
Monitoring report 2016

Tain Tributaries Forest Reserve



Berekum, 09-12-2016



Elaborated by

Form Ghana and Form international

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1. INTRODUCTION

Management is a continuous process. This means that management will be adapted over time in relation to changes in the field. To keep track of these changes, FORM Ghana applies a system of monitoring in which information is gathered annually. 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 made public to allow interested persons to be informed on the progress of FORM Ghana and the impact its activities has on the people and the environment in Tain II Forest Reserve.

Form Ghana Ltd.,

Willem Fourie

Managing Director

1.1 Plantation monitoring

The objective of Form Ghana is to establish and manage the timber plantation in an ecologically, financially and socially sustainable manner. These management objectives are divided into criteria and for each criterion, a set of measurable indicators are determined as well as the means to verify them (Table 1).

1.2 Monitoring framework

Table 1: monitoring framework

Management objectives	Criterion	Indicator	Verifier	
1.0 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 forest plantation/buffer zone	Map	
		1.1.3 Changes in planted area	Map	
	1.2 Biological diversity	1.2 Biological diversity	1.2.1 Extent of area protected	Map
			1.2.2 Fauna population and diversity in the forest reserves	Report
			1.2.3 Flora diversity in the buffer zones	PSP
			1.2.4 Existence and implementation of procedures to identify / protect endangered, rare and threatened species	Procedures
	1.3 Forest health	1.3 Forest health	1.3.1 Check growth rate of the plantation	PSP
			1.3.2 Check growth rate of the buffer zones	PSP
			1.3.3 Monitoring of fire frequency	Fire report
	1.4 Soil protection	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 erosion	PSP
			1.4.3 Procedures to avoid impact from work in the forest	Procedures
	1.5 Water	1.5 Water	1.5.1 Procedures to protect	Procedures

Management objectives	Criterion	Indicator	Verifier
	protection	forest and vegetation along water courses 1.5.2 Checking of water quality	Sample analyses
2.0 Guarantee financial and economic sustainability through the generation of income from the produced round wood and carbon sequestration	2.1 Forest protection	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
		2.1.4 Calculation of current stored carbon in the buffer zones	Calculation
	2.2 Economic aspects	2.2.1 Cost-Benefit of plantation	Table
		2.2.2 Value of wood sales	Sales data
3.0 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, intercroppers, out growers)	Annual report
		3.1.2 Training and capacity building for employees, intercroppers and out growers	Table
		3.1.3 Information to the public	Website, stakeholder meetings
		3.1.4 Worker health / Accidents on work floor	Statistics

1.3 Monitoring methods

In order to check compliance with the management objectives, Form Ghana has developed a monitoring system consisting of several activities. Different monitoring methods are adopted to optimize verification of different indicators. All indicators are monitored at least once every five years. Specific indicators can be monitored annually or bi-annually.

Each indicator is described in detail in the following paragraphs.

1.3.1 Extent and forest condition

Form Ghana entered into Public Private Partnership with the Forestry Commission of Ghana in 2012 to reforest Tain II Forest reserve. The total land area under the partnership is 14,500 hectares.

Form Ghana has established a total of 4363.1 hectares, with a conservation area of 36.7 hectares, as at the end of 2016. See Appendix 1 for the development of the plantation over time.

Currently, 7.1% of the total planted area consists of indigenous vegetation and is actively being restored into its former state as productive indigenous forest.

Table 2: Stratification of Form Ghana plantations

Planting year	Area Teak (ha)	Area Indigenous (ha)
2013	618.0	19.1
2014	1,904.2	194.7
2015	1,476.4	63.2
2016	87.6	-
Conservation area		36.7
Total	4086.2	313.6
%	92.9	7.1

An inventory has been conducted to check areas that are not doing well and these areas have been subtracted from actual productive areas. The inventory will continue in all other areas under management to ensure unproductive areas are clearly demarcated from productive areas.

The area planted in 2016 has been mostly done as a trial. Form Ghana has collected a number of different provenances from throughout Ghana. These were planted together in a compartment for comparison purposes (blocks A 29 and A 30). The provenances planted were: Bouaké(from Asubima), Wora Wora, Bia Tano (Kihuhwi), Pampawie, Dunkwa, Nsoatre (seeds from the provenance trial) and Jimera (Kihuhwi). Each provenance was planted as a separate block.

