

Evaluation of the Process of Forest Logging Inventory According To the Existing Practiced in Cafeco

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ABSTRACT

The present study on the evaluation of the process of forest logging inventory practiced in CAFECO (Cameroon Agricultural and Forest Exploitation Company) was carried out between February 2013 to June 2013 in the forest management unit (FMU) 11005; Annual logging unit (ALU) 2.4 with the specific objectives of bringing out the different stages and activities of forest logging inventory process observed in the field by CAFECO, then the different stages observed were compared with the existing norms practiced (logging inventory standards and order 0222 of 25 May 2001) in Cameroon and FSC (Forest Stewardship Council).

Data was collected using the triangulation method which involved field observation, documentary review and field interview within the study area.

Result reveals that the logging inventory process observed in the field was in conformity with existing norms practiced in Cameroon. This is due to continuous training of the logging inventory workers and the direct implementation of logging inventory and FSC standards. Despite these conformities, weaknesses were observed such as the marking of 2 timber species of *Amphimas ferrugineus* and *Azelia africana* below minimum logging diameter, the lack of buffer zones between the KORUP national park and ALU 2.4, the differences in surface area of ALU 2.4 between management plan and the field by 50 hectares which was due to lack of consciousness and negligence. The strict respect of logging inventory standards and FSC standards will ameliorate logging inventory process in FMU 11005.

Keywords: CAFECO, FMU 11005; ALU 2.4, Logging inventory process, Logging inventory norms.

INTRODUCTION

Forest logging inventory is the assembly of operations of identification, marking, counting, the positioning of logging trees, mapping of ALU (Annual logging unit) for logging, and the planning of forest logging activities NICOLAS (2002); An inventory is important for sustainable forest management which is the "Development that meets the need of the present without compromising the ability of the future generations to meet their own needs." WCED(1987); Forest logging inventory forms the basis of sustainable forest management and certification and also the first step of forest traceability NICOLAS(2002); The Cameroonian legal and institutional framework demonstrates the government's commitment to biodiversity conservation, as do the signing and/or ratification of many bilateral and multilateral international agreements, ministerial orders and cooperation agreements EBA'A., (2009); Logging inventory is the departing point of sustainable exploitation, so it is very important in the planning and follows up of the activities of forest exploitation.

The method used during the inventory process if not efficient can cause serious problems in the traceability process of the forest product or can cause bad estimation of the potentiality of the forest if the implementation of the said method is not sustainable. It can further lead to the withdrawal of the forest certification certificate Anonymous (2012a); Most forest companies and forest owners in Cameroon do not strictly follow the appropriate method or even do not conduct or carry out logging inventory at all before exploiting the forest. This prevents them from being certified.

The general objective of this study is to evaluate the process of forest logging inventory according to the existing norms practiced in Cameroon, using the case of Cameroon Agricultural and Forest Exploitation Company (CAFECO)

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Specific objectives are to:

- bring out the different stages and activities of forest logging inventory process observed on the field by CAFECO;
- compare the existing norms practiced in Cameroon with those observed on the field by CAFECO to bring out the weaknesses;

REVIEW OF THE DIFFERENT STAGES OF FOREST LOGGING INVENTORY ACCORDING TO FOREST LOGGING INVENTORY STANDARDS (LIS)

Delimitation of Annual Logging Units (ALU)

Its personnel consist of 10-12 persons comprising of:

- One compass man; He uses the compass and GPS to show direction and orientation of transects.
- Five cutlass men; They use cutlasses to open the width of transects.
- One chainman; He uses clinometers and 25 meter (m) cable steel to measure the distance, degree of steepness of the slope and also fill the chainers recording form.
- One assistant chainman; He places pegs along transects after measuring the distance and also after slope correction has been effected.
- One carrier of food and water; He carries water and food for logging inventory workers.
- One carrier of medications and first aid box; He carries first aid box for logging inventory workers.
- One driver; He transports logging inventory workers.

as they advanced with the logging inventory process in the field. The delimitation of the ALU involves the opening of transects with the help of a compass and GPS, by clearing off all non protected trees, lianas and any other vegetation below 15 centimeter (cm) in diameter using cutlass. Transect of width 2m is opened with respect to the limit of ALU. 2m and 5m are opened with respect to the limit of FMU for permanent and non permanent forest domain respectively following the boundaries description in the management plan. Also putting all the points of the limit and marking the entire limit with red paint so that it should be visible. Expected output per day is 2-3km/day.

