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TRACEABILITY

A MANAGEMENT TOOL FOR ENTERPRISES AND GOVERNMENTS

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS – FAO

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CONTENTS

LIST OF FIGURES AND TABLES

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ACRONYMS

AAC	annual allowable cut
CIFM	Centre industriel et forestier de Mindourou, Cameroo
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
EU	European Union
EUTR	European Union Timber Regulation
FLEGT	Forest Law Enforcement, Governance and Trade
FMU	forest management unit
FSC	Forest Stewardship Council
GPS	global positioning system
GSM	Global System for Mobile communication
ISO	International Organization for Standardization
NGO	non-governmental organization
OLB	Timber Origin and Legality
PEFC	Programme for the Endorsement of Forest Certification
RFID	radio frequency identification
SGS	Société générale de surveillance
DSS	Direct Surveillance System
TLTV	Timber Legality and Traceability Verification
USAID	United States Agency for International Development
VPA	voluntary partnership agreement
WWF	World Wide Fund for Nature

BACKGROUND

TRACEABILITY IS DEFINED AS THE ABILITY TO TRACE THE HISTORY, APPLICATION OR LOCATION OF AN ITEM OR ACTIVITY BY MEANS OF RECORDED IDENTIFICATIONS.[1] THIS INVOLVES TWO MAIN ASPECTS: ON THE ONE HAND, IDENTIFICATION OF THE PRODUCT BY MARKING; AND, ON THE OTHER, THE RECORDING OF DATA REGARDING THE PRODUCT ALL THE WAY ALONG THE PRODUCTION, PROCESSING AND DISTRIBUTION CHAIN.

The concept of traceability came to the fore in the management of tropical forests in the early 1980s with a growing worldwide awareness of environmental issues. At that time, tropical timber and its harvesting were almost automatically associated with deforestation (Amazonia), the funding of armed conflict (Liberia) or the eradication of iconic animal species (Democratic Republic of the Congo, Indonesia), conjuring up a picture of illegal, unsustainable practices. At the same time, the financial losses incurred by producer countries were deemed enormous. This image of the illicit exploitation of tropical forests steadily led consumers to take account of the origin of wood products. In the 1990s and 2000s, most Congo basin countries thus undertook an extensive reform of their forest codes, incorporating elements linked to management and respect for good harvesting practices. In many cases, these good practices already included measures to monitor the flow of wood from forest to processing unit.

In this situation of mistrust on the part of consumers in the northern hemisphere and ongoing development of regulatory frameworks on the part of producer countries, forest certification can be seen as an initial way of ensuring that international requirements are being properly met. Basically, forest certification can be described as an independent instrument guaranteeing the contribution of forest harvesting to sustainable development. Designed as a constructive way of counteracting the calls to boycott tropical woods that proliferated in the late 1980s, it seeks to offer an attractive commercial framework to "anchor" producers in the sustainable management of the forest areas they are harvesting. Certification is based on independent assessments that identify methods of good forest management – according to internationally recognized standards – and is intended as a marketing tool to promote forest products whose origin and mode of production are guaranteed to be sustainable. Logging companies thus see it as a communication opportunity and as

1 According to ISO 8402 standard.

legitimizing their exploitation of the forests allocated to them. Awareness of the messages disseminated by international NGOs is leading markets in the more developed countries to seek "responsible" ways of obtaining their supplies of wood. Certification is the primary solution here, whether it focuses on legality (OLB,[2] TLTV[3] etc.) or responsible management (FSC,[4] PEFC[5]). Each type of certification requires a reliable traceability system that covers the entire processing chain and is verified annually by the certifying body.

At the end of the 2000s, the countries of the northern hemisphere established new regulations in order to curb imports of illegal timber onto their markets. In the United States (the Lacey Act[6]) and Europe (the European Union Timber Regulation – EUTR[7]), importers were henceforth called on to establish mechanisms enabling them to demonstrate either (a) the legality of their supplies or (b) due diligence, which means actively protecting themselves against the risk of trading in illegal wood. In practice, obtaining supplies from exporters where the traceability of wood products is certified helps establish due diligence. Alongside these measures taken by importing countries, national traceability systems are being progressively put in place by various timber exporting countries. These are usually incorporated into the Legality Assurance Systems (LAS) developed within the framework of the voluntary partnership agreements (VPAs) of the Forest Law Enforcement, Governance and Trade (FLEGT) Action Plan of the European Union (EU). Some countries (Brazil, Cameroon, Colombia, Liberia) see it not only as a way of meeting legal requirements, but also as an opportunity to improve their efficiency in collecting taxes connected with timber extraction and processing. Lastly, at the enterprise level, although the establishment of a traceability system may initially have been seen as a response forced on them to meet a regulatory constraint, it subsequently turned out to be a major advantage in terms of the management of logging operations, stock movements, logistics and invoicing.

In the context of implementation of the FLEGT Action Plan, FAO has supported the development of traceability systems in several countries on the request of various groups of stakeholders (government agencies, private enterprises, local groups). The present publication will present a sample of these initiatives in order to show the advantages of efficient traceability that takes account of the user's aim and the environment in which the system will be operating. It is intended not only for the managers of large-scale enterprises, but also for the managers of community forests and for forest service officers with the task of developing a traceability system suited to their needs.

2 OLB = Timber Origin and Legality, system developed by Bureau Veritas.

3 TLTV = Timber Legality and Traceability Verification, system developed by the Société générale de surveillance (SGS).

4 FSC = Forest Stewardship Council, forest management advice body.

5 PEFC: Programme for the Endorsement of Forest Certification.

6 http://www.fws.gov/international/laws-treaties-agreements/us-conservation-laws/lacey-act.html

7 http://www.legal-timber.info/en/flegt-eutr.html

After explaining how traceability works in general terms in relation to certification and the FLEGT Action Plan (Chapter 1), several examples are presented of the development of traceability systems in various contexts (Chapter 2), allowing the formulation of recommendations to be taken into account when designing such a system (Chapter 3).

This publication is part of a technical series intended to build on experience gained by the FAO FLEGT Programme through projects implemented in its various intervention regions: Africa, Asia and Latin America. This first publication will be followed by a more general publication on **Lessons learned in the development and implementation of traceability, verification and monitoring systems for wood products**.


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1

FOREST TRACEABILITY

TIMBER TRACEABILITY SYSTEMS ARE USED TO PROVIDE INFORMATION ON THE JOURNEY OF WOOD FROM FOREST TO CONSUMERS, PASSING THROUGH ITS STORAGE AND TRANSPORT. THEY ARE USED ESPECIALLY TO VERIFY THAT THE RAW MATERIAL OF WOOD PRODUCTS COMES FROM SOURCES THAT ARE LEGAL, RESPONSIBLE OR ACCEPTABLE IN OTHER RESPECTS.[8]

1.1 HOW IT WORKS

Methods of ensuring the traceability of wood products are devised for each phase of extraction and processing operations. In many countries a framework for this is defined by national law.

1.1.1 Harvesting inventory

The harvesting inventory is carried out prior to production activities. It consists at the very least of a list of all the trees that will be felled in a given zone. In most countries, these lists give the unique identifier of each tree, its location in the plot covered by the inventory, its diameter and its species. As a rule, the recorded data are accompanied by maps. The harvesting inventory is the starting point of traceability.

The key to successful forest traceability therefore lies in individually locating the trees to be felled, giving each one a unique identifier.

1.1.2 Harvesting operations

Systems must be put in place to ensure the link between the trunk to be felled, sawn, skidded, further sawn, then transported, and the unique identifier of the inventoried tree. As a general rule, each stage in harvesting operations must be recorded (on paper, a tablet, a smartphone etc.) and then entered into a general traceability database. Each new product coming from the felled tree must be given a unique identifier, linking it to the previous product. The felled tree will thus be linked to the standing tree, the logs to the felled tree, the daughter logs to the logs produced by sawing the felled tree etc.

8 D. Louppe (collective work coordinated by), G. Mille *et al.* *Mémento du forestier tropical*. Quae-Cirad, 2015.

1.1.3 Processing operations

During processing, perfect traceability that goes back to the original individual tree is not generally sought, given the complexity of the chains of operations. There are various possibilities open to those operating processing units, and these can also be combined:

- "volume based tracking" traceability, which consists of establishing an explicit link between the tree in the forest and the processed product, thus allowing specific quantities of products to be linked back to a certain number of original trees. This type of traceability is particularly appropriate for first-stage processing mills involving fairly simple production chains. Two main types of traceability are possible here: (1) time-based traceability, which can link each item produced over a certain period to the logs entering the sawmill during the same period; and (2) contract traceability, which consists of linking the logs entering the sawmill to wood products produced for a specific contract.
- Traceability consisting of guaranteeing that the wood products coming into a mill or factory are of acceptable origin, but without systematically establishing a link to the individual origin of the trees. This type of traceability is especially suited to second- or third-stage processing and also to the manufacture of woodpulp.

1.1.4 Tools

Various tools have been put in place to ensure traceability on the ground. During the harvesting inventory, the trees are georeferenced, either manually or using a global positioning system (GPS). The manual method is the most widely used and entails recording standing trees in a "relative" manner, noting on a map their position within a plot whose outlines have been surveyed precisely by GPS (Figure 1). The GPS method entails simply noting the coordinates of each of the trees identified in the inventory plot.

The allocation of a unique identifier to standing trees and to logs and daughter logs can be done in a number of ways. Some countries simply apply painted numbers, using a code laid down by law or independently established by the enterprise. Some certified companies go further and attach plastic tags to trees and logs; these tags may have just a single section (Photo 1) or be divided into several sections, each bearing the number of the tree (Photo 2). In the latter case, the first section stays on the felled tree to ensure its traceability, while the other sections are taken by the feller or various people subsequently working on the wood, in order to keep track of daily extraction activities. Other countries require the use of unique bar codes supplied by the forest service (Photo 3). Still others (Brazil, Scandinavian countries) are considering the possibility of setting up traceability tools of the radio frequency identification (RFID) chip type to keep track of certain wood products at transit points in the chain (towns, ports). Lastly, some new technologies are using the intrinsic properties of wood (DNA markers and stable isotopes) to determine their geographical origin and thus establish their traceability. The genetic fingerprints of a number of species are being studied, and many applications are already generating considerable interest in the context of the EUTR, the Lacey Act or the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

The choice of medium used in monitoring traceability is still generally left up to the enterprise, provided that it respects legal requirements. Paper is used in most tropical countries. However, in the implementation of VPAs and the EUTR, various national traceability pilot schemes are appearing that seek the adoption of tablet-type numerical supports by enterprises or government services, which should facilitate the flow and entry of data being gathered and their forwarding to the forest service.

1.1.5 Computerized monitoring

Information is recorded almost systematically in a computerized database so that it can be used for economic or organizational purposes or be coordinated with national traceability. While many enterprises are still using simple programmes such as © MS Excel or © MS Access, other more sophisticated tools are being developed so that better use can be made of traceability-related data (see the examples given in Chapter 2).

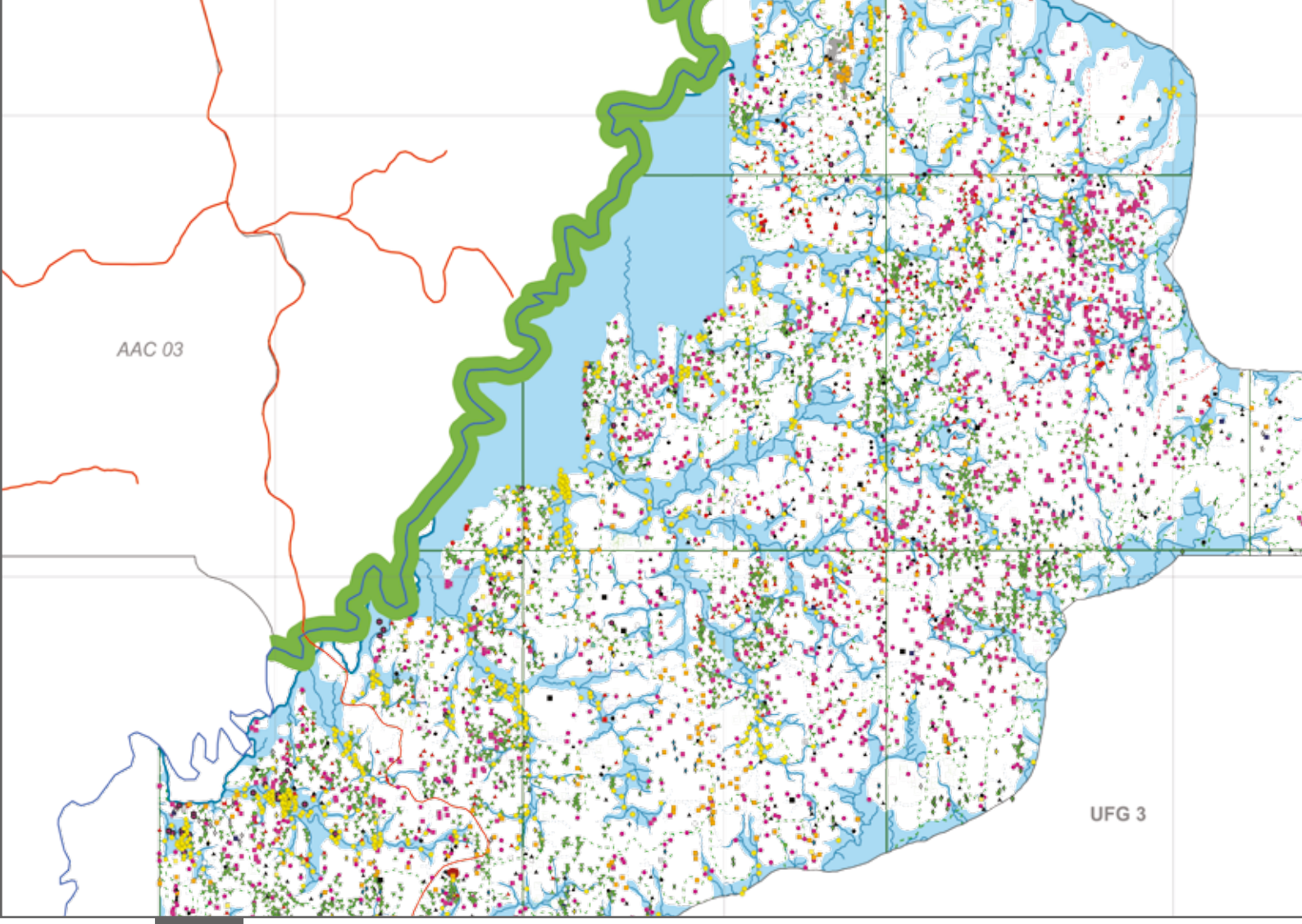
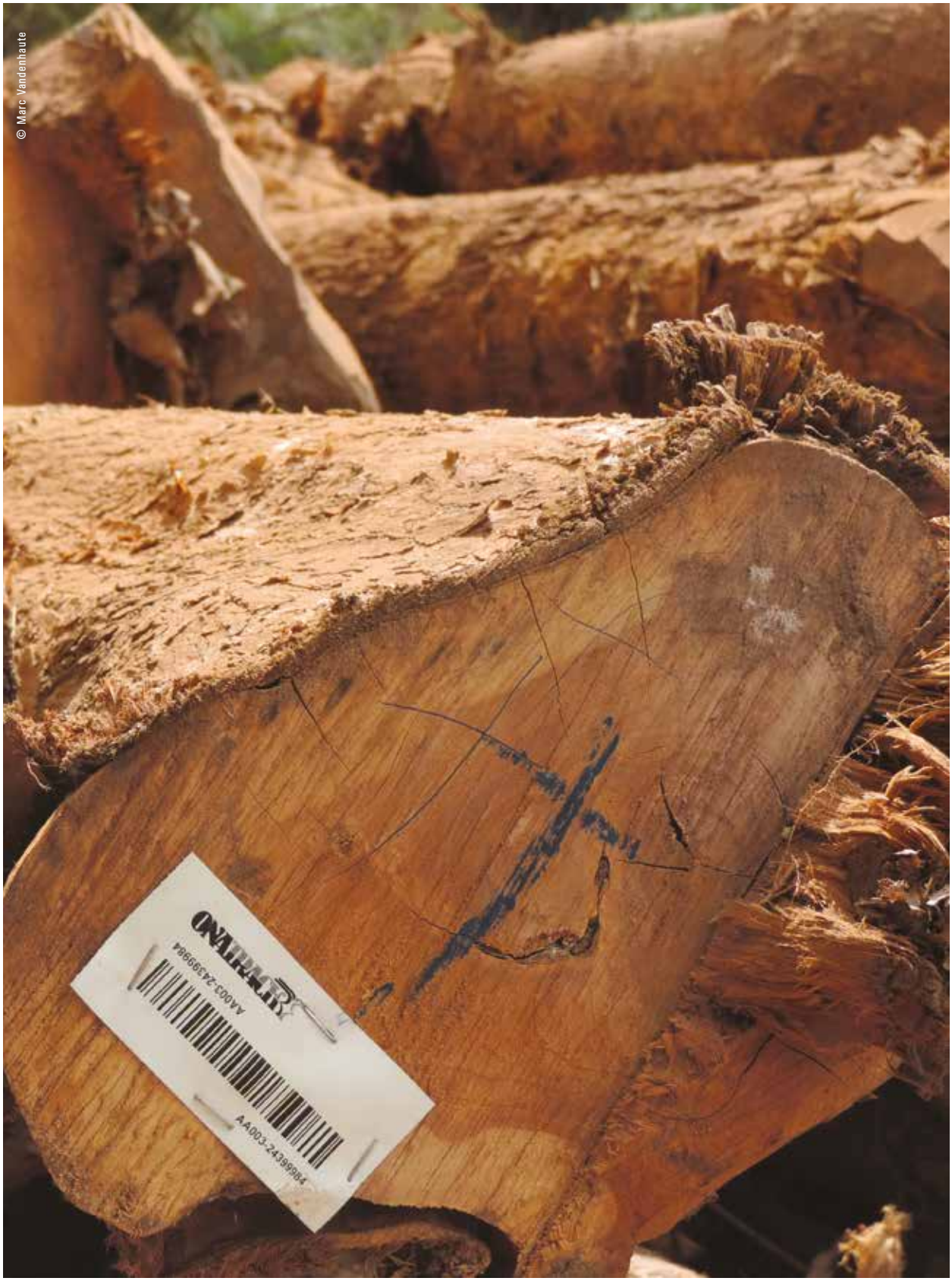