In 2015 Form Ghana planted a clonal / provenance trial in Block A 42. This trial is becoming a nice collection of clonal and provenance teak. On this spot we have so far planted clones from Asubima, from Tain provenance trial and from Bia Tano (Goaso) Forest Reserve. Also material from Tanzania (Longuza) and from Brazil (Tectona agroforestal) was planted there). It also contains the same provenances as the other two blocs: Bouaké(from Asubima), Wora Wora, Bia Tano (Kihuhwi), Pampawie, Dunkwa, Nsoatre (seeds from the provenance trial) and Jimera (Kihuhwi).

In the same block a spacing trial using selected clones was planted where the trees were planted at 3X6 meters.

And lastly a trial was planted with 4 different Eucalypts to see how they will do in Tain II. These are Eucalyptus pellita, Corymbia citriodora, Eucalyptus urophylla and eucalyptus dunnii.

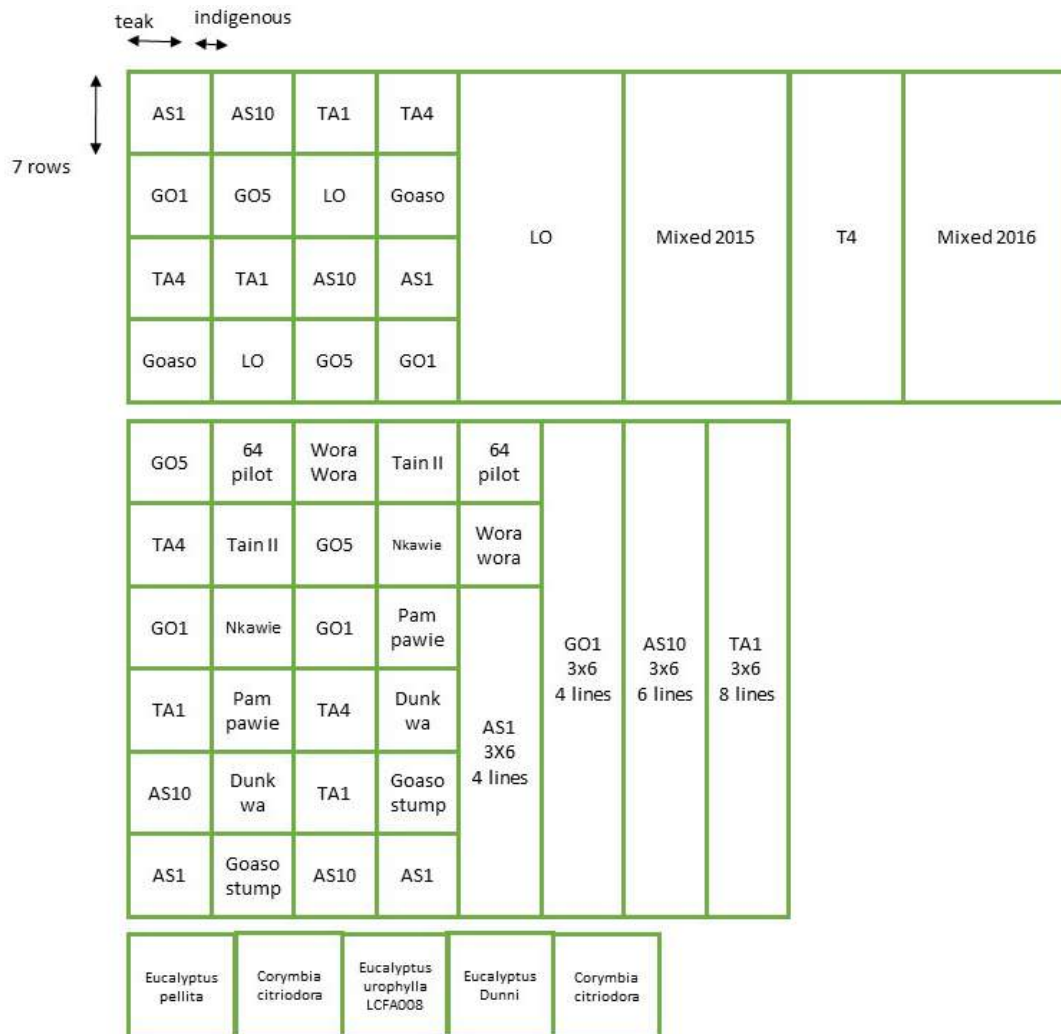


Figure 1: Map of the clonal / provenance trial in block A 42

1.3.2 Biological diversity

No biological monitoring has been conducted in Form Ghana management area in Tain II F/R. Fauna and flora monitoring is expected to take place every 5 years. The initial monitoring was done in 2013. This means that fauna and flora monitoring could take place in 2018.

1.3.3 Forest health

Analyses of forest growth and health as well as soil erosion are based on the PSP measurements taken in the plantation. Every year after planting, additional plots will be created in the newly planted compartments. The number of plots will therefore increase yearly.