Prospection work

Transect Opening

The personnel consist of 8-9 persons comprising of:

- One compass man; He uses the compass and GPS to show direction and orientation of transects.
- Five cutlass men; They use cutlasses to open the width of transects.
- One carrier of food and water; He carries water and food for logging inventory workers.
- One carrier of medications and first aid box; He carries first aid box for logging inventory workers.
- One driver; He transports logging inventory workers.

Transect opening consist of tracing lines on the field as indicated by the cartographic map of origin, he note the topography, hydrography and others aspect which will help in the elaboration of prospection map. With the help of a compass and GPS the starting point is located using the map, identifying a point that cannot easily be displaced. From here access transect is traced which eventually lead to the tracing of other transects.

This operation consists of cutting with the help of a cutlass all the young trees lianas, branches and vegetation that obstruct the passage below 15cm in diameter by opening a transect of width of 2m with respect to the limit of ALU, 2m and 5m are opened with respect to the limit of FMU for permanent and non permanent forest domain respectively then implanting pegs after every 50m which delimit and identify each counting unit. Transects will constitute a reference system to the counting team. The width of each transects is 1.5 to 2 m North- South and 1 to 1.5 m West-East. Expected output per day is 2-3km/day.

Chaining

It personnel consist of 3-4 persons comprising of:

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- One chainman; He uses clinometers and 25 m cable steel to measure the degree of steepness of the slope and also field the chainers recording form.
- One assistant chainman; He places pegs along transects after the distance has been measured and also after slope correction has been effected.
- One carrier of food and water; He carries water and food for logging inventory workers.
- One carrier of medications and first aid box; He carries first aid box for logging inventory workers.

Chainman uses 25 m cable steel to measure the distance after every 50 m and uses clinometers to effect slope correction when it exceed 7.5% this is done after every 50m (the degree of steepness is taken at every 25+25meter). From one North –South transect to another North –South transect is chained from the East-West transect that is after every 1000m. While from one East –West transect to another East –West transect is chained from North –South transect that is after every 250m. The limit of the ALU whether at the starting or end of transect it has to be indicated by a peg and the commutative distance written on it. The chainman record the distance, topography, hydrography on the recoding form. Expected output per day is 2-3km/day.

Counting

Its personnel consist of 10-12 persons comprising of:

- Six prospectors; they identify and used gallon circonférentiel to measure the diameter of each timber species identified.
- One pointer; He records the different timber species and numbers of stems of each species and their corresponding diameters identified, on a pointers recording sheet.
- One cartographic recorder; He records the different timber species and numbers of stems of each species and their corresponding diameters identified, on a recording sheet and also records water bodies, swampy zones, slopes, rocks, Villages path, particular interest site (sacred site, protected zone) and young trees.
- One carrier of food and water; He carries water and food for logging inventory workers.
- One carrier of medications and first aid box; He carries first aid box for logging inventory workers.
- One driver; He transports logging inventory workers

It consists of the counting of all exploitable timber species in each counting unit. A counting unit measure 250m North- South and 1000m West- East. In each counting unit 6 prospectors cover 2 bands of 125m width, to and back simultaneously. Each of the 6 prospectors has to give a distance of 21 m, this permit intelligent communication in the forest. The DBH is measured at 1.30m from the soil with a gallon circumferential and the result is recorded in a counting recording sheet. The numbering of exploitable timber species by the prospector is marked by letter “v” this mark is done with a cutlass. Expected output per day is 2blocks/day.

Auxiliary Team

The auxiliary team is composed of:

- One cook; he prepared food for the other workers.
- One assistant cook; he assist the cook to prepared food for the other workers.
- One driver; transport logging inventory workers

MATERIAL AND METHODS

Study Area

The Forest concession which constitute Forest management unit 11005(formed from two blocks UFA 11005A and 11005B) is located in then, Eyumojock Sub- Division in the Manyu Division of the South West Region of Cameroon. It is represented on the cartographic map 1/200000.