Figure **1** Tallying sketch map

Photo **1** Marking with tags in Benin

Photo **2** Traceability tag in several sections, in Cameroon

Photo **3** Bar-code label on a stump in Liberia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1.2 OBJECTIVES

1.2.1 A business management tool

While the primary purpose of forest traceability is to identify a log from its original tree through to where it is processed or exported, it also facilitates the close monitoring of logging operations. In other words, when forest traceability is correctly used and well integrated into a company's practices, it helps to optimize the management of harvesting plans. By consulting the database, company managers can monitor products all along the processing chain, with the possibility of extracting information at each key stage: the standing tree during the harvesting inventory, felling, skidding, transporting, processing, drying, transporting, exporting, change of ownership, second-stage processing and finished product.

Such monitoring enables companies to make the best use of their resource through regular checks on such conversion factors as harvesting coefficients (relation between the number of trees felled and the number listed in the inventory), marketing coefficients (relation between the volume marketed and the volume felled) or processing coefficients (relation between the volume leaving the mill and the volume entering it).

Some more highly developed databases allow more detailed analyses to be carried out, providing company managers with information on various economic performance indicators at different points in the production chain. Traceability is thus not only a tool to monitor the flow of materials, but can also be a powerful tool for business management.

1.2.2 Access to certification

Any company marketing certified wood products must possess traceability certification for the following intermediaries:

> the logging company;
> the processing unit;
> the dealer in logs or certified products;
> the end distributor.

Every company forming part of the production and processing chain must therefore be certified, right up to the sale of the finished product to the end consumer.

In the case of a mixed supply (certified and non-certified products), a company has various ways of ensuring certification of the traceability of the processed products:

> The system of traceability "by physical separation", in which the company physically and permanently separates certified products from non-certified products, right through the processing and/or manufacturing process. This is called the transfer system by the Forest Stewardship Council (FSC).
> The system of traceability "by percentage", in which the company mixes its supplies but must at the end of the chain guarantee a minimum percentage of certified raw material (70 percent in the case of the FSC and the PEFC) in all its products, or a minimum percentage of products (70 percent in the case of the FSC and the PEFC) containing 100 percent certified material.
> The system of traceability "by credit" for FSC certification, which proposes that the percentage of labelled products entering the factory or mill be identical with that of products leaving it and sold as certified.

1.2.3 Better monitoring of national statistics

Several producer countries have established national traceability systems. Initially, these were intended simply to see that logging companies observed the traceability rules set out in current forest regulations. The aim was to ensure that companies' declarations were consistent, thus facilitating the calculation and monitoring of the collection of forestry taxes and export duties. Over time, traceability systems have become more complex, and many of them are today tools that allow the production of national statistics regarding production, processing and export. Such tools mean that it is now possible to make short- or long-term forecasts regarding the contributions of the forest sector to the national economy.

1.2.4 A response to FLEGT requirements

The European Commission published the FLEGT Action Plan in May 2003, intended to combat illegal logging and the associated trade. This action plan has two main thrusts:

- **A voluntary partnership agreement (VPA)** is signed between the EU and each producer country wishing to do this. It is drawn up in consultation with all the stakeholders in the forest sector of the country concerned and it guarantees that every wood product covered by the agreement complies with the body of rules and regulations in force in the producer country. It is based on a Legality Assurance System (LAS), which includes export licences verified at EU borders (Figure 2).
- **The EU Timber Regulation (EUTR)**, in force since 3 March 2013, aims at completely eliminating wood of illegal origin from the European market by making the European private sector assume responsibility. Thus, importers themselves must make sure of the legality of the wood they import. This requirement, which is intended to ensure legality, is called due diligence.

There are two possible due diligence procedures that importers of wood can adopt regarding the European market. If the country signing the VPA has instituted a Legality Assurance System (LAS) and this has been validated by the EU, it can issue "FLEGT licences". These licences are issued for all wood whose legality has been proven, with a view to its being exported to the EU market. Since these certificates are recognized by the European authorities, importers have nothing further to do in terms of due diligence.

On the other hand, if the signatory country has not signed a VPA with the EU, but instituted a Legality Assurance System (LAS), European importers must themselves exercise due diligence with regard to any wood they purchase.

It is in this second situation that certifications of legality and responsible management have an important role to play in implementing the EUTR, inasmuch as most of the agreements signed state that companies holding a private certificate[9] recognized by the government of the producer country should be subject to simplified control procedures. These certificates thus facilitate recognition of the wood as coming from a legal source. In the absence of a Legality Assurance System (LAS) recognized by the EU, it is then easier for importers to prove the legal origin of their wood when it is imported into European territory.

In every scenario, whether the logging company seeks to introduce wood onto the market through a FLEGT licence or through due diligence exercised by the importer, it must set up a sound traceability system that can demonstrate the origin of any wood intended for export.

9 FSC, PEFC, SmartWood-Verification of Legal Compliance (SW-VLC), OLB, TLTV, Legal Harvest Verification (LHV).

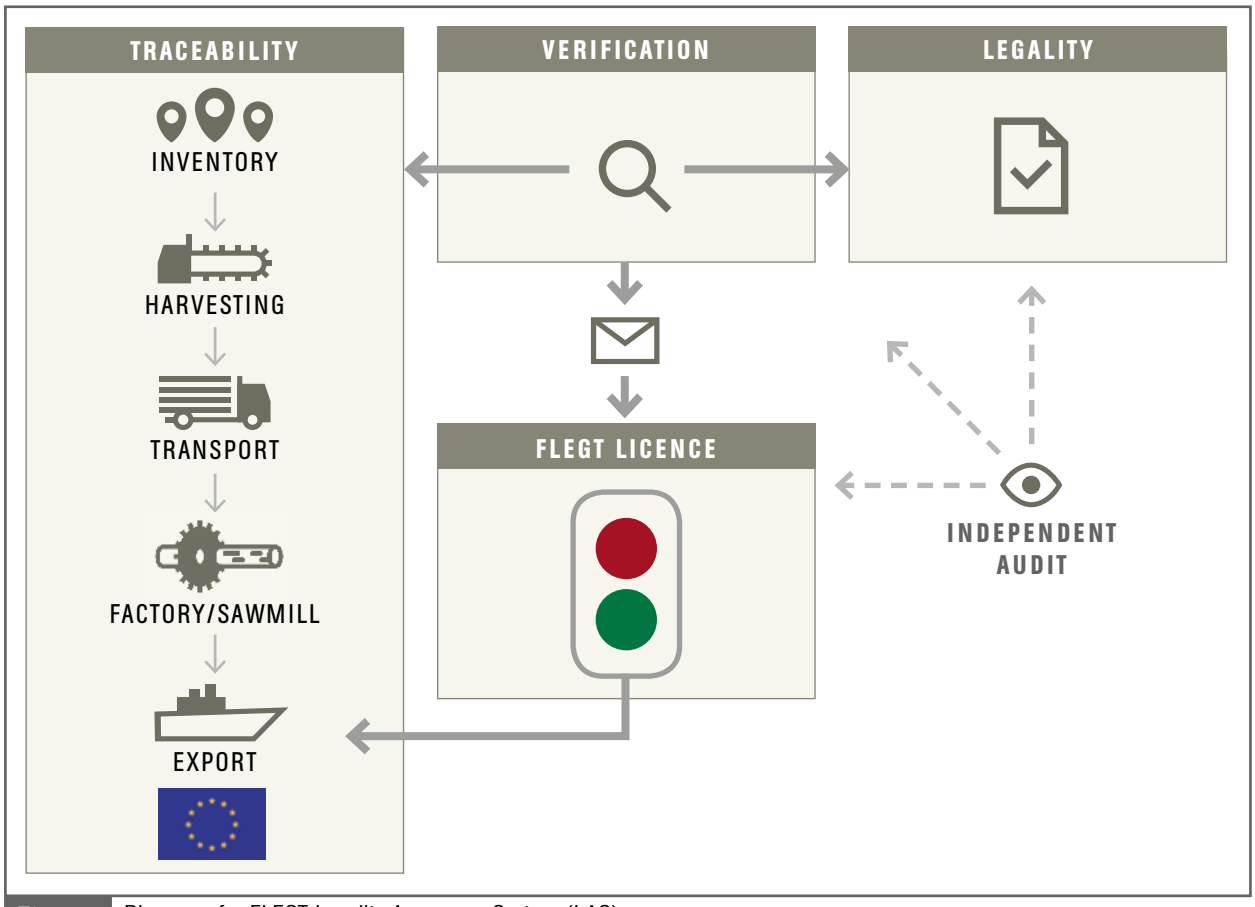


Figure **2** Diagram of a FLEGT Legality Assurance System (LAS)

2

EXAMPLES OF TRACEABILITY INITIATIVES

SINCE THE ESTABLISHMENT OF A NATIONAL-LEVEL TRACEABILITY SYSTEM IS ONE OF THE MAIN OBJECTIVES OF THE FLEGT ACTION PLAN, THE EU-FAO FLEGT PROGRAMME HAS SOUGHT TO SUPPORT A RANGE OF VERY SPECIFIC INITIATIVES IN THIS AREA (SEE TABLE 1). THIS CHAPTER DESCRIBES WHAT HAS BEEN ACHIEVED UNDER VARIOUS PROJECTS.

Table 1 FEATURES OF THE VARIOUS EXAMPLES OF TRACEABILITY INITIATIVE PRESENTED

SECTION	COUNTRY	PARTNER	TYPE OF FOREST	LOCALITY	AREA
2.1	BENIN	National Timber Office: state enterprise	Plantation	Bohicon zone (Zou Department), Akpè, Koto and Massi sites	14 000 ha
2.2	LIBERIA	Forest Development Authority: government	Natural forest: concessions/ community forests/ private-use permits	Forest zone of Liberia	2 300 000 ha
2.3	CAMEROON	Pallisco: industrial company	Natural forest: forest management unit	Eastern region of Cameroon	389 000 ha
2.4	DEMOCRATIC REPUBLIC OF THE CONGO	Compagnie forestière de transformation: industrial company	Natural forest: concessions	Tshopo Province	699 300 ha
2.5	GABON	Balem Izanza, Laboka and Nkang: village associations	Natural forest: community forests	Balem Izanza: Booué Laboka: Lalara Nkang: Oyem	19 000 ha

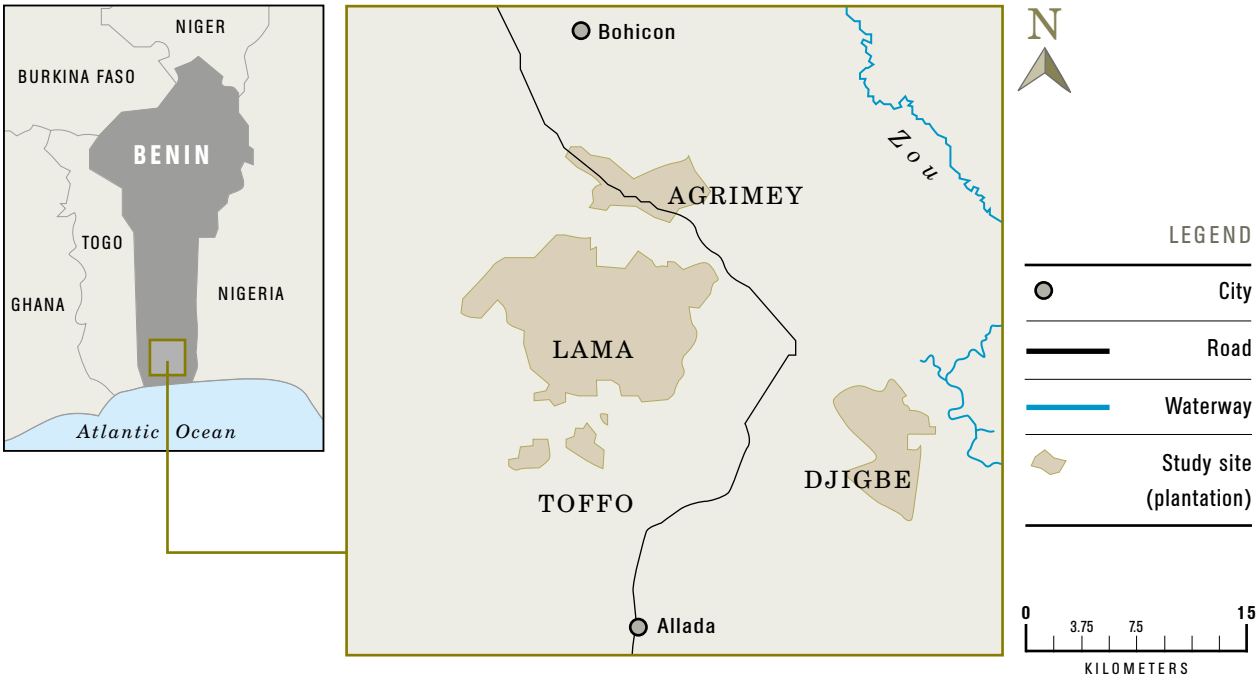
2.1 CASE STUDY OF A STATE ENTERPRISE MANAGING PLANTATIONS IN BENIN

"On our path to certification, we chose to develop the ONATRACK application. This tool makes us the leader with regard to traceability in the country, indeed in West Africa. Apart from its original function of establishing the 'pure traceability' of our wood products, ONATRACK has also played a structural role by enabling us to devise and introduce new working procedures directly related to improving the profitability of our plantations."

