 in 2011 rising from 300 in 2010.

FORM Ghana has contracted a professional nurse to assist people not feeling well or injured in the plantation. The nurse can assess the persons, treat them if it is a simple problem or forward them to the hospital in Akumadan or Techiman. The nurse is also responsible for

the renewal of the first aid training and for checking the contents of the first aid boxes.

During 2011 medical treatment has been issues 1352 times which is more than the 1019 times in 2010. But considering that more people have been working at FORM Ghana the rise is proportionate (0,42 times per worker). In 2010 119 times a sick report was issued for injuries sustained while working, in 2011 this was 30 times.

The main disease encountered is malaria, which occurred 332 times. The next most frequent illness was muscoskeletal pain, which occurred 162 times.

The workers have been trained on various subjects such as the use of phytosanitary products, the application of first aid, fire fighting, nursery techniques, plantation techniques, use of the chain saw and monitoring.

FORM Ghana has signed an intercropping agreement for 2011 with 131 people.

For the lease of Asubima all dues for 2011 have been paid. This means that 15399 Ghana Cedis have been paid as land rent which is shared between the local landowners and the ministry of forestry.

The local population and other interested parties have been kept up to date through the organisation of stakeholder meetings at the nursery (3 times), the FORM Ghana website has been kept up to date and has been improved.

2.3 Social evaluation

In 2011 a social evaluation was performed by FORM Ghana. This evaluation took place during meetings scheduled for the start of the fire season. The idea of the evaluation is to get better acquainted with the people and to get a better idea on how FORM Ghana is perceived by the population. This survey is to be repeated every year.

In order to reduce the people's time needed for this evaluation it has been based on a few relatively straight forward questions which can be answered quickly but give a good insight in the situation of the people and their view of the activities going on.

The main conclusions from the survey are that the people staying in or near the Forest Reserve do so because of their farming activities. The children walk to school or stay mainly with relatives near schools (in town). Many of the people have found either permanent or temporary employment with FORM Ghana which has positively changed their income situation. The type of work they get is usually in weeding or the preparation of planting. Most people perceive the restoration of the forest as a positive activity and already see positive changes in the presence of wildlife.

| No | Questions | Response from the communities | | | | | | | | | | |
|----|---|---|---|------------------------------|---|------------------------------|--------------------------|--------------------------|--------------------------|--|--------------------------|--------------------------|
| | | Yaa-Dansu (ofr)** | Atrensu (fr)* | Nkubem (ofr)** | Libya (fr)* | Joe-Nkwanta (ofr)** | Kennedy Hamlet (fr) | Atinga Village (fr) | 2nd tower Hamlet (fr) | Nsuguasua (ofr)* | Amponsakrom (ofr)* | Meta (ofr)* |
| 1 | How many people live here? | 60 | 40 | 80 | 70 | 500 | 3 | 6 | 3 | 60 | 80 | 120 |
| 2 | How many children are here? | 25 | 15 | 35 | 20 | 200 | 0 | 2 | 1 | 25 | 30 | 45 |
| 3 | How many children are going to school? | 15 | 8 | 15 | 10 | 70 | 0 | 0 | 0 | 8 | 10 | 25 |
| 4 | Where are the children going to school (distance)? | 6 km | Most children stay with other relatives in town | 2 km | Most children stay with other relatives in town | 1.5 km | n/a | n/a | n/a | Most children stay with other relatives in town (15km) | 3km | 0.2km |
| 5 | How many people are working ? | 35 | 25 | 45 | 45 | 350 | 3 | 4 | 0 | 35 | 50 | 80 |
| 6 | What is main occupation of the people in the village? | Farming & animal rearing | Farming & animal rearing | Farming & animal rearing | Farming & animal rearing | Farming & animal rearing | Farming & animal rearing | Farming & animal rearing | Farming & animal rearing | Farming & animal rearing | Farming & animal rearing | Farming & animal rearing |
| 7 | How many people from this village are working for FORM Ghana? | 10 | n/a | 15 | 10 | 70 | n/a | 1 | 0 | n/a | 40 | 60 |
| 8 | How many weeks in the year do they work with FORM Ghana? | 25-52 weeks | n/a | 20-25 weeks | 20 weeks | 25 weeks | n/a | 20 weeks | n/a | n/a | 25 weeks | 25 weeks |
| 9 | What kind of job do the people of the village do at FORM Ghana? | Nursery, weeding, planting & road maintenance | n/a | Planting, weeding & security | Fire-prevention, security | Planting, weeding & security | n/a | weeding | n/a | n/a | Weeding & peg cutting | Weeding & peg cutting |