- FMU 11005A is located on latitude $5^{\circ} 18'$ and $5^{\circ} 49'$ N and Longitude $8^{\circ} 49'$ and $9^{\circ} 07'$ E
- FMU 11005B is located on Latitude $5^{\circ} 21'$ and $5^{\circ} 34'$ N and Longitude $8^{\circ} 56'$ to $9^{\circ} 07'E$. It is bordered to the North by Eyumojock, KORUP to the south and in the East and West by the Ejagham Villages. Inside this FMU is located ALU 2.4. (Fig.2) below shows us the map of the FMU 11005 as well as ALU 2.4.

Material

Material for the realization of this research work include;

- FSC norms for Congo basin;
- summary of the management plan and FSC approach for FMU 11 005;
- logging inventory standards (LIS) edited by the government;
- order 0222 MINEF of 25 may 2002;
- GPS;
- Compass;
- Camera.

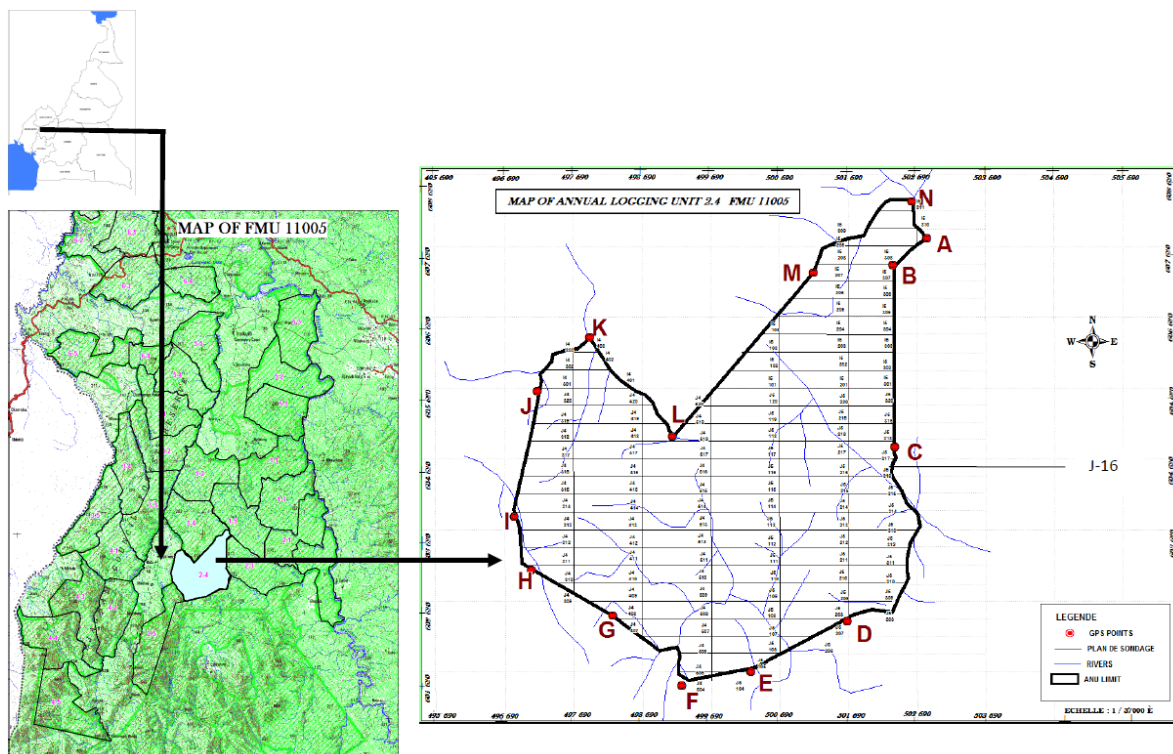


Fig2. Map showing area of study.

Methods

The triangulation method which is the means of verification of multiple sources was used. This is illustrated in (Fig.3)

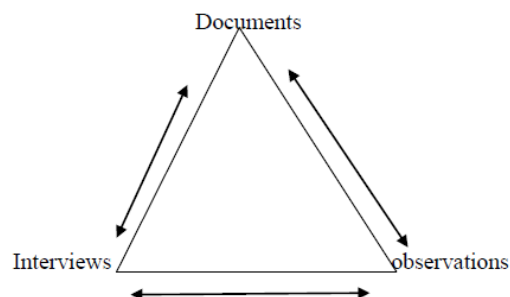


Fig3. Diagram showing the triangulation method.