Clément Kouchadé
Director-General, National Timber Office

"With the new system, I use a smartphone to record trees marked with a bar-code label. Synchronization of the recorded data means that the data processing unit obtains the information the same day. With the old system, I wrote all the information on sheets that were then periodically sent to the data processing unit to be entered. All that took a lot of time and delayed payday."

Justin Hounlome
Tree Marker, National Timber Office



2.1.1 Background

The National Timber Office is a Beninese public body with the mission of ensuring the sustainable management and marketing of the country's forest resources. As such, it manages some 14 000 hectares of production plantations, 300 hectares of which are harvested annually by clear cutting, while thinning is also carried out over an area of about 1 500 hectares. National Timber Office plantations are harvested according to a management plan drawn up for each of the sectors managed by the office. Total annual production averages about 50 000 cubic metres of logs, almost exclusively teak[10]. National Timber Office timber is marketed locally, either standing, or felled and sold by the roadside to local enterprises, which process it into semi-finished or finished products (from dressed timber to furniture). They then export almost all of it to the international market.

With support from the EU-FAO FLEGT Programme[11], the National Timber Office has received technical assistance to appraise and overhaul its timber traceability system. This was undertaken following the recommendations of a study carried out in 2013 on the certification potential of state forests managed by the National Timber Office[12], which concluded that the system for recording, processing and monitoring information on traceability was unreliable.

In this context, the National Timber Office's main objective was to take a first step in implementing a private certification programme for its plantations. The type of certification still has to be defined (legality certification or sustainable forest management certification), but the aim was to optimize the value of the wood produced by the office on the European market. As a corollary, this strategic choice entailed the certification of the whole production chain, including enterprises downstream of the chain, so as to be able to maintain and optimize of the National Timber Office certificate. The second objective was to improve the flow of information on the monitoring of harvesting and marketing, and to reduce the risks of illegal extraction. In the technical sphere, the National Timber Office wanted to boost its traceability system by using "new technologies", especially for recording field operations. Lastly, it hoped to reduce the costs linked to traceability, particularly by using bar-code labels that would be printed internally.

In terms of area, this initiative concerned only that part of the production chain under the direct responsibility of the National Timber Office. The traceability put in place is thus confined to the link between the logs sold by the roadside and the plots inside the plantation sectors. With a view to certification of the finished products, those downstream of the chain, i.e. the enterprises that are National Timber Office customers, must in turn establish a certification programme for their chain of custody.

The project was implemented in the Bohicon zone of Zou Department in southern Benin, about 100 kilometres from the coast.

[10] 66 000 cubic metres in 2014.

[11] Total project budget: about €125 000 over 14 months, including technical assistance.

[12] Evaluation report on the certification potential of state forests managed by the National Timber Office, 2013.

2.1.2 Legal requirements

Strictly speaking, Benin's legislation contains no specific obligation concerning the traceability of timber. The rules and regulations governing the harvesting of National Timber Office plantations are found in a manual of procedures. It is up to the office to decide on provisions concerning the traceability of logs in the field. It is only in the framework of FAO's support that specific traceability procedures have been developed. At present, the mechanism for authorizing the export of wood products is in no way linked to any kind of confirmation of legality of origin.

2.1.3 Development of the system

The very first stage consisted of an analysis of the existing traceability system. On the basis of this appraisal and with the support of a specialized Cameroonian company, Prosygma[13], FAO supported the design of the new traceability system, called ONATRACK (Figure 3). The specific requirements of this initiative concerned the development of a software programme to generate bar codes and of smartphone applications for recording information in the field.

Acceptance and adoption of the new system by workers in the field was the main concern throughout the development of the application. The following approach was adopted to achieve this end:

1. National Timber Office staff intended to act as "field agents" and "data input agents" were appointed and provided with the support needed to participate in the decision-making process regarding the system to be developed and subsequently act as trainers for all the staff involved in traceability.
2. The procedures were systematically tried out in the field and validated in a participatory manner. Rather than being drawn up as a single process, they were developed according to the structure and organization of the existing *modus operandi,* in order to avoid the superfluous actions observed in monitoring and auditing activities.
3. The new system was developed in the form of modules that were delivered phase by phase, in order to avoid possible tension resulting from too abrupt a change in habits. Each module was tested in the field and corrected or adjusted in preparation for deployment of the whole system.
4. Field recording using standard smartphones was preferred, since these phones are easy to use and the users like them.
5. Priority was given to developing tools that would enable field staff and managers to visualize the newly recorded information on smartphones, tablets or computers. Again with a view to speeding up adoption of the system, the modules concerning the monitoring of harvesting for use by the National Timber Office management were developed as a priority, before the monitoring and auditing modules.
6. In the implementation phase, a training expert worked with field teams for a month to ensure the smooth deployment of the application using the new procedures.

2.1.4 How it works

The trees are removed after thinning or clear cutting. Prior to thinning, an inventory makes it possible to locate the trees to be felled, which are identified and marked. No inventory is carried out prior to clear cutting, so that trees are identified individually in the system only as they are felled. Each inventoried and/or felled tree is identified in relation to the plot on which it is found and, more precisely, the particular harvesting strip of this plot. The identification of trees is based on the use of bar-code labels to mark the trees extracted, as well as the stumps and the logs after felling and sawing (Photo 4).

[13] http://www.prosygma-cm.com

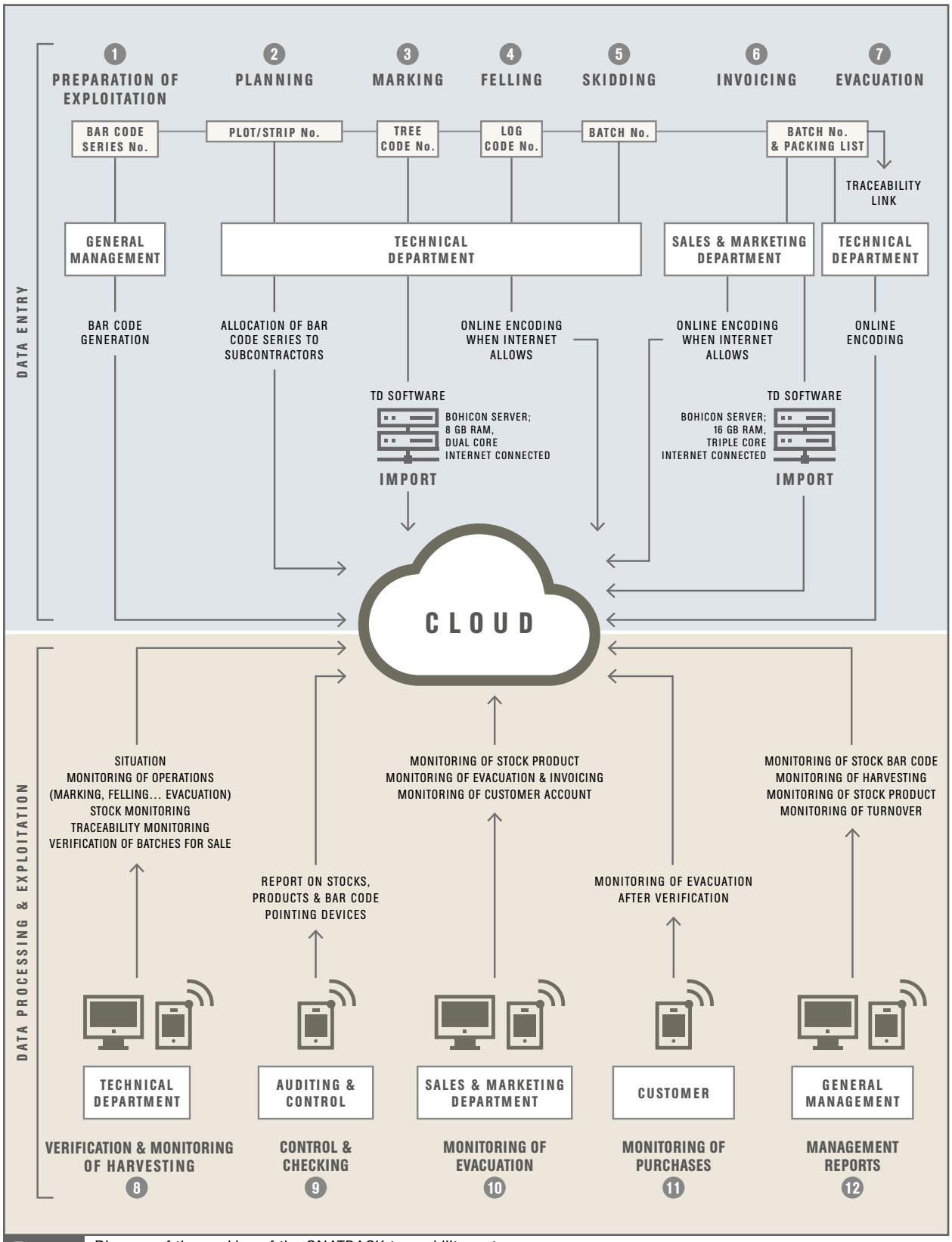


Figure 3 Diagram of the working of the ONATRACK traceability system

Photo **4** Stump with a bar-code label

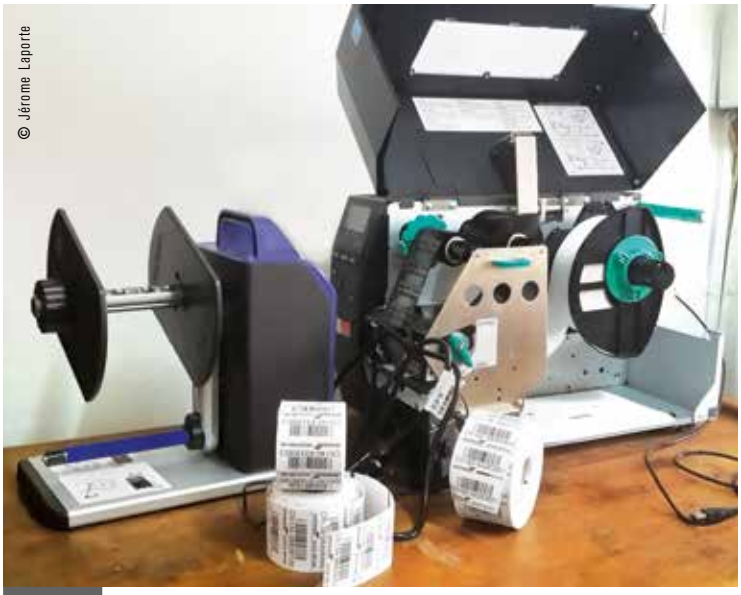


Photo **5** Printer and rewinder with newly printed labels

The bar-code numbers are generated and the labels printed by the ONATRACK system. The National Timber Office purchased a label printer under the project (Photo 5). Following field trials of various materials, Robuskin labels were chosen as performing best in terms of the quality-price ratio (Photo 6).

The main original feature of ONATRACK is that the system relies almost entirely on smartphone applications. All field data can be recorded directly simply by scanning the labels (Photo 7). This can be done even when the individuals are out of cover of the GSM network, data being automatically updated in the central database when 2G, 3G or wifi cover is resumed. This last point is clearly fundamental inasmuch as it allows data collection even when there is no GSM cover – which is often the case in forest zones.

Each operator has personalized access to the system, enabling him or her to carry out the tasks for which he or she is strictly responsible.

All the data relating to the monitoring of production, the marking of trees and sales may then be consulted on a smartphone or computer. A special interface has been developed for the National Timber Office management. The office's customers can monitor the progress of production under contracts with the office, and also that of their own production.

Since the scope of traceability by the National Timber Office is confined to production, the functions of the system do not include processing activities or the monitoring of production costs or cost-effectiveness.

2.1.5 Outlook for the future

Following the project, ONATRACK is now the tool used to monitor harvesting of the plantations managed by the National Timber Office. The development and implementation of this system have allowed the adoption of an innovative approach that offers a wealth of lessons. The latter could be useful in establishing new systems on a wider scale, in

Photo **6** Trial of different types of label

Photo **7** Scanning of field labels using the ONATRACK application

particular enabling the whole traceability chain to be covered, from the forest to the point of export of products.

The first lesson drawn from this initiative is that it is vital to develop this kind of project from the inside, so that it incorporates the daily reality of the end user. This approach has generated a better understanding of the expectations, *modus operandi* and working environment of the National Timber Office. It has also enabled the users to provide input and play a real role in developing the system they will subsequently use.

This initiative has also shown the major advantages of adopting a step-by-step approach. The application was delivered in separate interconnected modules that were tested directly in the field. It was thus introduced gradually, so that each individual could be trained concerning the module destined for him or her. After each module and field procedure had been validated, support was provided to enable the teams to assume ownership of the system in the best possible conditions.

The use of smartphones for recording in the field greatly facilitated acceptance and adoption of the new system, inasmuch as smartphones are much more than mere working tools and most of the staff had one even before the project got under way.

The other fundamental factors that contributed to the success of this project were the strong desire of the National Timber Office management to carry the initiative through to its conclusion and the targeted, skilled expertise provided by FAO.

The main difficulty lay in the poor view that some field staff took of the system, resenting this new tool as a way of increasing supervision and control of their work. In some cases this view created a real attitude of inertia and resistance to change. The project team therefore had to undertake a major communication and awareness-raising drive on the advantages that the system could bring to staff in their daily work.

2.2 CASE STUDY OF A NATIONAL TRACEABILITY SYSTEM IN LIBERIA

"Liberia's traceability system enables improvements to be made in the management of forest operations. It is a tool giving companies a clearer picture of their stock, so that they can then plan and manage their operations. It is also a tool for the government, enabling it to ensure the receipt of revenue from the sector, revenue that was previously diverted to pay for war but can now make a better contribution to the national economy."

Thomas de Francqueville
European Forest Institute

2.2.1 Background

In 2003, at the end of an armed conflict lasting more than ten years, the United Nations Security Council imposed an embargo on the export of wood from Liberia, since the forest industry, whose enterprises were linked to Charles Taylor's regime, was accused of playing a major role in financing both the conflict and the arms trade, so that people began to speak of "blood timber".

The first president elected after the war, Ellen Johnson Sirleaf, signed a decree three years later declaring null and void all forest concession contracts made by the previous regime. At the same time, a new

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Photo 8 Logs waiting to be exported from Liberia (Buchanan port)

forest code was promulgated and the embargo on the export of wood was lifted by the United Nations.

New forest concessions were allocated between 2007 and 2008. Their wood could be exported so long as forestry taxes were paid and the origin of the wood demonstrated. In this context, the Government of Liberia entrusted the Sociéte générale de surveillance (SGS) with developing and implementing a national traceability system (LiberFor), under the supervision of the Liberian Forest Development Authority and with funding of US$1.6 million from the United States Agency for International Development (USAID).