| No | Questions | Response from the communities | | | | | | | | | | |
|----|---|--|---|---|---|---|--|---|---|--|--|---|
| | | Yaa-Danso (ofr)** | Atrensu (fr)* | Nkubem (ofr)** | Libya (fr)* | Joe-Nkwanta (ofr)** | Kennedy Hamlet (fr) | Atinga Village (fr) | 2nd tower Hamlet (fr) | Nsugwasua (ofr)* | Amponsakrom (ofr)* | Meta (ofr)* |
| 10 | How do you experience the presence of FORM Ghana? | Job opportunity ,increase in income level | Access to Land For Farming (Intercropping) | Job opportunity, access to land for farming (intercropping) | Job opportunity ,increase in income level, access to land for farming (intercropping) | Job opportunity, access to land for farming (intercropping) | Access to Land For Farming (Intercropping) | Job opportunity, access to land for farming (intercropping) | Access To Land For Farming (Intercropping) | The company is improving the forest. Access to land for farming. | The company is improving the forest condition. Access to land for farming. | The company is improving the forest condition. Access to land for farming |
| 11 | How do you perceive the forest here? | Expecting improvement of forest influence on the environment | There is hope for the return of the forest and its benefits | Teak plantation improving forest cover and its benefits | Teak plantation improving forest cover and its benefits | There is hope for the return of the forest and its benefits | The plantation has improved forest condition | The plantation has improved forest condition | There is hope for the return of the forest and its benefits | It provide good conditions for farming | Expecting improvement of forest influence on the environment | High hope of forest returning to normal |
| 12 | How do you perceive the water here? | Source of water not always the best | Water quality not always the best. | Water quality of well is good | Source of water is good | Water quality not always the best. | Source of water is good | Source of water is good | Water quality not always the best. | Not always the best. | Water quality not always the best. | Water quality not always the best |

| No | Questions | Response from the communities | | | | | | | | | | |
|----|--------------------------------------|---|--|---|--|--|--|---|---|---|--------------------------------------|--------------------------------------|
| | | Yaa-Danso (ofr)** | Atrensu (fr)* | Nkubem (ofr)** | Libya (fr)* | Joe-Nkwanta (ofr)** | Kennedy Hamlet (fr) | Atinga Village (fr) | 2nd tower Hamlet (fr) | Nsugasua (ofr)* | Amponsakrom (ofr)* | Meta (ofr)* |
| 13 | Has the wildlife population changed? | Small antelope footprint found and other rodents, grass-cutters and squirrels | Many of smaller rodents, squirrels, rabbits and bats seen. | many of smaller antelopes rodents, squirrel ,rabbit and bats seen | Wildlife population increasing slowing along the buffer zone | Wildlife population improving with the return of wildlife along buffer zones | Wildlife population improving with the return of wildlife along buffer zones | Wildlife population increasing slowing especially along buffer zone | many of smaller antelopes rodents, squirrels ,rabbits and bats seen | Seen some increase in wildlife population | Slow increase in wildlife population | Slow increase in wildlife population |

2.4 Conclusions

From the information provided it is clear that the planting of Asubima has gone quicker than initially planned and that nearly all of the terrain allocated to FORM Ghana has been planted. The area under natural vegetation or indigenous plantation has grown to 222 hectares

Monitoring results for biodiversity show that the vegetation in the buffer zones is quite severely degraded. The animal species found reflect this impression as they are more typical of savannah vegetation than of a forest environment.

The company has also put an enormous effort in improving the conditions for the workforce and in improving the relations with the local population.

The plantation is not growing completely as was expected. Some of the plots fall in an area that grows much better than was expected, but areas with lower performance are also present.

The activities of FORM Ghana have a positive effect on the availability of paid employment in the region. It is perceived as aiding significantly to the restoration of the forest and its various services.