Source: SAVOIE (2000);

Documentary Review

- Amongst the document reviewed was the Management plan for FMU 11005, checked in order to verify the different types of timber species to be harvested by CAFECO, to confirm the different

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minimum logging diameter, to verify the passage permit for logging in the management blocks and to verify the procedure for the protection of plants and animal species;

- Technical document of the annual logging unit 2.4. was consulted to know the different number of transects to be opened, the different number of blocks, and the description of the limit of ALU 2.4;
- Recruitment document showing the recruitment of workers from neighbouring villages and to verify if they satisfy the ILO requirements;
- Logging Inventory Standards (LIS) by ONADEF was consulted to compare with what will be implemented in the field;
- Document on safety and security measures at work was viewed to see if it satisfy all legal requirement on working condition standards;
- Documents showing procedure for first aids treatment of workers and waste treatment generated during logging inventory;
- FSC manual for FMU 11005 was consulted to know the procedure put in place for the implementation of logging inventory norms by CAFECO in the field.

Field Observations

This involved an examination of the field site and the validation of the documented management system. The reference list and their different diameters were observed to compare it with DME/ADM of the different timber species identified.

On the field, GPS and compass were used to verify the accuracy of

- the orientation of the transect;
- width and distance of each transect;
- The limit of the annual logging unit.

This was to see whether it was in compliance with the management plan and technical document.

The different materials used during logging inventory and how the counting was being implemented was also observed to compare it with logging inventory norms; composition of each team was observed to verify if they are in compliance with logging inventory norms.

The workers camp were observed to examine the treatment of waste generated, quality of food provided to the workers, the location, how the camps were build, and different basic hygienic measures if they were suitable for habitation.

Security equipment that is individual protection equipments (EPI) of the workers were observed to verify if they were complete to prevent accident.

The output of workers per day was observed to verify if the process was cost efficient.

Interviews

A total of 26 questionnaires were administered to the logging inventory workers to know if they came from the neighbouring villages, to know the level of experience, efficiency, accuracy of his team, composition, to know their various ages, to know the state of individual protective equipments, to know the output they are expected to produce per day, to verify if they are over laboured, to verify if they eat well, comfortable and satisfied with the job, to know if first aid treatment is being administered to them when they are injured and also know how poaching activities are managed in the ALU 2.4.

The forest manager was interviewed to know the movement of the traceability tickets put in place during logging inventory.

An analysis of data collected during this survey was undertaken using a number of computer programs. Data was entered and managed using, graph and charts which were produced using excel.

RESULTS

Implementation of Logging Inventory Process By Cafeco

Delimitation of the ALU

The delimitation of the ALU was done with all the inventory team (26 persons) as they progressed in the field with the help of a map of the ALU, GPS and Compass. All the points on the limit of ALU

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from point A- N were located and marked with red plates indicating their corresponding points. Points which indicated the limits of the ALU(ALU limits point A,B,C,G,H,I,K,L,M,N) transect were opened at a width of 2m, by clearing off all the vegetation with diameters less than or inferior to 15 cm with the exception of the protected plant species. Points which indicated the limits of the FMU (FMU limit point F, E.D.J) transect were opened at a width of 5m, by clearing off all the vegetation with diameters less than or inferior to 15 cm with the exception of protected plant species. The limits were marked by a red paint. Total surface area of the ALU was (2222 HA).Output per day was 2-3½km/day.

Transect Opening

During the transect opening, the team was divided into 3 groups composed each of five persons:

- One compass man;
- One head cutlass man;
- Three assistant cutlass men. In totality the transect team was composed of fifteen persons. With the help of a compass man and a cutlass man, the base transect was located, which was transect J16 and a peg was implanted in the position with the distance marked by a red paint. This operation consisted of cutting with the help of a cutlass all the young tress lianas, branches and vegetation that obstruct the passage below 15 cm in diameter by opening a transect of width of 2 m with respect to the limit of ALU and 5 m with respect to the limit of FMU. The transect team advanced by 1000 m using the orientation East-West and North-South. Transect was opened by 1.5 m width and pegs were implanted after every 25metres, with intermediate pegs implanted after every 50 m. The pegs indicated the corresponding distancescovered. All transects that were opened were the continuation of the previous ALU2.3. A total of 33 transects were opened.