The SGS has been managing Liberia's forest traceability system since 2008, ensuring the collection of taxes linked to the sector and the training of Forest Development Authority staff in traceability. The end goal is to guarantee that all wood products exported from the country are traceable back to the inventoried tree, and that felling and export taxes are correctly paid. This objective is in line with the requirements of the VPA signed with the EU[14] and ratified by Liberia at the end of 2013. Once the origin has been checked and the taxes paid, the SGS issues a wood export licence.

With additional financial support from the British Department for International Development and the EU, the SGS has been working since 2014 to develop a Legality Assurance System (LAS) for Liberia (the LiberTrace Project[15]). The main mission of this project is to make the government's Legality Verification Department fully operational. The working of the department is based on the traceability system developed during the LiberFor Project, combined with a legality verification mechanism being developed under the current project.

Once the Legality Assurance System (LAS) is up and running, the objective of the Legality Verification Department will be to issue FLEGT licences for each batch of wood whose legality and traceability have been verified by the system. These FLEGT licences will then replace the export licences currently granted by the SGS (Photo 8).

[14] More information may be found at www.euflegt.efi.int/liberia

[15] The LiberTrace Project was launched in 2014 for a period of five years and a total sum of about €8 million, financed by the British Government's Department for International Development and the EU; see https://libertrace.sgs.com

2.2.2 Legal requirements

The legal requirements regarding the traceability of wood in force in Liberia are based on procedures set up under the LiberFor Project. The objective of these procedures is to ensure that all wood products exported from the country should be traceable back to the inventoried tree and that felling and export taxes have been fully paid. Twenty-one traceability procedures were thus put in place between 2008 and 2013. Some of these are aimed at logging companies and cover such operations as forest harvesting, the declaration of information and the application for an export permit. The others are aimed at LiberFor Project and forest service staff, and lay down how field monitoring is to be carried out and the consistency verifications to be carried out on the database.

Under the LiberTrace Project (2014-2019), traceability procedures have been updated to bring them into line with the new database management system. However, the way things work in the field is still similar to that set up under the LiberFor Project.

2.2.3 How it works

The LiberFor traceability system developed by the SGS works with the use of unique bar codes that are affixed to the tree and then to each daughter log until it is exported or processed (Figure 4). Field recording is carried out using the following forms:

- **The Stock Survey Form (SSF)** covers all the trees listed in the harvesting inventory, giving their individual characteristics (bar-code number, species, diameter, height).
- **The Tree Data Form (TDF)** enables the felled tree to be linked back to the inventoried tree. The bar code on the inventoried tree is withdrawn here and a new bar code is attached to the felled tree. All the new characteristics of the log are recorded on it (bar code of the mother tree, bar code of the felled tree, species, dimensions) with a view to the invoicing of felling taxes.
- **The Log Data Form (LDF)** enables logs or daughter logs resulting from sawing to be linked back to the felled tree or mother log. The mother log bar code is then replaced by a new bar code for each daughter log. All the new features

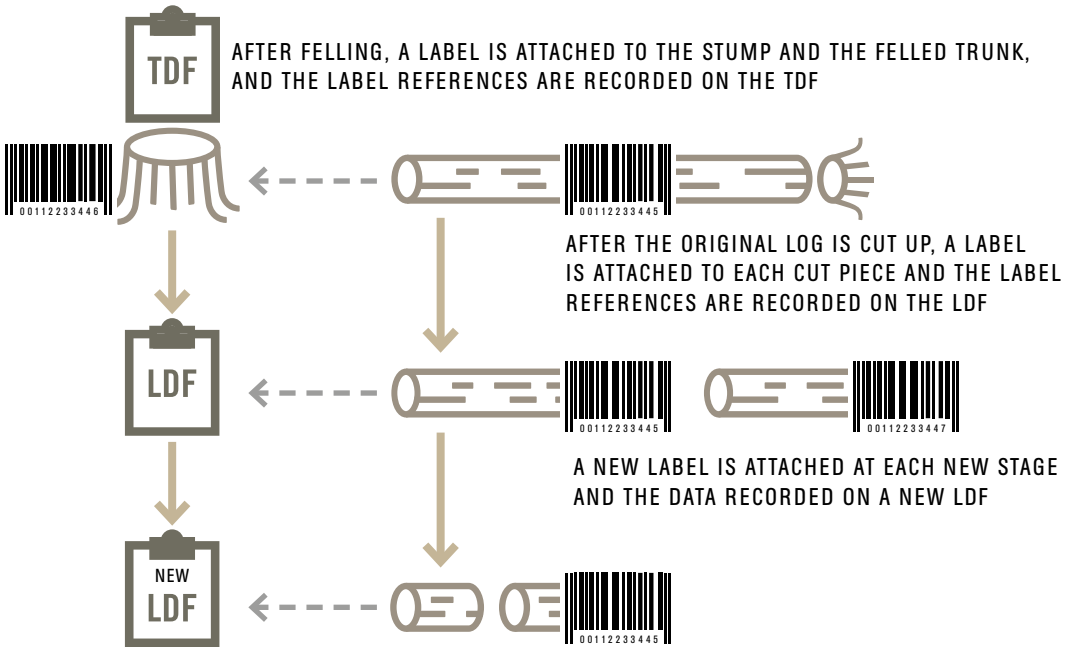

Figure 4 Field recording carried out under the LiberFor system

of the daughter log are again recorded (bar code of the mother tree, bar code of the felled tree, species, dimension).

> **The Specification Form (SF)** enables a list to be established of logs that are destined for export and have received a licence following automatic checks carried out on the database. The form consists simply of a series of bar codes and a list of the features of the log.

The logging company must send each form to the project team in electronic format (as an Excel file) and as a hard copy (Figure 5). The TDFs are used directly for invoicing felling taxes. The LDFs are used for invoicing export taxes if an application for an export licence has been made and approved.

The following verifications are carried out by the SGS with a view to issuing export licences:

> Such elements as the syntax of the bar codes, their allocation (a company cannot declare bar codes that have not been issued to it) and the consistency of dimensions (the total length of the daughter logs must be less than that of the mother log) and species are automatically and systematically verified on the database.

> Logs required for export are systematically inspected in the timber yard to check that they correspond to the company's declaration.

Once the export licence has been issued:

> All the logs listed in the SF are systematically inspected prior to lading (Photo 9).

> Checks are carried out on 5 percent of the trees to verify the declarations recorded in the harvesting inventories (or stock surveys - SSFs).

> Regular checks are carried out on harvesting sites to verify logging companies' declarations (TDF, LDF).

2.2.4 Outlook for the future

In a context of weak forest governance, LiberFor was a key factor in revitalizing the sector, thanks to the application of an initial regulatory framework based on a traceability system. However, several years after this project was launched in 2008, the traceability system is still not properly incorporated into practices in the sector.

LiberFor
monitoring the Liberian Forest sector

STOCK SURVEY FORM SOP7-4

Site type and Reference:		Holder TIN:	
Date Surveyed:		Enumerator :	
Date entered		Entered by	
Date checked		Checked by	

Tree ID Number	Tree Map #	Cell Reference		Species Code	Diameter Class # (cm)	Height (m)	Crop Trees		FDA Remarks/Reason for Rejection
		Survey Line #	Cell ID #				Requested	FDA Approved	

Figure 5 Stock Survey Form

Its acceptance and adoption, not just by companies but also by the forest service, still appears to represent a major challenge. It is vital to step up action to raise awareness and provide training on traceability. The limited acceptance and adoption is explained not only by the administration's weak capacities and the companies' lack of skills, but probably also by the companies' lack of the tools that would enable them to improve their management through the proposed traceability system. For example, although companies are using bar-code labels to mark trees, logs and wood products, they do not have the tools to read the codes or manage the traceability of their production. This raises the problem of the sustainability of these systems, which need regular funding in the medium term.

Acceptance and adoption of the system should increase under the LiberTrace Project, which was launched in 2014, with operators able not only to monitor the traceability of their wood but also its compliance with legal requirements through the data sent to the Legality Verification Department. The development of applications enabling them to read bar codes directly in the field and send the information to a central database should also be examined in the framework of this project. LiberTrace's final aim is to set up a coordinated traceability system that can be consulted by each operator, enabling them to plan harvesting operations more efficiently and anticipate export activities.

Photo **9** Checking of logs declared for export by the SGS

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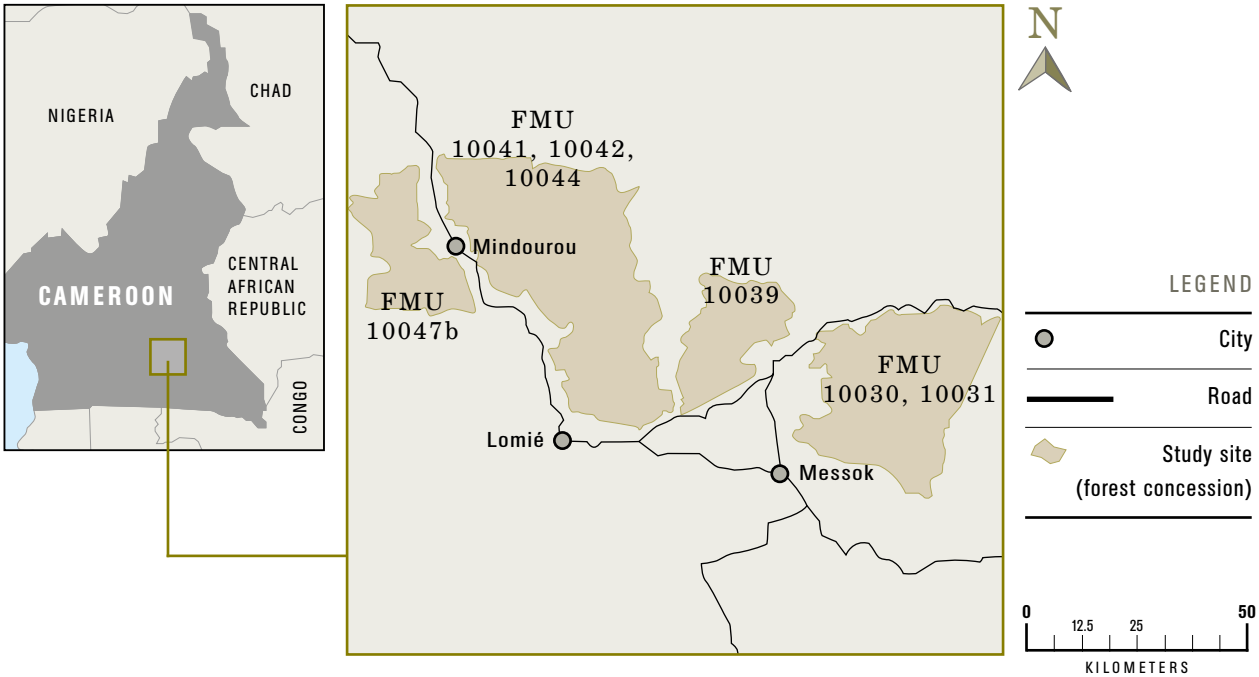
2.3 CASE STUDY OF A PRIVATE LOGGING COMPANY IN CAMEROON

"As Director, I have a simple tool with which I can follow what is happening on our sites 500 kilometres away in real time and at every stage in the process from inventories up to the marketing of processed products.

It is also a tool to help in decision-making, giving me a good picture of my costs and profitability, so that I can optimize my management processes."

Loïc Douaud
Director, Pallisco-CIFM



© Marc Vandenhaute

Photo **10** FSC-certified sawnwood ready for export

2.3.1 Background

The Pallisco-CIFM companies[16] are located in eastern Cameroon and have been certified by the FSC since 2008. Their forest management operations cover 388 949 hectares of natural forest, with an average annual production of 130 000 cubic metres, about 80 percent of which are directly sawn by the company. The whole production is intended for export, mainly to the EU market (Photo 10). In a context of placing concessions under management and preparing for FSC certification, a first traceability system was established in 2003. Developed on the basis of © MS Access in single-user mode, it allows monitoring of wood products and invoicing.

In 2001, the companies decided to modernize and convert this initial system into a forest management system. They therefore created an application suited both to their internal working procedures and methods and to national traceability requirements and the available technology.

[16] http://www.pallisco-cifm.com

Photo **11** Consultation of the map based on the harvesting inventory

2.3.2 Legal requirements

In Cameroon, the legal requirements regarding forest traceability are clearly laid out in the legality grid that was produced in the context of the VPA[17]. Two types of secured document are used: site registers, known as DF10s, in which fellings are recorded, and registers of waybills for the transport of logs and processed products. The choice of numbering system used for the trees in the harvesting inventory is left up to the company (Photo 11).

The unique code of the felled tree (DF10 number) is obtained by combining the page number of the corresponding DF10 register and the line number on the page where the tree is recorded. "Daughter logs" are identified by adding a letter to the DF10 number. The DF10 numbers are hammered onto the stumps and painted on the daughter logs, before being recorded in the monitoring registers. Other information is also recorded on the logs, such as the reference to the forest management unit (FMU), the number of the annual allowable cut (AAC), the FMU beneficiary and the date of felling (Photo 12).

The DF10s and the various other production data are transmitted to the forest service so that it can carry out a statistical monitoring of national production and calculate tax receipts from the forest sector. However, there is as yet no centralized system that would allow the individual monitoring of logs and other products from production zone through to export.

2.3.3 Development of the system

The PALLITRACKS application was developed by the Cameroonian company Prosygma after three years' work in the field involving the management and all the staff associated with forest management, processing and invoicing. The development method was based on a progressive delivery of the application in independent but interconnected modules. The staff involved could thus become familiar with each new module as it was delivered, while other modules were being developed.

[17] See Grid 1 (Operating Agreement).
Indicator 2.4: The forestry body respects the quantities of timber allocated in line with the prescriptions in the annual certificate/permit.
Indicators 3.1 and 3.2: The forestry body ensures that the logs produced/imported to be processed in its facilities are accompanied by all the necessary documents and regulatory labels verifying their legal origin.

Photo **12** Timber yard with DF10 references recorded on the ends of logs

The main PALLITRACKS modules are as follows:

- harvesting inventory or stock survey;
- selection for harvest;
- felling;
- skidding;
- preparation of logs in the forest;
- haulage (transport of logs from the forest to the main timber yard);
- management of the main timber yard;
- forwarding of logs from the main timber yard to the mill or outside customers;
- management of the mill's timber yard;
- processing;
- milling;
- forwarding of processed wood products;
- management of the timber yard at the timber port (Douala);
- invoicing.

Prosygma spent several months fully immersed in the forest and the sawmill, so that it could really understand how the company worked, with a view to adapting the new traceability system to the real constraints and expectations of those on the ground.

Systems to generate automatic reports for the management were developed in order to make it easier for the company to assume ownership of the mechanism. These reports followed the format of earlier reports, which were initially written up by an employee, usually on the basis of data coming from various people within various departments. The management now has rapid access to automatic reports that are available in a single database that can be consulted on the Internet.

Various user profiles have been drawn up in the application, giving each person specific access to the modules concerning his or her work and responsibilities. This means that handling can be simplified according to the category of user. The management for its part has an overall picture of the system and the data that compose it.

Clear procedures that are known to stakeholders were developed, taking into account the many harvesting and traceability procedures already existing within the company.

The main obstacle encountered during this development process was basically connected with the gradual shift from the old system to PALLITRACKS. In order to ensure a steady transition, the two systems existed side-by-side for several months. During this period the users' workload, especially that of data entry operators, almost doubled. It was not easy to convince users of the advantages of shifting to this new working environment, so that the support team had to work hard to gain their adherence.

