Current and potential use of ICTs in the forest sector governance in Uganda

Steve Nsita for the World Bank

November 2010

DISCLAIMER

The views in this paper are entirely the views of the authors, and do not reflect the official positions of the World Bank and the position of the forest sector agencies contacted.

ACKNOWLEDGEMENT

The preparation of this report was strongly supported by views and expertise of Mr. Gaster Kiyingi. However, the any possible remaining mistakes and omissions are entirely the responsibility of the author.

This paper is funded by the World Bank

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Acronyms

AAC	ANNUAL ALLOWABLE CUT
BUCODO	BUDONGO COMMUNITY DEVELOPMENT ORGANISATION
CBO	COMMUNITY BASED ORGANISATION
CFM	COLLABORATIVE FOREST MANAGEMENT
CFR	CENTRAL FOREST RESERVE
CG	CENTRAL GOVERNMENT
CODECA	COMMUNITY DEVELOPMENT AND CONSERVATION AGENCY
CSO	CIVIL SOCIETY ORGANISATION
DFO	DISTRICT FORESTRY OFFICE
DFS	DISTRICT FORESTRY SERVICE
EI	EXPLORATORY INVENTORY
FD	FORESTRY DEPARTMENT
FMP	FOREST IMPROVEMENT MANAGEMENT SYSTEM
FGLG	FORESTRY GOVERNANCE LEARNING GROUP
FLEGT	FOREST LAW ENFORCEMENT GOVERNANCE AND TRADE
FM	FREQUENCY MODULATION
FMP	FOREST MANAGEMENT PLAN
FMU	FOREST MANAGEMENT UNIT
FR	FOREST RESERVE
FRMCP	FOREST RESOURCES MANAGEMENT AND CONSERVATION PROGRAMME
FSSD	FORESTRY SECTOR SUPPORT DEPARTMENT
GIS	GEOGRAPHICAL INFORMATION SYSTEM
GPS	GLOBAL POSITIONING SYSTEM
ICT	INFORMATION COMMUNICATION TECHNOLOGY
IGG	INSPECTOR GENERAL OF GOVERNMENT
ISSMI	INTEGRATED STOCK SURVEY AND MANAGEMENT INVENTORY
IT	INFORMATION TECHNOLOGY
JLOS	JUSTICE, LAW AND ORDER SECTOR
LAN	LOCAL AREA NETWORK
LFR	LOCAL FOREST RESERVE
LG	LOCAL GOVERNMENT
MOFPED	MINISTRY OF FINANCE, PLANNING AND ECONOMIC DEVELOPMENT
MTEF	MEDIUM TERM EXPENDITURE FRAMEWORK
MWE	MINISTRY OF WATER AND ENVIRONMENT
NAFORRI	NATIONAL FORESTRY RESOURCES RESEARCH INSTITUTE
NCMP	NATURE CONSERVATION MASTER PLAN
NDP	NATIONAL DEVELOPMENT PLAN
NEMA	NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY

NFA	NATIONAL FORESTRY AUTHORITY
NFP	NATIONAL FORESTRY PLAN
NFTPA	NATIONAL FORESTRY AND TREE PLANTING ACT, 2003
NGO	NON-GOVERNMENTAL ORGANISATION
PA	PROTECTED AREA
PC	PERSONAL COMPUTER
PFE	PERMANENT FOREST ESTATE
PPDA	PUBLIC PROCUREMENT AND DISPOSAL ACT
PSP	PERMANENT SAMPLE PLOT
REDD+	REDUCING EMISSIONS FROM DEFORESTATION AND FOREST DEGRADATION+
SPGS	SAWLOG PRODUCTION GRANT SCHEME
TMF	TROPICAL MOIST FOREST
UCC	UGANDA COMMUNICATIONS COMMISSION
UTGA	UGANDA TIMBER GROWERS ASSOCIATION
UWA	UGANDA WILDLIFE AUTHORITY
VHF	VERY HIGH FREQUENCY

Chapter 1: General Background

Introduction

Following from forest sector reforms that reached a climax in 2004, Uganda is again struggling to improve forest governance and reducing forest crime. In order to achieve this, there is need to go back to the drawing board, to assess what has worked well after the reforms, what has failed and what needs to be done to deliver good governance in the forest sector (Nsita, 2010). Of course this means revisiting the forestry policy, the legal frameworks, governance of forestry public institutions, law enforcement, needs and aspirations of the private sector operations and civil society participation.

One of the issues under investigation is the use of information and communication technologies (ICTs) in improving forest law enforcement and governance in Uganda. The question is: can ICTs play a substantial role in delivering good governance in the forest sector in Uganda. This is what this document tries to address.