In the interior of the East-West and North-South transects square blocks were created which constituted transect trace by 250m orientating (North-South) and 1000m orientating (East-West), a total of 116 blocks were created with a distance of 1.5m separating each block. A line called “Virei” in the East West direction was opened i.e. advanced by 1000m. Also, it is just a line of about ½ meter to facilitate counting.Out put per day was 2-3½km/day.

Chaining

It was composed of two persons:

- One technician (chainman);
- One Chainman helper.

The technician used an instrument called Clinometers for slope correction and a cable of 25 m to measure distances. The North South transect was chained from East West of base which started at point O to the North limit and point O to the South limit. The two distances were added to give the total distance of 1 N.S that has been chained. The same process was repeated for NS 1, NS2, NS3, NS4, NS5, and NS6.The East- West transect was chained between 2 North - South and it started from East to West. But at the limit, the East end of the North South was chained towards the limit East and the West end of the North South was chained towards the limit West.

The peg that was implanted during transect opening was used by the chaining team to write the corresponding distances on it that is every 50 m in the junction N-S, E-W five Pegs was implanted the middle peg indicated the corresponding distances of N-S, E-W while the four other pegs indicated each of the corresponding blocks and their numbers written on it with a red paint. The chainman took record of the slope, forest stratification, water body and swampy zone on an inventory sheet and consequently, slope correction paper was used to correct the distance measured which gave the real distance.

Counting

It was composed of seven persons:

- Five prospectors;
- One cartographic recorder;
- One pointer.

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The counting team advanced along the length of the blocks. The blocks were divided into two parts by a line called, “Viree”. (Fig.4) below shows how the prospector advanced first on one section of each blocks when opening the blocks and on the other section when closing the blocks. Each section measure 125m. out put was 2-3 blocks/day.

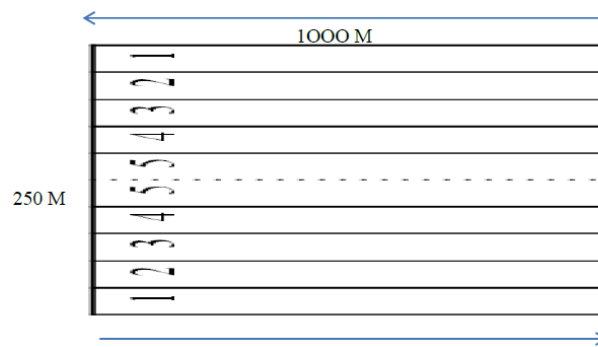


Fig4. Evolution of prospection team

Legend

1, 2, 3, 4, 5 Prospectors

- Vire
- ↑ Opening of block
- ↓ Closing of block

The prospector identified the required timber species using the reference list by measuring the diameters of the timber species with the instrument “pied à coulisse” this is illustrated in (Fig.6) at 1.3m after the trunk as they evolve in the same manner and speed. From the 6000 stems of different timber species identified, 3120 stems constituting 52 %, had their logging diameters measured with the instrument “pied à coulisse”.While 2880 stems of different timber species identified constituting 48 % had their logging diameters from mere estimation. This is illustrated by (Fig.5) below.

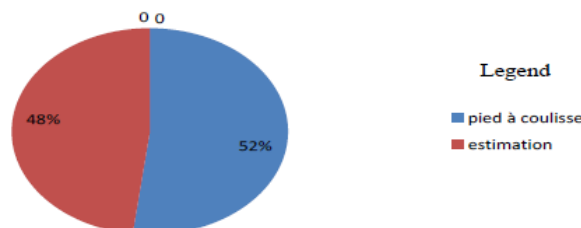


Fig5. Measuring the DBH of timber species either with “pied à coulisse” or mere estimation

Timber species identified were immediately communicated to the pointer and the Cartographic recorder who took them down respectively on the prospector record sheet. The trees were identified according to the reference list and the counting diameter. The prospectors communicated the following the MLD, quality ,water body, swampy zone, slopes, rocks, Villages path, particular interest site (sacred site, protected zone) and young trees to the pointer and to the Cartographic recorder.