2.3.4 How it works

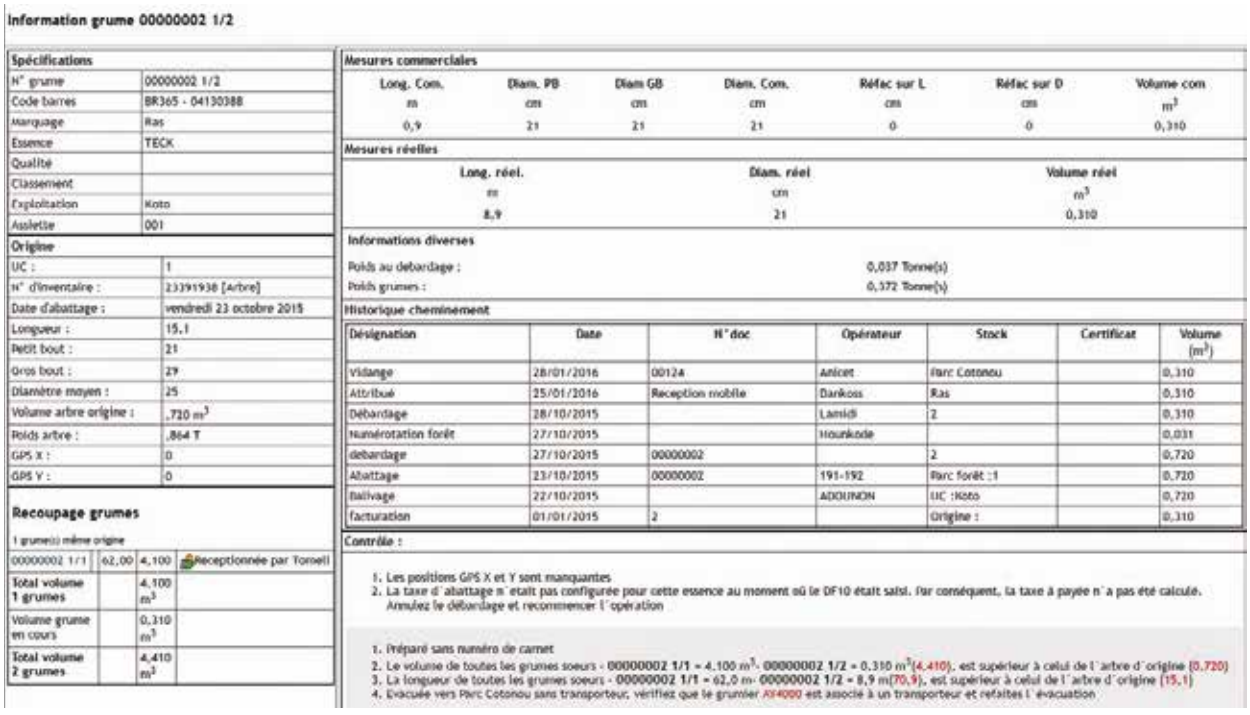
The PALLITRACKS system enables all the traceability data to be centralized on servers that can be accessed by Internet, from harvesting inventory up to invoicing for logs and processed products. Log information sheets (Figure 6) thus allow the path of each inventoried and felled tree to be followed, whether it has been processed or not, all the way through to delivery to the customer. Conversely, each wood product can be traced back to an inventoried tree specified particularly by its GPS coordinates.

The PALLITRACKS application uses a powerful server that can respond to the most complex requests and also store a vast amount of data. This makes it easy to update the application and allows permanent access to the data for all authorized users on a large number of terminals, including smartphones.

PALLITRACKS enables the following harvesting operations to be monitored in real time:

- current status and analysis of harvesting inventories;
- current status of felling, skidding and haulage;
- monitoring of stocks and movements of logs and processed wood;
- monitoring of invoicing.

The application also allows full use to be made of data from the monitoring of logging operations in order to produce statistics:



Information grume 00000002 1/2

Spécifications

N° grume	00000002 1/2
Code barres	BR365 - 04130388
Marquage	Ras
Essence	TECK
Qualité	
Classement	
Exploitation	Koto
Assiette	001

Origine

UC :	1
N° d'inventaire :	23391938 [Arbre]
Date d'abattage :	vendredi 23 octobre 2015
Longueur :	15.1
Petit bout :	21
Gros bout :	29
Diamètre moyen :	25
Volume arbre origine :	.720 m³
Poids arbre :	.864 T
GPS X :	0
GPS Y :	0

Recoupage grumes

1 grume(s) même origine

00000002 1/1	62,00	4,100	Receptionnée par Toroell
Total volume 1 grumes		4,100 m³	
Volume grume en cours		0,310 m³	
Total volume 2 grumes		4,410 m³	

Mesures commerciales

Long. Com.	Diam. PB	Diam GB	Diam. Com.	Réfac sur L	Réfac sur D	Volume com
m	cm	cm	cm	cm	cm	m³
0,9	21	21	21	0	0	0,310

Mesures réelles

Long. réel.	Diam. réel	Volume réel
m	cm	m³
8,9	21	0,310

Informations diverses

Poids au débardage : 0,037 Tonne(s)
Poids grumes : 0,372 Tonne(s)

Historique cheminement

Désignation	Date	N°doc	Opérateur	Stock	Certificat	Volume (m³)
Vidange	28/01/2016	00124	Anicet	Parc Cotonou		0,310
Attribué	25/01/2016	Reception mobile	Dankoss	Ras		0,310
Débardage	28/10/2015		Lamidi	2		0,310
Numérotation forêt	27/10/2015		Hounkodé			0,031
debardage	27/10/2015	00000002		2		0,720
Abattage	23/10/2015	00000002	191-192	Parc forêt :1		0,720
Bailvage	22/10/2015		ADOUNON	UC :Koto		0,720
facturation	01/01/2015	2		Origine :		0,310

Contrôle :

1. Les positions GPS X et Y sont manquantes
2. La taxe d'abattage n'etait pas configurée pour cette essence au moment où le DF10 était saisi. Par conséquent, la taxe à payée n'a pas été calculé. Annulez le débardage et recommencer l'opération

1. Préparé sans numéro de carnet
2. Le volume de toutes les grumes soeurs - 00000002 1/1 = 4,100 m³, 00000002 1/2 = 0,310 m³(4,410), est supérieur à celui de l'arbre d'origine (0,720)
3. La longueur de toutes les grumes soeurs - 00000002 1/1 = 62,0 m, 00000002 1/2 = 8,9 m(70,9), est supérieur à celui de l'arbre d'origine (15,1)
4. Evacuée vers Parc Cotonou sans transporteur, vérifiez que le grumier AX4000 est associé à un transporteur et refaites l'évacuation

Figure **6** Log information sheet

> analysis and monitoring of production costs;
> analysis of yields and profitability (outlays, margins).

Apart from the forest management and traceability aspect, the application is becoming a real tool for help in decision-making. Now that the company has a clear picture of its production costs and profitability, it can choose whether or not to accept a particular log or sawing contract.

Complementing the functions described above, PALLITRACKS also has a special application for the head of the company. This is basically an interface (Figure 7) that can be accessed at regular intervals on a smartphone or computer and allows the CEO to monitor not only progress on milling contracts, but also stock movements of logs and other wood products.

2.3.5 Outlook for the future

Centralization of information on the harvesting and marketing of timber opens up new prospects for the company. With a standardized overview of its operations and its production and processing costs, it has been able to develop procedures for selecting contracts and fixing prices, thus avoiding contracts that would work out at a loss and maximizing profits.

The Pallisco-CIFM companies' forward-looking approach means that they are constantly involved in efforts to improve all their management processes. In this spirit, they are planning to equip their traceability system with bar-code labels and an application that works on smartphones to record data in the field.

An indication of the aptness of this new traceability system is that in less than three years PALLITRACKS has been adapted for two other forest companies in Cameroon, Cameroon United Forests (CUF) and the Fabrique camerounaise de parquet (= the Cameroon Parquet Factory – FIPCAM). It has also been used as the basis for the ONATRACK system, adapting it for forest plantations managed by Benin's National Timber Office (see section2.1). In 2016, the system was being used to manage more than 1 million cubic metres of wood produced from more than 1 million hectares of natural forests and plantations.

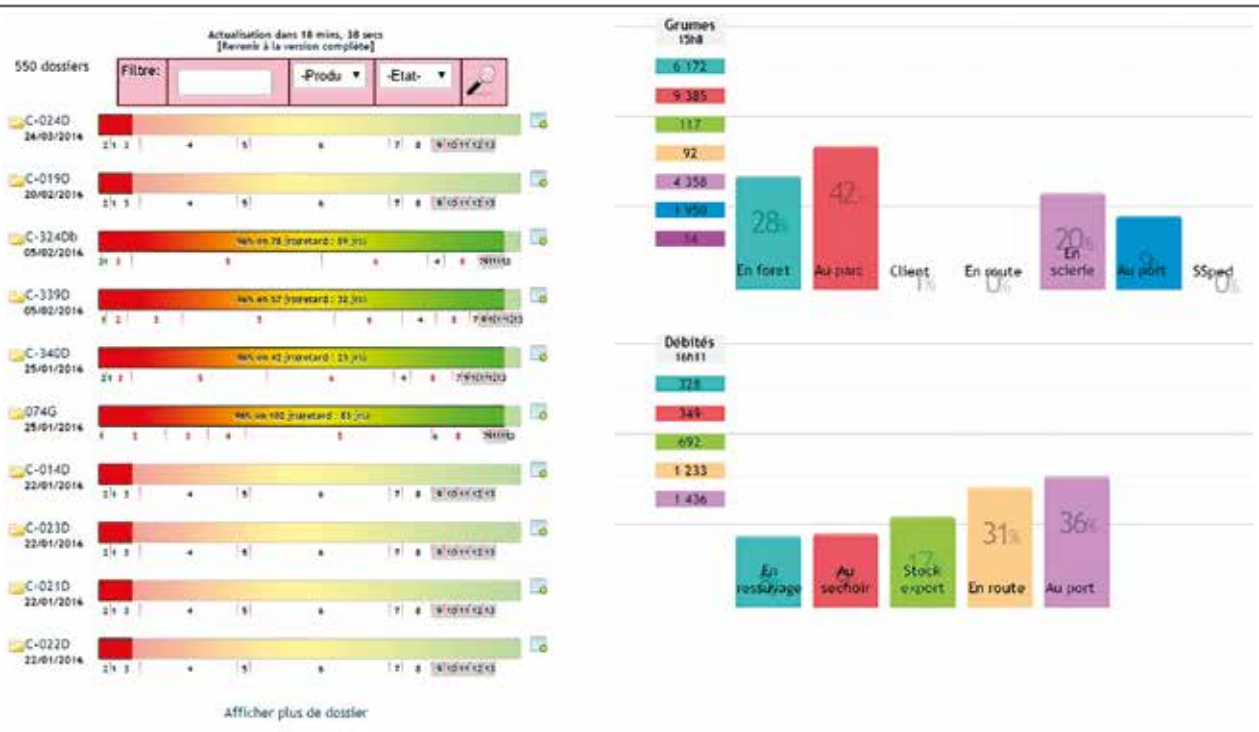
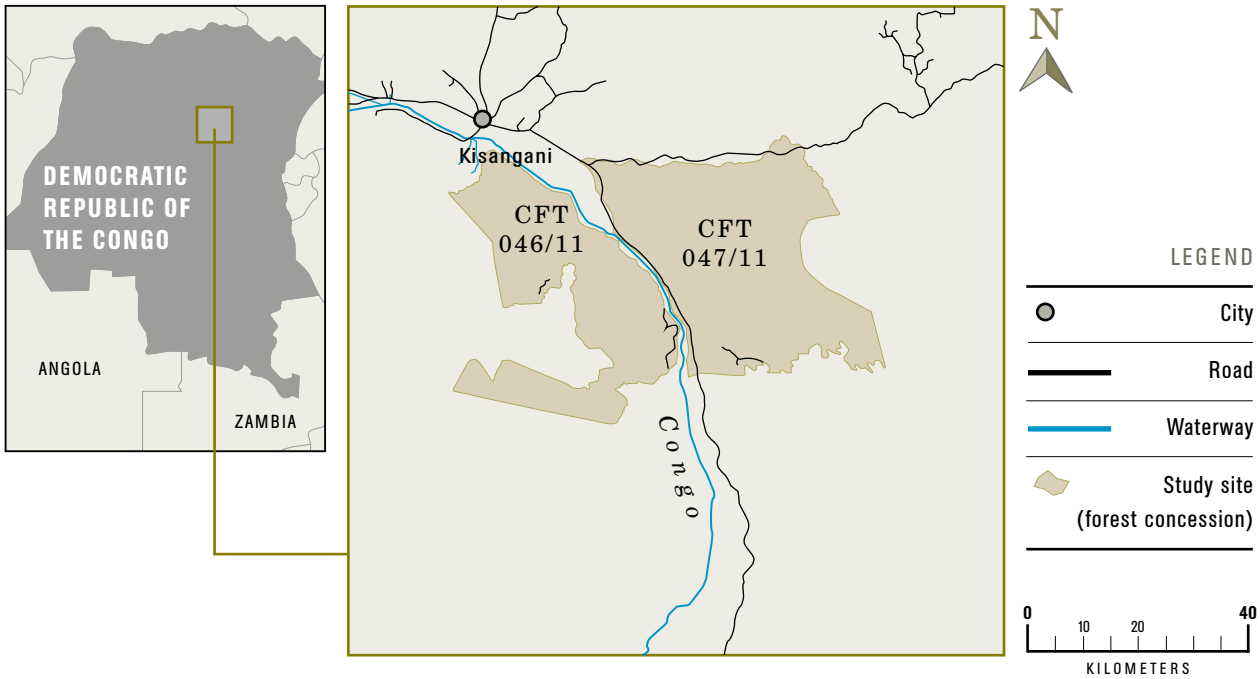


Figure **7** PALLITRACKS interface intended for the CEO
(The left side of the screen shows specific milling contracts, while the right side allows changes and movements in the stock of logs and other wood products to be monitored)

2.4 CASE STUDY OF A SURVEILLANCE SYSTEM IN THE DEMOCRATIC REPUBLIC OF THE CONGO

"The Direct Surveillance System provides a list of information that is extremely useful for the agencies responsible for forest monitoring and other organizations carrying out independent monitoring of forest harvesting activities. Being able to rely on precise information in real time about the movements of machinery in the forest is of major help in combating illicit harvesting and illegal felling, and also in reducing the need for expensive, time-consuming monitoring missions. The system has also proved a powerful management and communication tool for the logging company, enabling it to demonstrate the legality of its activities, while also improving its capacity to monitor operations on a day-to-day basis, thus significantly reducing the costs of harvesting and the impact of the latter on the environment."

Valérie Vauthier
Director, Resource Extraction Monitoring




© Emmanuel Heuse

2.4.1 Background

Resource Extraction Monitoring[18] is an NGO with long experience in the independent observation of forest harvesting in the Congo basin. This experience clearly showed that the systems currently in place were not sufficient to allow any effective monitoring of compliance with the rules and regulations intended to ensure sustainable forest management, a situation compounded by the poor human and material capacities of the government agencies responsible for oversight and in some cases by a lack of political will. Even the most elementary measures, such as respect for the limits of the annual cutting plots allocated to concession holders according to an established rotation (usually 25 or 30 years) based on the area or extraction possibilities of the concession, are thus all too seldom observed. In such a situation, logging companies that have not voluntarily undertaken a certification process have very little incentive to respect the legal framework.

Systematic and regular access to two key elements – the date and zone of felling – is vital with a view to effective monitoring of harvesting activities. Realizing that it is impossible to place a forest officer at the foot of each felled tree to record such information, Resource Extraction Monitoring came up with the idea of developing a system in the Democratic Republic of the Congo that would carry out continuous monitoring of the machinery used to extract and transport wood, here known as the Direct Surveillance System (DSS). Inasmuch as this project is part of the much wider objective of improving governance, it is not necessary to have the exact location of each felled tree, nor to record it in an accessible format, as in a certification process.