PSP monitoring is done according to Protocol 13: Monitoring.

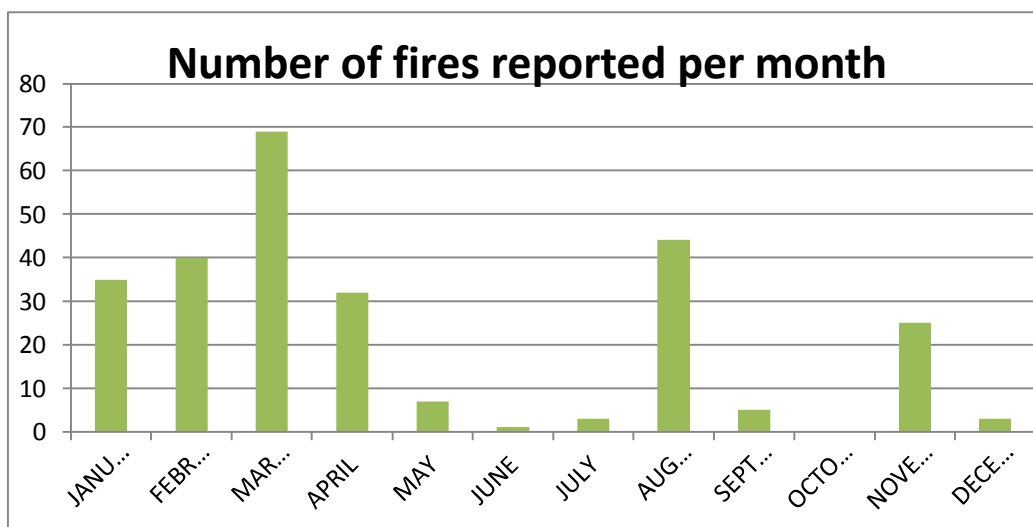
Currently, PSP monitoring has not started in Tain II F/R; it is expected to start in 2017.

1.3.4 Protection against fire

Fire is a great potential threat to the plantations. In 2016, 264 fires were reported by the security team. 231 of these fires were located outside the Form Ghana area. 33 fires were within the Form Ghana boundaries, but could quickly be quenched by the rapid response teams. However, one of these fires caused a devastating effect on the plantation that is, losing about 600 hectares. Fire occurs mostly during the first three months of the year and the frequency of occurrence quickly drops with the onset of rains.

Fire occurrences

Month	Fires outside	Fires inside
January	27	8
February	38	2
March	65	4
April	30	2
May	6	1
June	1	0
July	3	0
August	32	12
September	4	1
October	0	0
November	22	3
December	3	0
Total	231	33



1.3.5 Soil protection

Soil survey is conducted in PSP to check erosion and soil compaction. There are no PSP in the plantation currently; areas prone to erosion are checked frequently. PSP monitoring is expected to start in 2017.

1.3.6 Water protection

Water quality is expected to improve after plantation establishment through reduction in erosion, sedimentation, decreasing turbidity levels. A hydrological study conducted by Tollenaar in 2012 shows that the water quality in Tain II F/R is not suitable for drinking. Tain II F/R is replete with seasonal streams which dry up in the dry season.