Fig6. Measuring the DBH of *Staudtiakamerunensis* with “pied à coulisse”

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Traceability tickets were placed on it as low as possible on the identified timber species. The first parts of the tickets were removed and were taken to the office for control. Also future trees of *Lophira alata*, *Erythroleum ivorense* and *Cylicodiscus garbonensis* illustrated in (Fig.7) were also identified and a yellow tissue tied round the tree and it was recorded on the pointer and cartographic recorder filling sheet.



Fig7. Protection of future tree of *Lophira alata* with a yellow tissue

Camping

On the field 7 camps were build and 26 beds using young woods and plastic bags as illustrated in (Fig. 8). These plastic bags got burst doing heavy rain fall and the workers were wet as well as their beds. The camps were located in area were there were no dead wood or large woods and near a water body.



Fig8. Camps of logging inventory workers.

Waste Management

The camps were swept every day. The waste that was generated was non degradable waste (plastic, batteries, medical waste), and degradable waste (remains of food particles). Degradable waste was disposed in the forest in a particular location, while non degradable waste was separated and put in different bags for evacuation to Mamfe, which was later taken to Douala for treatment and disposals as illustrated in (Fig.9) below.

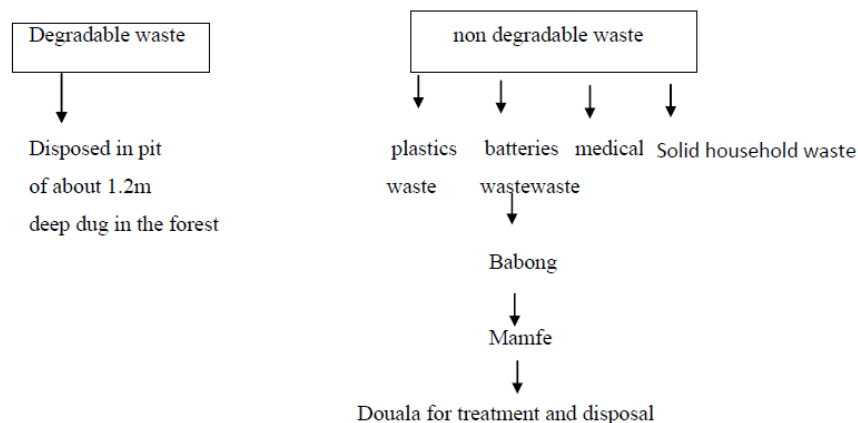


Fig9. Waste Management system during logging inventory process.

Recruitment of Workers

There were two types of workers permanent and daily workers, of the 26 workers in the logging inventory process, 10 workers (38.5 %) constituted Permanent workers who were in charge of the technical aspects, daily workers were made up of 16 workers (61.5 %) they were mainly labourers as illustrated in (Fig.10) below. The permanent workers did not come from the villages around the FMU while the daily workers came from the villages around the FMU.

The ages of the workers were 20 years and above and it was in their owned will to work in the logging inventory process.

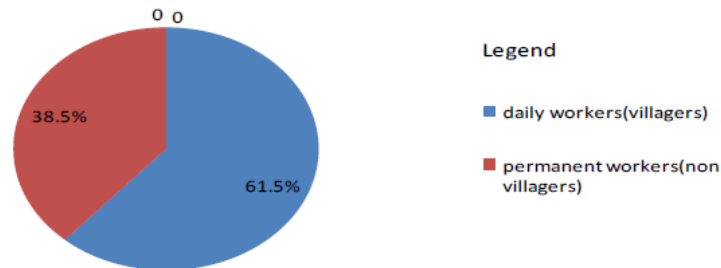


Fig10. Recruitment of workers during logging inventory

Security Measures

Each worker was given individual protection equipment (EPI) such as boot, gloves caskets and touches as illustrated in (Fig.11) below to be used during the night. The workers were not allowed to walk in the night and alone this was for their owned security and safety.