This type of monitoring of a fleet of vehicles is not new, but is regularly used by large companies in developed countries to monitor and make the best use of their fleets. The question here was whether this technology could be transposed to the context of forest harvesting as carried out in the Congo basin, where there is no mobile network and the environment is far from easy.

[18] http://www.rem.org.uk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2.4.2 Legal requirements

The traceability of wood from forest harvesting on concessions in the Democratic Republic of the Congo is governed by a decree of 25 September 2015 (Ministerial Decree 050/CAB/MIN/EDD/01/03/BLN/2015).

Whether loggers are working on a large industrial scale or a very small scale, they have to mark every felled tree and every sawn log distinctly. The markings should indicate the following elements: (i) the number of the tree in a continuous series for each felling permit (the annual felling number in the case of a forest concession); this number must also be stamped on the stump; (ii) the reference of the log in the tree (the log from the bottom receives the letter A); (iii) the logo of the logging company; and (iv) the number of the logging permit.

This information must be recorded on forms in a site register. The model for these forms is established by the forest service and they are filled out with the commercial or scientific name of the species of each felled tree, together with the date of felling, the diameter of the tree at breast height and the length of the trunk.

There are also official documents to make sure that wood circulating outside the plot or concession where it is felled (consignment notes) can be monitored, to allow monitoring for taxation purposes and also for statistical purposes (quarterly statements) and to guarantee the legality of the whole chain (declarations of purchase, sale or export of timber).

2.4.3 Development of the system

The first trials of the DSS began in the Democratic Republic of the Congo in 2014. The country was chosen primarily because it was negotiating a VPA that anticipates in particular the establishment of a Legality Assurance System (LAS). The presence of an independent observer appointed by the government[19] and a partner of Resource Extraction Monitoring also played a part in this choice. Lastly, the major logistical constraints facing forest monitoring missions and the difficulty of access to harvesting zones make the case of the Democratic Republic of the Congo particularly appropriate for planning this type of solution. Following the interest expressed by the Ministry of the Environment, Nature Conservation and Tourism during the first trials, which were financed by the European Development Fund, a second set

[19] Forest Governance Observatory; see http://www.ogfrdc.cd

of technical trials was carried out in 2014-2015, thanks to funding from the EU-FAO FLEGT Programme, in collaboration with the Compagnie forestière et de transformation (= the Forestry and Processing Company) in Kisangani region. This company has five concessions under management, covering an area of 699 300 hectares.

The task of developing the system was carried out through several missions spread over 12 months, so that the equipment, especially the GPS terminals, could be regularly adjusted to conditions on the ground: attaching to the machinery and vehicles, power supply, transmitter quality, placing of terminals according to the type of vehicle (skidders, bulldozers, forklift trucks, logging trucks, barges etc.). Technical adjustments were made with support from the Insystek company, which is hosted by the Makespace community workshop in Cambridge.[20] This incubator, which is managed as a community, hosts start-ups specializing in the manufacture of prototypes and offers the possibility of consulting experts with a view to developing prototypes that need very specialized technical equipment (electrical circuits, laser cutters, lathes etc.).

2.4.4 How it works

The DSS relies on a GPS box that can at any given moment provide the geographical coordinates of heavy machinery used for extracting timber from tropical forests. The device is powered autonomously or by the machine in question. At specified intervals it records the position deviation and heading deviation, together with such supplementary data as the payload of the vehicle or images via a GSM network or a satellite or wifi connection, depending on availability. The central server receives and stores the data received, which are then available to users through an intuitive, easy-to-use interface accessible on the Internet (Figure 8 and 9).

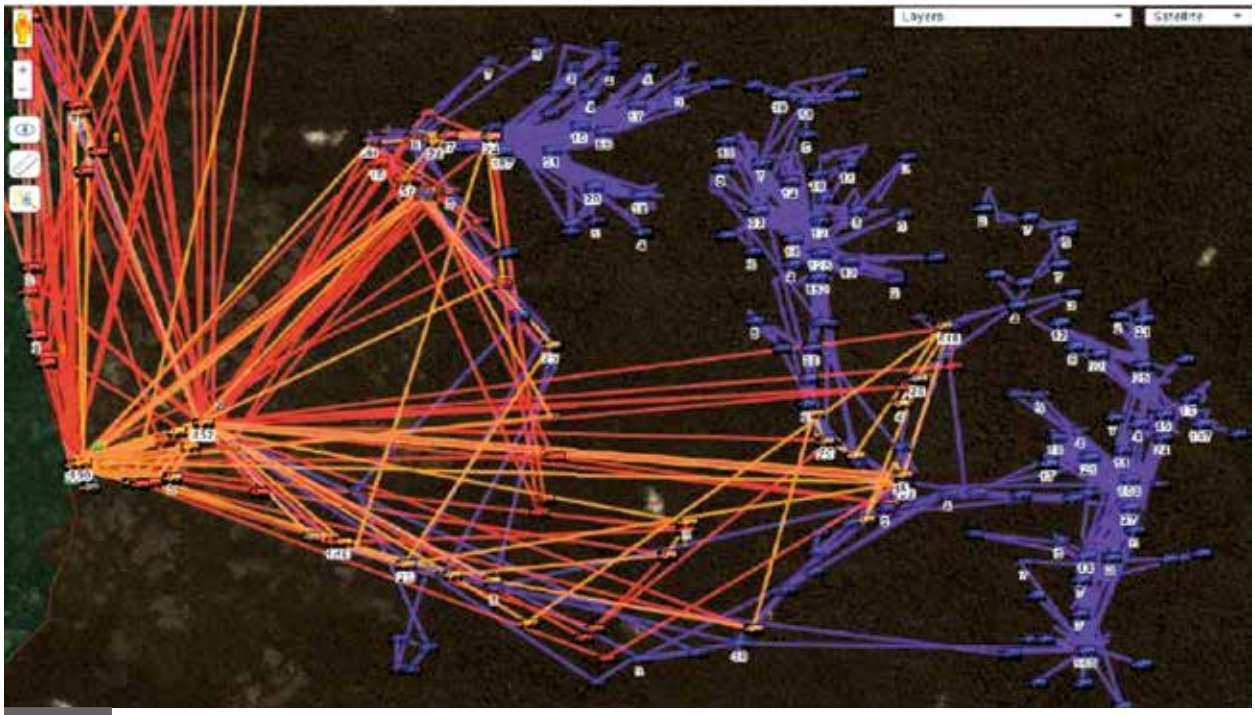


Figure 8 Routes of various machines and vehicles in the cutting area

[20] http://makespace.org

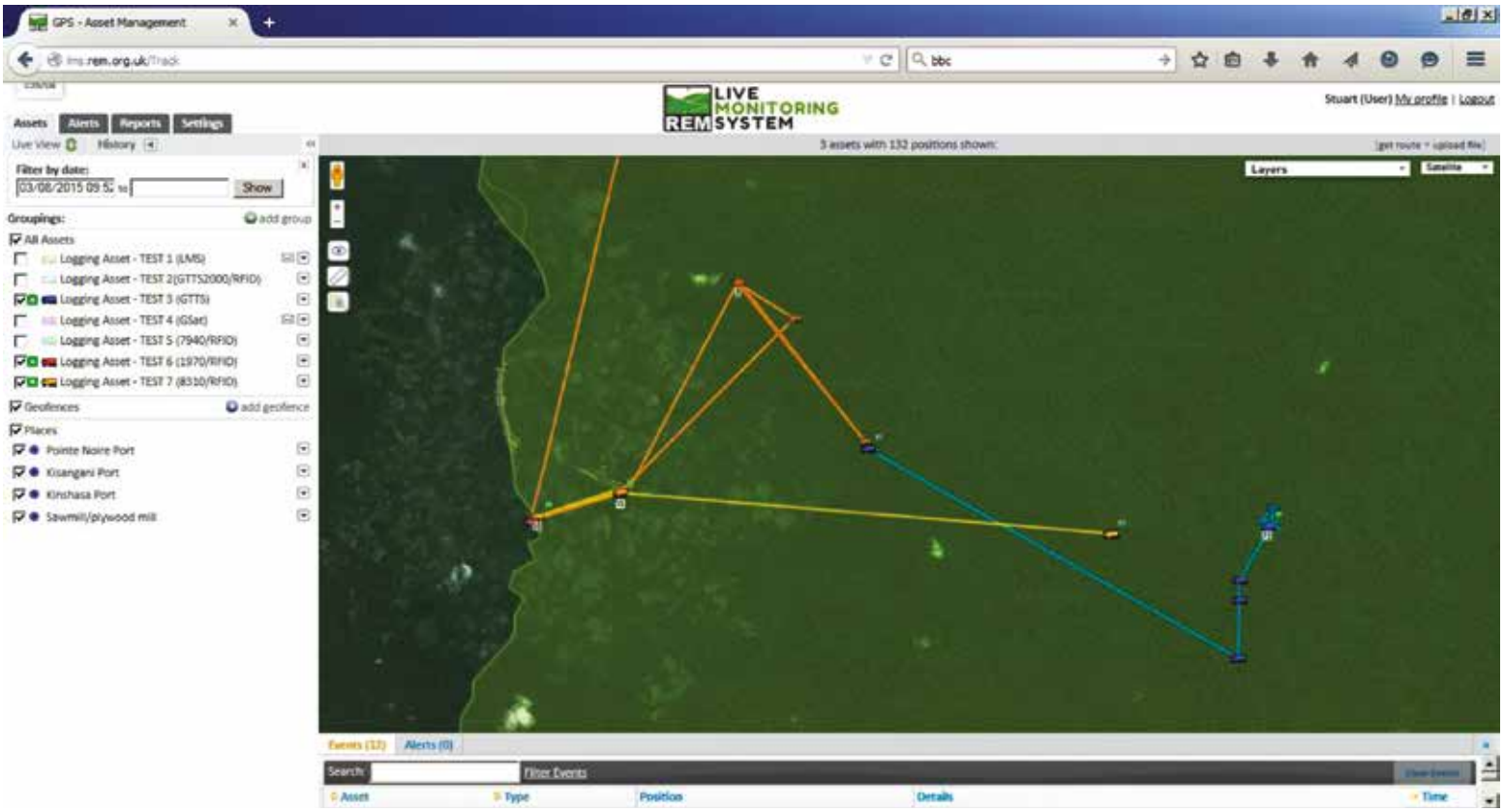


Figure **9** Routes of a logging truck (in orange), a loader (in yellow) and a skidder (in blue)

The platform also incorporates information from other sources so as to provide complete data on what is happening on the ground in real time. Thus it includes, for example, the boundaries of concessions, the limits of annual allowable cuts, the water network, topography, land use, drilling concession boundaries and the road network. The user, organization or independent observer can have almost direct access (with a time lapse of 20 to 90 minutes) to the movement of all the machines fitted with the system, without having to travel physically to the logging site.

It is easy to see the advantage of such a system in zones as vast and cut off as forest concessions in the Democratic Republic of the Congo, where it is extremely difficult to obtain reports on extraction activities and their progress. With this system, it is also possible to see in real time, from Kinshasa, if vehicles are operating within the limits of the forest concession and the annual allowable cut. It can also send alerts by email or SMS regarding vehicles that may venture into an unauthorized concession, a protected zone or any other site of particular interest.

The GPS box (Photo 13 and Photo 14) is composed of:

- a GPS module with an integrated antenna capable of giving a geographical position to within 1.8 metres, with the time and date;
- a self-powered unit that can work for up to two years;
- a satellite transmission module that can transmit the data collected;
- a humidity- and water-resistant protective casing;
- a processor that can programme and receive external data if necessary;
- a sensor that can identify any falsification or any removal from the GPS box;
- a magnetic pad that can attach the device to a vehicle.

2.4.5 Outlook for the future

The DSS is basically a tool with which government staff, independent observers and logging companies can monitor, check and collect data in real time, through monitoring and reports on mobile logging machinery on the ground, wherever it may be.

Notification in real time and access to field information are vital in any surveillance or monitoring activity. The DSS combines the latest technology with a platform that is intuitive and easy to use, thus making it possible to:

1. ensure that forest harvesting complies with legal requirements;
2. ensure that sustainable forest management practices are respected;
3. reduce the export of illegal logs, thanks to the monitoring of transport from stump to point of export;
4. monitor operations beyond what the company or logger wishes to show or that sporadic checks are able to reveal (because of logistical constraints);
5. reduce the possibility of marketing wood that did not come from authorized forest concessions;
6. ensure that the harvesting limits laid down in annual management plans are respected;
7. enable companies to monitor and supervise their machinery (including distances travelled and the amount of fuel used), and also optimize productivity and the organization of work;
8. reduce the need for long, costly field monitoring missions;
9. provide valuable information on the volume of wood actually extracted and its location.

The DSS is basically a powerful and flexible monitoring tool that can offer solutions to many problems and may thus be of interest to a wide range of organizations. It is also interesting to note that after the trials, the Compagnie forestière et de transformation expressed great interest in the system to help improve monitoring of its logging activities and optimize the movement of its machinery and thus its cost-effectiveness.

Photo **13** Installation of the GPS box on a forest machine

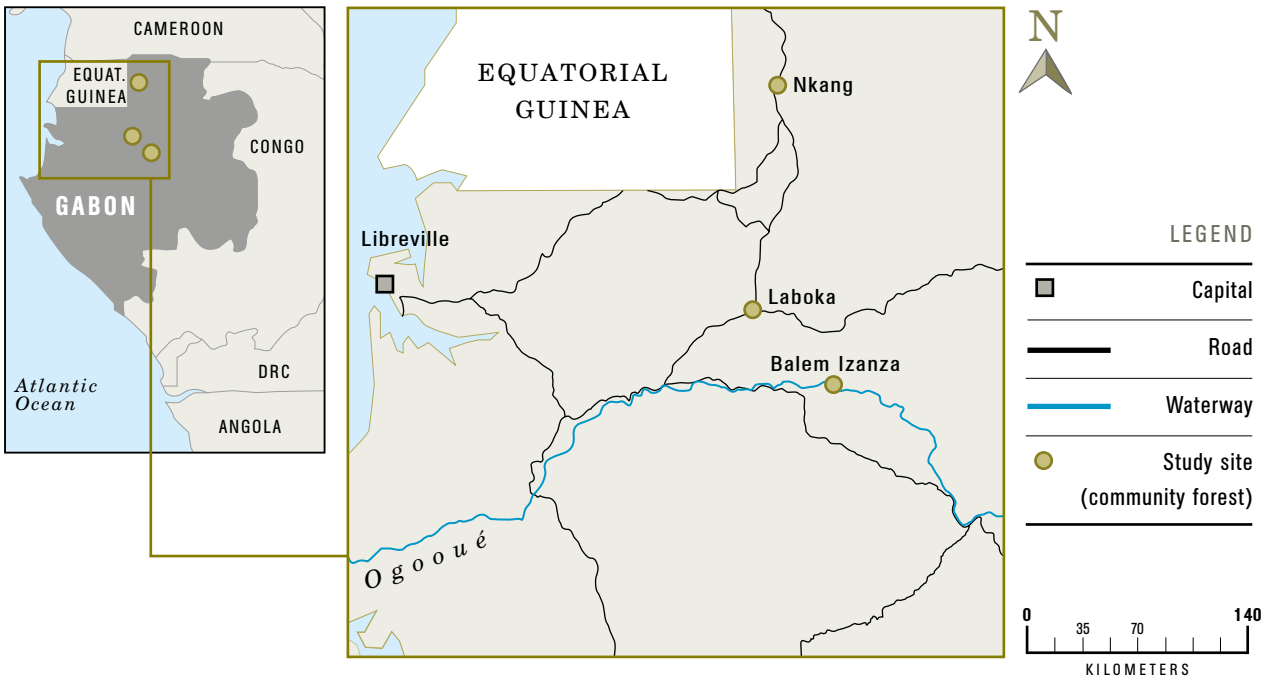
Photo **14** GPS box fixed to the roof of a machine

Further development of the tool is planned in order to explore other technical features that could be useful in forest monitoring, including the recording of the volume of logs transported and the use of RFID chips in the form of nails that would allow individual logs to be traced all the way from the harvesting inventory.