The restoration of the 30 meter buffer zones along the water courses is expected to reduce erosion and prevent chemicals/sedimentation of streams. Measurements done at the various sampling points in November 2016 show that; water has a lower turbidity and lower total dissolved solids (TDS). Dissolved solids refer to any minerals, salts, metals, cations or anions dissolved in water. Total dissolved solids (TDS) comprise inorganic salts (principally calcium, magnesium, potassium, sodium, bicarbonates, chlorides and sulphates) and some small amounts of organic matter that are dissolved in water. TDS is an indicator of general quality of the water. High TDS values may be associated with influx of waste-water or agricultural run-off. According to WHO drinking water guidelines, the palatability of water with levels below 600ppm is generally considered to be good. The average conductivity values at all sampling location show the water quality is good. Conductivity shows the presence of heavy metals in water. The value measured at the various sampling station/point shows the presence of heavy metal may be low.

Table 3: data from the water monitoring

Sampling point	PH		Conductivity/ms		TDS		Turbidity		Temperature	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
SP1	6.2	0.1	0.26	0.005	194	3.60	3.35	0.30	24.14	0.14
SP2	6.7	0.3	0.35	0.005	257	2.47	27.50	3.37	24.24	0.25
SP3	8.1	0.1	0.36	0.000	263	0.81	14.77	2.02	28.07	0.26

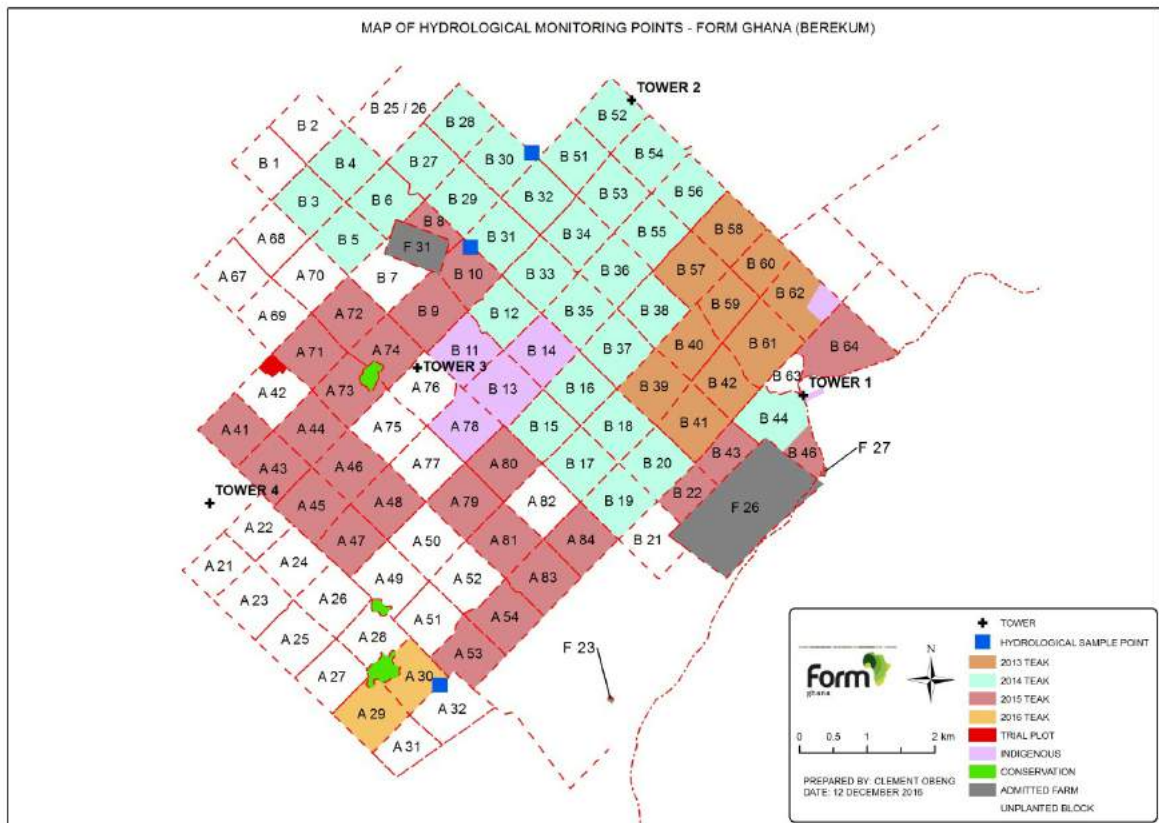


Figure 2: Map of Form Ghana Tain area showing water sampling points (blue squares).