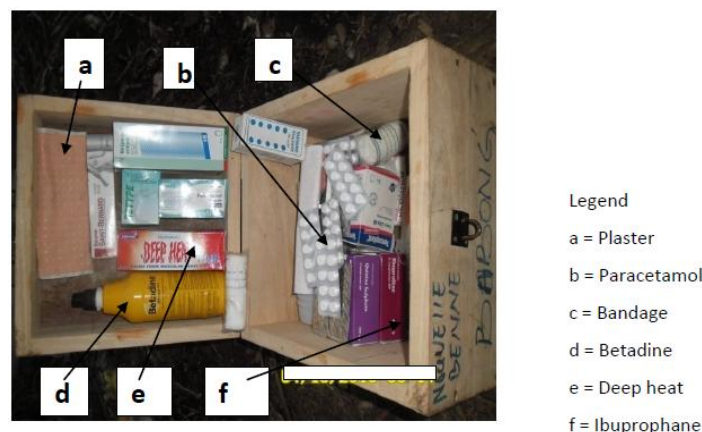


Legend
a = Casket
b = Boot

Fig11. Logging inventory workers with individual protective equipments

First Aid Administration

There was the presence of a first aids box (Fig.12) that contains different medication to treat injured persons. In the box contained drugs like Paracetamol, Ibuprophane, Quinine Sulphate, Beta dine, Plaster and Gauge. There was a person in charge to treat injured workers he had been trained on how to administer first aids to injured workers. There were three cases were the injured workers were taken to the general hospital in Mamfe.



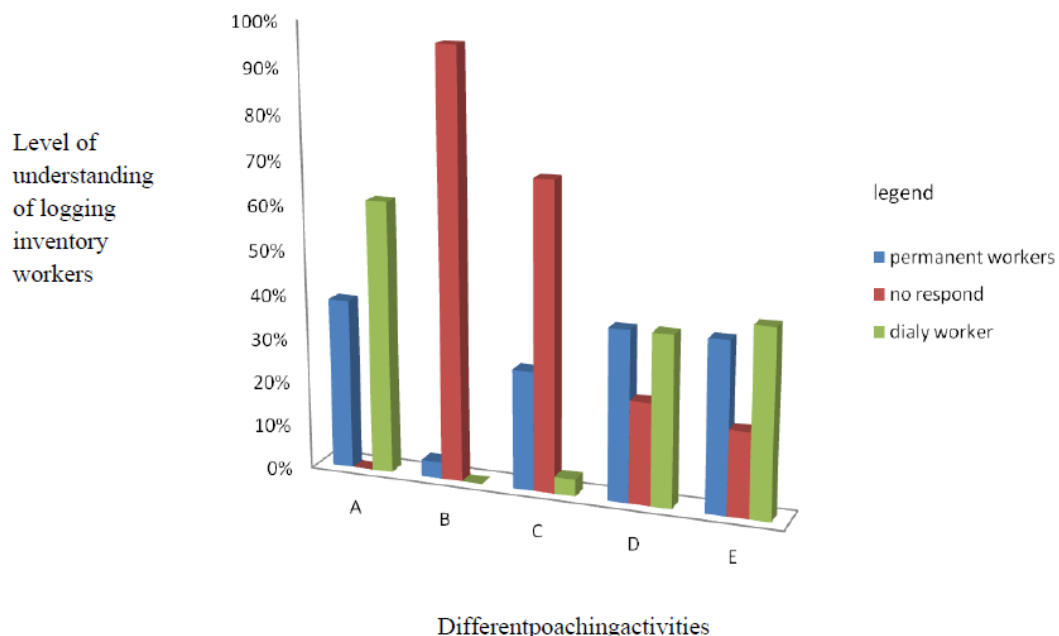
Legend
a = Plaster
b = Paracetamol
c = Bandage
d = Betadine
e = Deep heat
f = Ibuprophane

Fig12. First aid box of logging inventory workers

Poaching Activities in the ALU During Logging Inventory Process

With regards to poaching activities by the villagers, gun shots were heard at night and animal screening. Used bullets were seen and traps made with iron and other metallic materials were discovered. We also noticed a decaying deer caught in a trap. This shows that the villagers are doing illegal poaching/hunting by respecting the 1994 forestry laws.