2.5 CASE STUDY OF A TRACEABILITY SYSTEM ADAPTED TO A CONTEXT OF SMALL-SCALE FORESTRY IN GABON

"This initiative allowed various traceability options to be tested and compared in the very specific context of community forestry in Gabon. The objective is to bring the conclusions of this comparative analysis to the attention of policy-makers in Libreville so that the real conditions on the ground can have a positive influence on the decisions to be made when the time comes to develop a regulatory framework concerning traceability in community forests."

Quentin Meunier
Nature+



© Quentin Meunier

Photo **15** Felling in a community forest in Gabon

2.5.1 Background

Alongside the development of large-scale value chains, since 2011 Gabon has been developing regulatory frameworks for the creation of community forests governed by simple management plans suited to the rural context.

As a long-time promoter of sustainable management in its forest laws, Gabon has been involved in negotiating a VPA with the EU since the end of 2009.

The government wanted the agreement to cover not only wood from large-scale concessions but also that from community forests. A traceability system specific to this latter type of operation (Photo 15) therefore had to be considered. Given the recent nature of the rise of Gabonese community forestry and its particular management features, appropriate traceability tools needed to be proposed.

An initiative of the non-profit association Nature+ in partnership with WWF Gabon enabled the design and trial of a specific legality grid and three possible traceability systems, which are now available to the Gabonese Government within the framework of the VPA negotiations. The various systems have been tested in real conditions in order to determine their feasibility.

2.5.2 Legal requirements

Gabon as yet has no legal requirement regarding the traceability of wood originating from community forests. This is because these forests are not local village forest concessions, as is often the case in other countries. Activities taking place there may be concerned with agriculture, for example, or else with capitalizing on non-forest products.
The simple management plan, the backbone governing the use of forest resources, strictly governs the management of timber. The localization of extractions at regular intervals guarantees the sustainability of the system.

2.5.3 Development of various systems

Today, technological progress in terms of semi-electronic, electronic or DNA-based systems offers reliable methods of tracing products in real time. However, relative costs and limited accessibility are often obstacles for developing countries, and even more so in the local-level context of community forests, which are faced with a major problem in the form of the lack of electricity.

A simple system was thus devised to start with: that of blazing stumps, logs and sawnwood, and encoding the information on sheets of paper. During the first discussions on implementation of the FLEGT Action Plan in Gabon, doubts were raised about this system because of the significant risks of abuse.

In order to reduce such risks, a second system involving the georeferencing of trees was then tested. The idea was to provide the geographical coordinates of each tree to be felled, locating it precisely within the harvesting plot. Since this option needed computers to process the data collected, it involved considerable work in terms of training and supervision.

A third system, which would overcome the computer problem, consisted of recording all the information concerning the felled tree on a phone application and not on a computer in the village. The user records the data concerning the log or sawnwood on a smartphone. The collected data can then be fed into a computer and sent in real time to the appropriate government offices at each stage in the harvesting and processing of a log. This last approach has been much appreciated in the villages, especially because of the popular and widespread use of mobile phones. Even so, the limited access to electricity and the phone network in villages could compromise the generalized adoption of this approach.

Thus, three systems were developed:
- a traceability system in which data are recorded on paper (not electronically);
- a semi-electronic traceability system (with georeferencing);
- a system using smartphone technology.

Their costs were compared, since this is also a determining factor in the choice of a system (Table 2).

2.5.4 How they work

The first two possible traceability systems are based on records made on paper. The association in charge of managing the community forest has forms to be filled in and filed. The forms record a minimum of characters to ensure the traceability not only of the log but also of the sawnwood that can be taken from it (Figure 10).

The third system, which is newer and more technical, uses a less well-mastered technology of forms shared online. A set of data, specified in advance using the free application ODK Collect®2 (on the community forest, the block number, the species and the diameter, together with subsequent processing and purchasers if applicable), is entered on a mobile phone, wherever the person may be. These forms are then published online via a phone network on a free server (FormHub®3), access to which is limited by a password. Further data may be added depending on the

Table **2** COMPARISON OF INVESTMENT COSTS FOR THE DIFFERENT TRACEABILITY OPTIONS

TRACEABILITY METHOD	INVESTMENT COST	COST PER 100 LOGS
USE OF PAPER WITH GEOREFERENCING	> Making of a hammer for the community forest by a blacksmith: CFAF 170 000 > Cost of registration of the hammer: CFAF 70 000 > Purchase of a numbering hammer: CFAF 140 000 > Purchase of a GPS receiver: CFAF 300 000	> Photocopying of sheets from the tracking register: CFAF 100 per page > Binding of tracking register: CFAF 500 > Purchase of batteries for the GPS receiver: CFAF 3 000 > Depreciation of the GPS: CFAF 5 000 > Delivery of tracking book to the Water and Forest Service (transport fee): CFAF 20 000
	Total: CFAF 680 000 (€1 037)	**Total: CFAF 38 500 (€58)** or CFAF 385 (€0.58) per log
USE OF SMARTPHONE	> Making of a hammer for the community forest by a blacksmith: CFAF 170 000 > Cost of registration of the hammer: CFAF 70 000 > Purchase of a numbering hammer: CFAF 140 000 > Purchase of a smartphone (with GPS option): CFAF 225 000 > Downloading of the application (paid and free versions available – free in our case)	> Estimated depreciation of the smartphone: CFAF 10 000 > Recharging of phone credit for data transmission: CFAF 10 000
	Total: CFAF 605 000 (€922)	**Total: CFAF 20 000 (€30)** or CFAF 200 (€0.30) per log

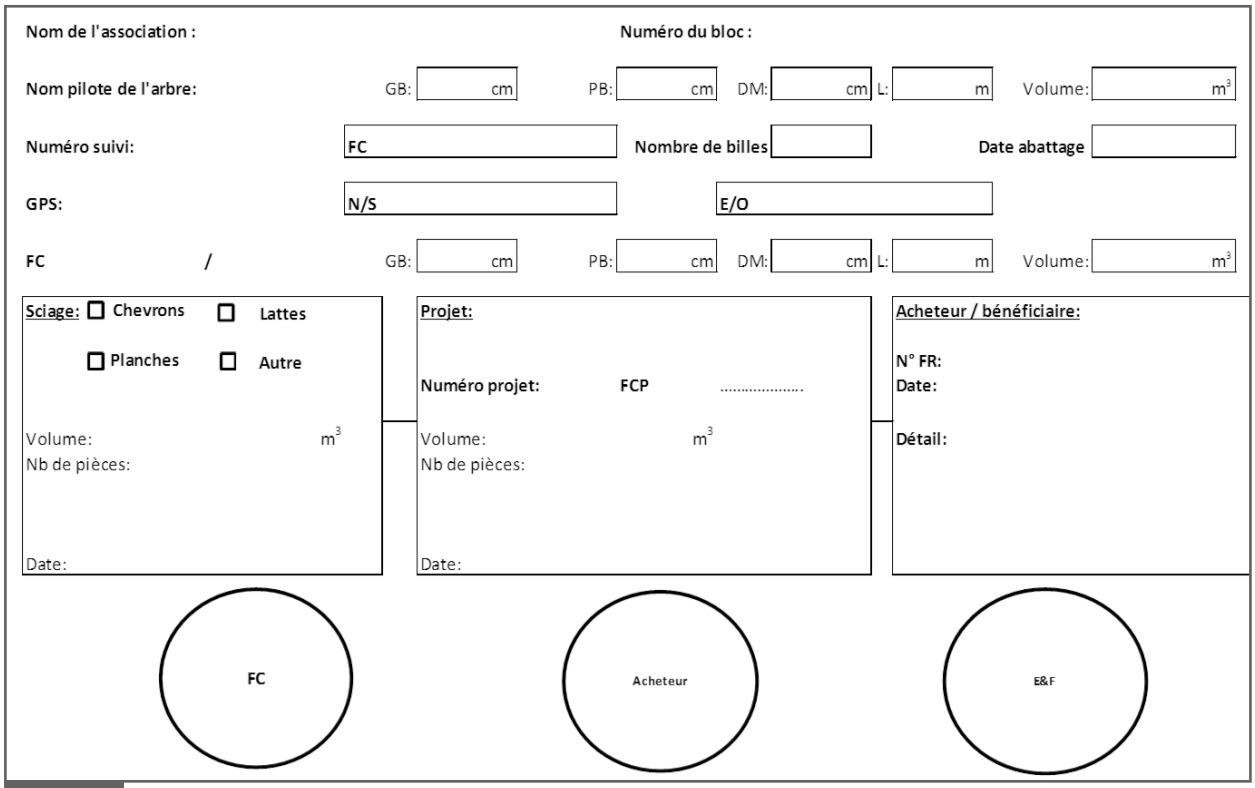


Figure **10** Proposed form for the traceability of wood from community forests in Gabon

context, since the forms are based on Excel® and are very easy to access and modify. All the software, both that used on the smartphone and that used as a server to centralize information, is freely available on the Internet (Figure 11).

In the three traceability options proposed in Gabon, a monitoring number must be attached to the log and any subsequent processed products. This is done with the use of two forestry hammers (Photo 16):

> a hammer specific to the community in question (a seal), with a number corresponding to the identification number given to the community forest when it was assigned; for example, if a community forest (*forêt communautaire* = FC) was given the number 02/13, its seal will be:

F C 0 2 1 3

> a standard numbering hammer with the numerals 0 to 9, used to indicate the identification number of the felled tree on each piece of wood; each log extracted from a community forest will thus have its own unique number, which will follow the seal; for example, the 42nd tree harvested in this community forest will bear the number:

F C 0 2 1 3 4 2

This code, which is recorded on paper in the tracking register or using the smartphone application (Photo 17), corresponds to the label that will be reproduced on each piece of wood derived from this tree. No difficulties were observed during trials using these forestry hammers.

2.5.5 Outlook for the future

The trials have shown that some communities understand and know how to use the options based on a paper system. However, they have also shown that the option based on a smartphone is easy for people to adopt. Although such a system does seem more accessible and less restrictive, there are fears over the fragility of the device and the lack of safeguards for data recorded other than on the phone.

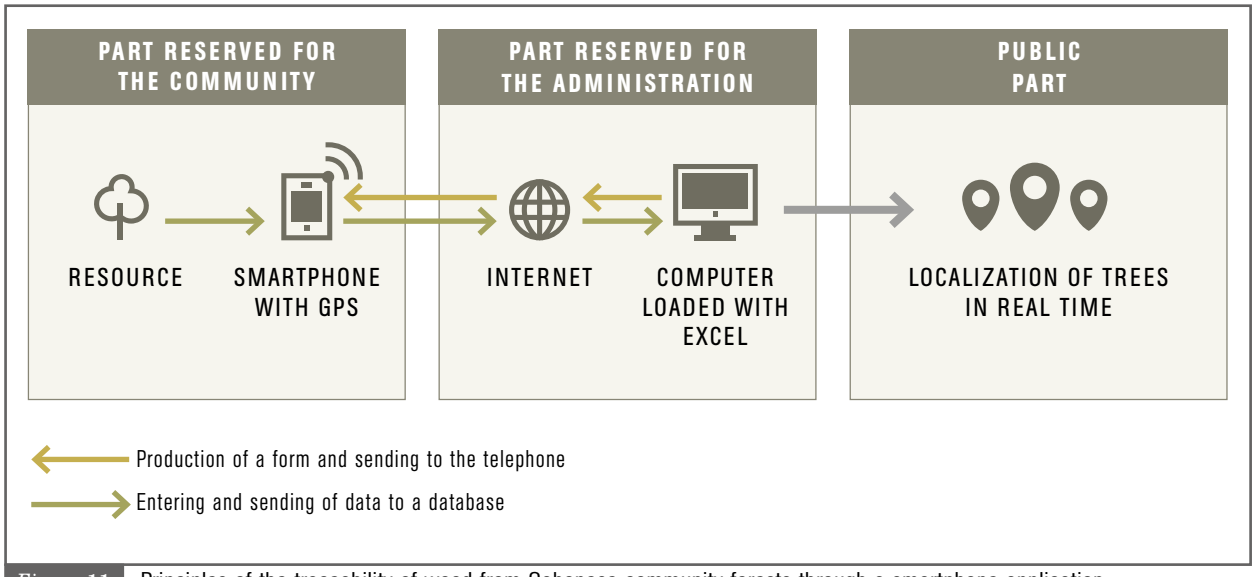


Figure 11 Principles of the traceability of wood from Gabonese community forests through a smartphone application (*Source*: Quentin Meunier)

Moreover, the use of paper is still at this point indispensable to enable villagers to monitor and secure data. It seems possible and helpful to combine them with the use of a GPS. While the system using a smartphone application is attractive, the practice of recording data on paper seems more reliable, inasmuch as the government services responsible for forests in Gabon would not as yet be able to maintain a server to centralize data at the provincial and national levels.

In more general terms, there is a pressing need to support and train community forest users in the monitoring of their forest and its harvesting (photo 18). The responsibility here lies with the Gabonese forest service, which must first of all train its own staff in these new methods, so that they can then support community forest users in the implementation of monitoring. Without such essential training, there is a serious risk that the establishment of a traceability mechanism would be unsuccessful.

Photo **16** Tools for marking wood from community forests in Gabon

Photo **17** Use of the smartphone application in a community forest in Gabon

Photo **18** Hand sawing in Gabon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3

VITAL FACTORS TO BE TAKEN INTO ACCOUNT WHEN DESIGNING A TRACEABILITY PROJECT

THE VARIOUS INITIATIVES DESCRIBED IN THE PREVIOUS CHAPTERS RAISE A NUMBER OF QUESTIONS THAT MUST BE CONSIDERED BEFORE STARTING ON THE DEVELOPMENT OF A TRACEABILITY SYSTEM.

3.1 WHAT IS IT TO BE USED FOR?

The answer to this question may seem obvious, but apparently it has not been paid sufficient in-depth attention in many traceability projects. A variety of objectives may in fact be pursued, depending on the target group:

- In the case of government services:
  - to monitor the flow of timber on a national or regional scale;
  - to ensure that forestry taxes are collected;
  - to collect data and produce statistics on the harvesting and export of timber.
- In the case of logging companies:
  - to obtain certification of legality or responsible management;
  - to monitor the production of a chain of custody;
  - to control production costs all along the production and processing chain;
  - to ensure that stocks are monitored.
- In the case of communities:
  - to declare traceability data to the central government;
  - to have better control over production costs;
  - to have better visibility for placing wood on the market.

In general terms, a system based solely on restrictions would be hard to maintain in the long term. On the other hand, a system to manage and monitor forest operations, in which traceability is one of multiple functions, will have a better chance of sustainability.