1.3.7 Rainfall

The precipitation in the area was measured at four points in 2016.

- Permanent site
- At fire tower #1 in the North-eastern part of the Tain II forest reserve
- At fire tower #2 in the North-western part of the Tain II forest reserve
- At fire tower #3 in the South-western part of the Tain II forest reserve

The data show that average rainfall has reduced from 2013 to 2016 with highest average figure being 887.70mm in 2014 and lowest average figure being 798.5mm in 2016.

Table 4: Average rainfall in Berekum

P. Site	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
2014	40	0	119	161.9	62	150	40.5	33	53.6	66.6	16.5	0	743.1
2015	0	71	22.4	143.6	115.7	91	66.4	49.2	78.5	240	44	0	921.8
2016	0	10	53	48	90	120	24	34	96	171	15.2	42	703.2
Tower 1	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
2013	0	0	78.8	85.5	148	44	93	10.2	227.5	83	113.5	0	883.5
2014	40	0	119	161.9	62	179.5	79	109.5	119.4	157	5	0	1032.3
2015	0	72	63.5	109	98.5	56.1	17	96	108	158.74	23	0	801.8
2016	0	0.1	17	55	115	57	52	22	197	138	16	35	704.1
Tower 2	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
2015	0	60	75	114	172	37	71.7	114	131	204	15.7	0	994.4
2016	0	0.3	61	125	198	115	75	23	199	56	37	30	919.3
Tower 3	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
2015	0	70	41	117	164	65	46.5	64	84.2	155	16	0	822.7
2016	0	0.3	60	81	109	187	37	5	164	98	69	57	867.3

1.3.8 Forest production

There has not been any commercial thinning as at 2016. No monitoring and calculations have been done to establish the carbon content of the plantation.

1.4 Economic aspects

There have been no sales of forest products as at 2016.

1.5 Social benefits

Social monitoring was conducted to assess the impact of Form Ghana's operations on the surrounding/fringe communities and below is the outcome of the survey:

Table 5: results from social survey

Number of Inter- cropping agreement	In 2016, a total of eight (8) new farmers were registered adding on to the previous of 528 making a total of 536. This will however be renewed early next year to get the active number in and around the plantation.
Results of Social Survey	<p>Positive Impacts:</p> <ul style="list-style-type: none"> • Employment for community members: permanent (155), casual and contract workers (370) • Reduction in and control of wildfire outbreaks • Good roads easing transport of farm produce • A relatively high number of farmers in the communities around the reserve have been allowed to farm thus reducing unemployment and increasing standard of living. <p>Expectations:</p> <ul style="list-style-type: none"> • In all the communities visited, they all had at least a common anticipation and that is, support for the Fire Volunteer Squad through the provision of kits. • Some also suggested that, farmers who are still farming in an area within the plantation after a year or two should be encouraged or motivated with at least boots and/or cutlasses. • Some community members (quite a distance from the current project area) also want to be employed. • The road from the plantation through the Tain River to the community to be maintained in good condition (Asantekrom, Arkokrom and Meremano). • Farmers want a tractor with a dehusking machine and a storehouse (Kotaa). • Farmers request for assistance in-terms of chemicals for farming. <p>Concern:</p>

	<ul style="list-style-type: none"> • Form Ghana still burns to create fire belts even after the declaration of “Cease Fire” by the Fire Service • They are not informed when Form Ghana is burning the belts and as such cannot tell whether it’s controlled or being set by other people. This could endanger both parties.
Social Projects/interventions	A total of 35 boots and 35 cutlasses were donated to assist Fire Volunteers; 25 to the Fire Service and 10 to Kotaa community.

1.5.1 Information to the public

Three stakeholders’ meetings were held in Berekum in 2016. The main subjects discussed at the first meeting were; fire in the plantation, Form Ghana’s activities, and social issues. The last two meetings were basically about fire protection in the plantation/forest reserve.