There was no poaching observed by the inventory workers. Also from the questionnaires administered to the logging inventory workers to know their level of understanding about poaching/ hunting activities during logging inventory process, it shows that 38.5 % (10 persons) of permanent workers and 61.5% (16 persons) of daily workers gave positive responds to the views that the killing of wild animal is poaching/hunting. 3.80 % (1 person) of permanent workers gave positive responds to the views that buying of wild animals during logging inventory process is poaching/hunting while 96.20 % (25 persons) of logging workers gave no respond. Regarding filming of wild animal for commercial purposes during logging inventory process 27 % (7 persons) of permanent workers and 3.80 % (1 person) of daily workers gave positive responds to this view, while 69.20 % (18 persons) of logging inventory workers gave no respond to this view regarding the filming of wild animal for commercial purposes during logging inventory process. 38.50 % each of permanent and daily logging inventory workers (20 persons) gave positive responds to the view that hunting in reserve near logging inventory unit is poaching/hunting while 23 % (6 persons) gave no responds. Concerning capturing of wild animals and the use of prohibited weapons and vehicles 38.50 % (10 persons) of permanent workers and 42.30 % (11 persons) of daily workers responded positive to this view, while 19.20 % (5 persons) of logging inventory workers gave no responds..



Legend

A= Killing of wild animal

B= Buying of wild animals during logging inventory process

C= Filming of wild animal for commercial purposes

D= Hunting in reserve near logging inventory unit

E= Capturing of wild animals and the use of prohibited weapons and vehicles

Fig13. Views of logging workers to know their level of understanding on hunting/poaching during logging inventory process.

Food Stuffs

Food stuff was provided to the field worker these include; cocoyam, plantain, rice, beans. Groundnut, fish, magi, pepper, salt, spaghetti. These food contains the six classes of nutrient that is protein, fat, carbohydrates and others. The workers ate twice a day in the morning and evening.

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TableIV. Comparism between the existing norms practiced in Cameroon with field observationby CAFECO to bring out the weaknesses.

Evaluation elements Parameters	References	observations
Minimum loggingdiameter (MLD)	Logging inventory standards, Article 53, of order 0222 of 25 may 2001.	2 timber species of Amphimasferrugineus and Afzeliaafricanawere identified with diameter below MLD/ADM of 50 cm and 70 cm respectively.
Poachingactivities	FSCIndicator 6.2.8Hunting and trapping shall be controlled in compliance with applicable regulations	-Gun shots were heard at night with animal screening. -Used bullets were seen. -traps made up of different iron materials were observed in the ALU 2.4.
Reduce impact on logging	FSC Indicator 5.3.3Low impact operating techniques shall be used	No buffer zone was created between the FMU in general and ALU in particular with KORUP national park
Safety and Security measures	Indicator 4.2.1The forest manager shall undertake to take preventive measures to minimise accidents at work related to forest operations	Camps were build with plastic bags which got thorn during a heavy rain storm and the workers were at risk.
Composition of prospection team	Logginginventory standards	The prospection team was composed of 5 prospector separated by a distance of 21 m each instead of 6 prospector separated by a distance of 25 m each.

Source: Adapted from Logging Inventory Standard, order 0222 of 25 May 2001 and FSC Standards

CONCLUSION

The process of forest inventory that was observed in the field was in accordance with the norms practiced in Cameroon. All the different stages of forest logging inventory from transect opening, chaining, marking and counting was well implemented according to logging inventory standards and FSC norms. The measuring of timber stems with the instrument “pied à coulisse” and the protection of future trees with yellow tissue show proof of sustainable logging. The involvement of villages around the FMU during the logging inventory process shows that the villagers are involved in the management of the forest and also their right is not being neglected. The legal origin of the wood could be traced with the traceability ticket put in placed which was very efficient in the tracing of wood origin from the forest to the last consumer. Also a good recruitment strategy, a strong hygiene and securities measures put in place was good and in conformity with what is practiced in Cameroon. In spite of the conformity some weaknesses was observed like the marking of trees below MLD and also there was no provision of buffer zone could be ameliorated for a better sustainable forest management.

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