Three aspects should in particular be taken into account:

- **With regard to the end user,** it is vital to develop a fast, practical tool that can provide an overview of the operations carried out. For a logging company, the application intended for the CEO, generating automatic reports at each stage in the production and processing chain, quickly becomes an indispensible management tool for decision-making. Similarly, if the implementing body is the state, applications can be created that will in particular provide an overview of the monitoring and collection of forestry taxes. This will encourage the state to set up the necessary monitoring mechanisms to ensure that operators' declarations are made correctly and within the set time limits.
- **With regard to operators in the traceability chain**, a system presented solely as a means of increasing the control or inspection of work would quickly run up against obstacles and risk being rejected and not maintained in the long term. The future functions and advantages of the traceability system must be highlighted, so that operators can see how useful it can be on a daily basis. In this regard, it will be more helpful, for example, to highlight the advantage of the new system in terms either of (a) the added value of wood products thanks to a new certification, (b) the higher value placed on labour, through individual bonuses for production or quality, or (c) a reduction in the arduousness of the work thanks to tools that make recording in the field easier. Similarly, if a national traceability system is put in place, private operators are more likely to accept it if it gives them preferential access to certain more profitable markets or if they receive regular production reports so that they can see how some of their activities are progressing (exports, modifications in administrative records etc.).
- **With regard to the market**, the complexity of the system developed or the investments allocated to its preparation must be weighed against the advantages it could bring. A market with little concern over the origin of its wood will not encourage an operator to maintain a traceability system that goes beyond the legal requirements or the effective application of forest laws.

3.2 WHAT WILL ITS LEGAL FRAMEWORK BE?

Apart from the specific requirements of the structure implementing the traceability project (state, company or community), it is imperative that national legal requirements be taken into account. For this reason, Pallisco based itself on the DF10 site registers when developing its traceability system (section 2.3). Similarly, in the case of community forests in Gabon, the references recorded on smartphones corresponded to the markings made on logs with a forestry hammer (section 2.5).

When setting up a traceability system, a state or company may also take into account the legal requirements of the country being exported to. In order to strengthen their purchasers' observance of due diligence (section 1.2.4), companies exporting mostly to European or American markets (EUTR or the Lacey Act) can attach documentation verifying the origin of their wood to the sale documents. If the traceability system is sound enough, it should be quite possible to make information available to purchasers on all the stages a wood product passes through, from the felling of the original tree to exporting – as is the case, for example, for various forest species produced in Alaska and destined for the American musical instrument industry.

3.3 WHAT ARE THE CURRENT WORKING HABITS?

Whoever designs the traceability project must take into account the staff's current working habits, which are often linked to legal requirements. The way must be carefully laid towards change and the project designer must reconcile:

1. the human, technical and financial resources at his or her disposal to help the staff involved in traceability through training in the field;
2. the margin for manœuvre he or she has within the structure with a view to introducing modifications in working habits and procedures;
3. the staff's existing habits and their skill level.

For example, in the design of the National Timber Office traceability project (section 2.1), it was tricky to modify the working practices of a large staff when only limited resources were available for prolonged support in the field. The project designer therefore decided to base the new traceability procedures exclusively on processes observed on the ground. Similarly, from now on, all recordings made on smartphones are simply continuing those previously made on paper. The changes introduced by the new system thus aim simply at making field recordings faster with user-friendly working tools.

3.4 WHAT IS THE SCOPE OF TRACEABILITY ENVISAGED?

The designer of a traceability project must specify the scope of his or her system: from what point of entry and with what degree of precision must trees or wood products be recorded?

Knowing the GPS coordinates of each felled tree is not always useful. Generally speaking, the important thing is to be sure that a log or a wood product comes from a specific zone in which harvesting has been properly authorized. In the case of the National Timber Office project (section 2.1), it was decided to set up a traceability system taking strips as the entry point. The strips are subdivisions of harvesting plots, the spatial units to which forest workers such as tree markers and fellers are allocated. Wood is also sold using the strips as reference. The system adopted here allows detailed monitoring of operations in each of the strips, whereas locating each tree by GPS would be superfluous and unnecessarily laborious.

On the other hand, in the case of natural forests in central Africa, all production is based on the data in the harvesting inventories, where each tree is individually located in order to comply with regulatory requirements. It is then appropriate to base a traceability system on these geolocalization data.

Downstream of the production chain, the designer of the system is careful to define clearly where the monitoring of products must cease: by the roadside, at delivery to a customer, at the port etc. Whatever the case, the designer ensures that his or her system is compatible with that of the customer, so that the data can be easily combined.

3.5 WHAT TECHNOLOGY SHOULD BE USED?

In most situations, the recording of information concerning harvesting (inventory, felling etc.) is carried out on paper. Various people often then enter the same data into a number of databases that are not connected with one another. Apart from the redundancy of all this information, each time data are entered, the risk is increased of introducing errors.

Moreover, in order to produce simple production status reports or analyse inventory data, company managers often have to bring in different departments within their companies. When the requested status report is produced, it no longer reflects operations on the ground in real time.

In addition, individual operators often have their own personal analytical methods, so that two identical reports may not reflect exactly the same situation.

Lastly, the “technological” environment of the structure will affect the methods of the traceability system, both in the field and when designing the database.

Technology for designing the field traceability system

Various factors need to be taken into account: (1) the coverage of the mobile phone network (3G, 4G) over the whole activity zone; (2) the possibilities of access to recharging points for smartphones, laptops or tablets; (3) the traceability medium anticipated (tags, bar codes, painted numbers); and (4) the weather conditions in which operators usually work. There is no point in developing systems linked to technology that is too delicate for the climate. Similarly, if


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control points for forest products are set up by the roadside and inspections carried out exclusively with the use of new technologies (verification of bar codes by consulting a central database on a laptop), careful account must be taken of the risk of a break-down in the system where Internet access is erratic. Lastly, if it is decided to use bar-code labels for traceability, it is essential to plan a reliable source of supply, either by on-line purchase or from a supplier. In this latter regard, along with the budgetary aspect, the constraints in managing a bar-code printer must be weighed against the timeframe for deliveries from suppliers.

Technology for designing the database

Various factors need to be taken into account: (1) the number and skill level of the staff who will work on the database and be responsible for data checking and entry; (2) the way in which the central database will be consulted; (3) the Internet connection and the quality of the network within the structure; and (4) the physical security of the installations and level of confidentiality. For example, if the installations are affected by regular power cuts or if a number of people must have access to the data, the establishment of a cloud server would be more appropriate than a physical server in the offices of the structure in question. If many people are working on the database, it would be a good idea to develop software with personalized levels of access and the daily recording of operations carried out. Lastly, it is advised that the tool to manage the centralized database and the field traceability system be developed at the same time, since it is essential that the technologies be compatible.

Example of the National Timber Office in Benin

Table 3 summarizes the elements of the context taken into account when designing ONATRACK.

Table **3** EXISTING CONTEXT AND CONSEQUENCES IN TERMS OF THE SOLUTION TO BE ADOPTED

EXISTING CONTEXT	RESPONSE PROVIDED
Limited telephone cover, not covering all sectors of the plantation, 3G/4G network accessible daily for National Timber Office staff	Recording of operations on smartphones in the absence of a connection, then synchronization of recorded data on return of the network or by wifi, on the centralized database on the cloud. The obligation to connect to a centralized database as a condition for continuing with the further stages of harvesting must be avoided at all costs (e.g. recording the numbering of logs on the Internet before having the right to skid them).
Lack of electricity supply in plantation sectors where the villages are located and where the staff of National Timber Office service providers live	Traceability recordings carried out either on smartphones or on paper, since both can later be synchronized on the central database. Increasing the autonomy of smartphones through external back-up batteries.
Small diameters of felled trunks	Marking of stumps and logs with a forestry hammer. Use of bar-code labels.

3.6 WHAT ARE THE VERIFICATION MECHANISMS?

A system centred on a database, however powerful, can never completely replace physical field inspections. However, it can boost and steer them. This section seeks to describe the verification mechanisms that can operate on a database and thanks to which various parameters can be automatically verified. These verifications are intended to control "inconsistencies":

- On the felling database:
  - correspondence between inventoried trees and felled trees on the basis of diameter/species/location;
  - validity of the numbering (syntax, label allocated if applicable, previous use);
  - length and maximum diameter of logs.
- On the sawing and skidding database:
  - sum of dimensions of daughter logs not exceeding the dimension of the original tree;
  - diameter/species/location correspondence;
  - validity of numbering (syntax, allocated labels, previous use).
- Extraction:
  - comparison between the locations of operations as authorized and observed;
  - validity of numbering (syntax, allocated labels, previous use);
  - traceability of the inventoried tree.

In all cases, tolerance systems must be put in place. For example, the diameters of a tree often differ slightly from one operator to another, perhaps because they are measured at different heights. It is therefore important to make sure that the system is flexible enough to allow slight variations in measurements and thus avoid pointless hold-ups. A good system can then easily guide field inspections in case of doubt.

FACTORS IN THE SUCCESS OF A TRACEABILITY SYSTEM

MANY ELEMENTS WILL DETERMINE THE SUCCESS, SUSTAINABILITY AND ADOPTION OF A TRACEABILITY SYSTEM.

SECURE DATA COLLECTION AND PROCESSING.

It is recommended that those responsible for entering data be independent of field staff, since it would be unwise to link their salary in any way to production activities. Situation reports or automatic reports can then be produced avoiding any kind of subjectivity in analysis and using secure information. This will reduce the risk of inconsistencies in the reports generated, since such inconsistencies can skew calculations of production and yields, as well as other analyses and comparisons made at the end of the production chain. The production of automatic reports means that identical reports can be produced. With regard to this last point, a record tracing the history of interventions and modifications to the database may be useful.

DEVELOPMENT OF AN APPLICATION IN INDIVIDUAL, INTERCONNECTED MODULES THAT ARE DIRECTLY TESTED IN THE FIELD.

Phased delivery of the application means that each user can be trained in the module intended for him or her, thus ensuring better assumption of ownership. In addition, it is important to make sure that each module is tested together with its real users.

CONSTRUCTION OF A SIMPLE, EASY-TO-USE SYSTEM.

Clear procedures, together with readable operating manuals and easy-to-use, user-friendly tools, are a key to success.

FREE FLOW AND CENTRALIZATION OF INFORMATION.

These two factors are usually connected. The soundness of a traceability system and the level of ownership assumed often depend on the speed with which data are incorporated into it. The more closely a system reflects the current situation on the ground, the more useful it is to its managers, who can be really reactive in their decision-making. The centralization of information, with Internet access, entails secure, personalized levels of access.

DESIGNATION OF A TRACEABILITY OFFICER.

This would be a person within the structure, ideally involved in designing the traceability system, who should be familiar with all the procedures and production points involved in the system. Situated apart from the rest of the hierarchy, he or she can carry out independent inspections and checks.

REGULAR MAINTENANCE AND CAPACITY FOR ONGOING TECHNICAL ASSISTANCE.

Maintenance is ideally carried out regularly and from a distance, so that it does not involve excessive recurrent costs. The cost should also be included in the budget.

DEVELOPMENT OF A FLEXIBLE SYSTEM.

Administrative bottle-necks and changes in legal requirements can prejudice the whole working of a traceability system. The flexibility of the applications developed will allow them to adjust to any changes in the legal framework.

AVOIDANCE OF DEVELOPING AN APPLICATION BASED SOLELY ON "CONTROL FOR CONTROL'S SAKE".

It is particularly important to create functions that provide "services", such as the monitoring of yields and production, the production of statistics and the preparation of official declarations.

GOOD MANAGEMENT OF STOCKS OF EQUIPMENT AND MATERIALS.

Poor logistical management, especially with regard to the medium used for traceability in the field, can have harmful effects on the whole production process. Whatever traceability medium is chosen (tags, labels, paint etc.), it is essential to maintain sufficient stocks.

AVOIDANCE OF ANY UNDERESTIMATION OF THE IMPORTANCE OF THE HUMAN FACTOR.

It is vital to train and support users and technical staff, since they have to understand and use the system. Field controls remain essential.


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4

CONCLUSIONS

THE CONCLUSIONS OF THE EVALUATION OF THE FLEGT ACTION PLAN[21] INDICATE THAT THE ESTABLISHMENT OF TRACEABILITY SYSTEMS IS THE MAIN CHALLENGE IN SETTING UP LEGALITY ASSURANCE SYSTEMS (LAS) IN COUNTRIES SEEKING TO ENTER INTO A VPA. THE EVIDENCE GATHERED DURING THE PRESENT EVALUATION GOES STILL FURTHER, INDICATING AN UNDERESTIMATION OF THE SIZE OF THE TASK AND THE NEEDS IN TERMS OF HUMAN, TECHNOLOGICAL AND FINANCIAL RESOURCES. THE EVALUATION BY THE EU COURT OF AUDITORS[22] DRAWS SIMILAR CONCLUSIONS: TAKING CAMEROON AS AN EXAMPLE, IT NOTES THE MAJOR DIFFICULTIES MET IN SETTING UP THESE TRACEABILITY SYSTEMS, WHICH IS THE MAIN CAUSE OF DELAYS IN IMPLEMENTING VPAS.

Even so, the technical aspect is not the main obstacle, inasmuch as the majority of consumer products today are traceable: even small products coming from complex production chains have bar codes enabling their provenance to be established; and this is obviously even truer for products the size of a log or a whole load of sawn pieces that come from relatively simple production chains, so that they can be traced without any great difficulty. From the experience of the EU-FAO FLEGT programme on the ground, it appears that private or public initiatives have been successfully carried out and effectively allow wood products to be followed by attaching information on their origin, so long as certain prior conditions are met.

In the first place, this type of project cannot be successfully carried out without the firm resolve of the head of the company or government department. The example of Benin's National Timber Office, a state company, shows that a director-general who has vision and can count on a motivated team can impose significant changes in working habits. Such impetus must come from above and be applied constantly, since change will always meet with resistance. The development of a system must then take account of what already exists and the context in which the future tool will be applied. Recourse to cutting-edge technology is not always the most appropriate response if the context does not allow it. When setting up traceability systems for

[21] *Final report of the evaluation of the EU FLEGT Action Plan 2004-2014*. European Commission and European Forest Institute, 2016.

[22] European Court of Auditors. *EU support to timber-producing countries under the FLEGT Action Plan*. European Union, 2015. Available at: http://www.eca.europa.eu/Lists/ECADocuments/SR15_13/SR_FLEGT_EN.pdf

community forests, for example, due note must be taken of the technological gap in these villages, which often lack electricity and Internet access and where management capacities are poor. The initiative carried out in Gabon shows that made-to-measure solutions are needed for these community forests. If a solution designed by and for large-scale concession-holders is transposed lock, stock and barrel to community forests, it can only end in failure. A step-by-step or module-based approach is therefore recommended. It can provide flexibility and avoid the risk of operators digging in their heels when faced with changes that seem too radical compared to their current habits. It leaves time to convince them through practice and to adapt the development process depending on their reactions when faced with the concrete situation. Lastly, another lesson to be drawn from the various pilot projects presented in this study is that it is vital to see traceability not only as a tool that can meet legal requirements, but also and above all as a business management tool that can have an impact on yields, working conditions and production efficiency.

The traceability of wood products lies at the heart of the Legality Assurance System (LAS). Consumers will be reassured about the legal origin of the wood product they purchase only if the product is accompanied all along its production chain by information on its origin that is consistent, documented and verified. The present work has provided an insight into the working of a number of these systems that have been implemented in the field on various scales and in various contexts. We hope that these examples will be a source of inspiration for new initiatives and thus contribute to implementation of the FLEGT Action Plan.

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FAO FLEGT
PROGRAMME

TECHNICAL
PAPER

N°1

TRACEABILITY

A MANAGEMENT TOOL FOR ENTERPRISES AND GOVERNMENTS

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