Besides the stakeholders’ meeting, several community and farmers’ meetings were held to discuss about intercropping activities and fire education.

Form Ghana has signed an intercropping agreement with 536 farmers as at the end of 2016. The number is expected to increase as plantation establishment continues.

1.5.2 Training and capacity building

Fire education was given in and around the Form Ghana areas. As the use of fire has become part of their lifestyle, all communities were advised to use fire with great caution. Community members were advised not to leave any fire unattended even before leaving farms for their homes. Recalcitrant members are to be reported to the appropriate authorities for sanctioning redress. Form Ghana assists farmers to burn their farms during land preparation in what FG calls the “Farm Land Incineration Aid”.

In general, the communities expressed great appreciation for the collaboration during the yearly fire education program in the communities and also promised to keep fire out of the communities and the forests.

Workers and management of Form Ghana have been trained on various subjects such as the sustainable forest management, the application of first aid, health and safety, firefighting, nursery techniques, plantation techniques, use of the chain saw, monitoring, GIS mapping and FSC.

Table 6: trainings were provided in 2016.

Training	Date	Number of people
Social monitoring	16-01-2016	2
Quality control	24-02-2016	4
Chemical weeding using Knapsack	3-04-2016	23
First aid and envenomation by snake	1-04-2016	20
Vehicle safety checks and inspection	22-04-2016	14
Stump harvesting	25-04-2016	49
Planting–Teak and indigenous	26-04-2016	20
Planting-Teak	3-05-2016	120
Thinning	16-05-2016	10
The Ten Commandment of Good Safety Habit	5-07-2016	155
FSC and waste management	12-07-2016	16
Seven common accident causes	13-07-2016	155
Good personal hygiene	19-07-2016	155
Boils	27-07-2016	155
Nursery monitoring	28-07-2016	4
FSC	29-07-2016	14
Conjunctivitis	12-08-2016	155
HIV/AIDS awareness counseling	17-08-2016	14
Dehydration	18-08-2016	155
Minimizing the spread of flu	23-08-2016	155
Malaria	13-09-2016	155
Domestic fire	22-09-2016	155
Fire tower hygiene	24-09-2016	18
First aid	26-09-2016	155
Chemical weeding using Knapsack and mankar	27-09-2016	18
How to stop bleeding and bandaging	28-09-2016	155
HIV/AIDS awareness	30-09-2016	155
Sustainable commercial reforestation management	10-10-2016	19
How to operate bakkie-sakkie	14-10-2016	19
FSC Protocol	31-10-2016	9
Forest fire fighting	14-11-2016	21
Headache	16-11-2016	155

Training	Date	Number of people
Cough	24-11-2016	155
Grievance redress mechanism	25-11-2016	155
Forest fire fighting	28-11-2016	77
Dehydration	30-11-2016	155

1.5.3 Size of the workforce

Form Ghana employed permanent and casual workers from local communities in the Tain II area for land preparation, firefighting and planting activities.

Table 7: Number of workers employed by Form Ghana

Year	Permanent workers	Casual workers	Total
2014	159	650	809
2015	173	333	506
2016	155	370	525

1.5.4 Worker health / accidents on the work floor

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

An onsite professional nurse assists 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 Berekum.

The nurse is also responsible for the renewal of the first aid training and for checking the contents of the first aid boxes.

Table 8: Dispensary use per person/worker

Medical treatment	2539
Number of people	1986
Treatment/worker	1.3

During 2016, medical treatment has been issued 2539 times in Berekum. The number of treatments per person is 1.3 times.. The main disease encountered on malaria. After malaria (429), most treatments were given to people with musculoskeletal pain (422), cough (332), headache (294), stomach (264), wounds (119), and diarrhea (136). Typical work related injuries were reported 127 times mainly cut and leg swelling resulting from slipup.

1.6 Conclusion

- The annual rainfall was highest (887.7mm) in 2014, decreased in 2015 (885.185mm) and decreased again (798.48mm) in 2016.
- Form Ghana's operations have had positive impact on the fringe communities.
- The results of the hydrological monitoring show that water quality will improve over time after the establishment of buffer zones.

Appendix 1: Form Ghana Planting Years Map- Tain 11 F/R