What is governance?

Governance refers to the manner in which public officials and institutions acquire and exercise the authority to shape public policy and provide public goods and services (World Bank, 2009). The World Bank has developed a framework for forest governance and this framework has five pillars:

- transparency, accountability and public participation
- stability of forest institutions and conflict management
- quality of forest administration
- coherence of forest legislation and rule of law
- economic efficiency, equity and incentives

A detailed elaboration of these pillars and how they apply to governance issues in Uganda can be found in the governance background paper entitled “in search of forest governance reform in Uganda” by Steve Nsita.

What are ICTs?

Information and Communication Technologies (ICTs) are the technologies used in the conveying, manipulating and storing of data by electronic means (OECD, 2004). These technologies are gaining a foothold in service delivery and have several characteristics that drive major transformations (Uganda Bureau of Statics, 2008). In the forest sector and where they are applied especially in the western world, ICTs have been used to:

1. … generate, aggregate and store data for forest resource management
2. … allow personalized experience in manipulating and presenting data for decision making
3. … help to network people and institutions and their clients for effective marketing of products
4. … support new, open, collaborative, and innovative ideas in forest governance
5. … mechanize processes for economic efficiency of operations
6. … improve access to information, public participation and access to justice.

ICTs, including mobile phones, the internet, remote sensing gadgets, global positioning systems and field level applications, have in many cases proved valuable in promoting transparent and equitable governance. Forest sector actors now believe that there is potential for ICT to advance these governance

objectives especially if utilized innovatively. Consequently, forest sector actors in Uganda are starting to adopt and use ICTs in various aspects of forest resources management.

Objective and scope of the study

The objective of this study is to document current and potential use of ICTs in the forest sector in Uganda as an input into the ongoing global study on the use of ICTs in improving forest law enforcement and governance. The study puts emphasis on analyzing how ICTs have been utilized and can be utilized to address the governance solutions and challenges identified during the analytical process.

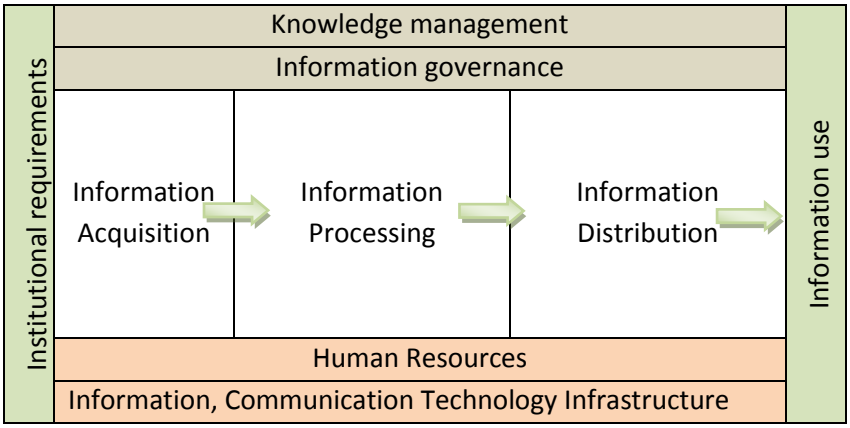
This study builds on the work and outcomes from the analytical work on forest governance reforms in Uganda and goes into analyzing and documenting innovative, successful and/or unsuccessful cases of deployment of ICTs in the forest sector in Uganda. It focuses on issues and governance challenges identified during earlier studies on governance and dwells on the following ICT-related issues:

- Use of ICTs in Uganda and the current state and potential to improve forest governance
- Perception of key stakeholders on the potential of ICTs in forest governance
- Costs of installation, operation and maintenance of the ICT systems and applications and cost of training and support services needed to operate the system

Conceptualizing ICTs for forestry in Uganda

ICTs are important in capturing, processing and distributing information. It involves consideration of the institutional requirements on one hand and putting into perspective the information uses as demanded by the end users (Hawryszkiewycz, 1994). It is also a requirement that the human resource managing the information infrastructure has the necessary training and capacity to meet the quality and standards required and being able to package such information for the decision making process. Figure 1 below illustrates the above interplay.

Figure 1: Understanding use of ICTs in an institution



Adopted and modified from I.T Hawryszkiewycz, 1994

Once the information is available, there must be observance of it to grow into a knowledge base (Howe, 1989) and therefore knowledge management becomes a prerequisite in mapping the desired outcomes in the short run and its impact in the long run.

The use of ICTs in the forest sector should be aligned along this thinking. Considering what has been achieved so far in the use of ICTs in the forest sector in Uganda, there is positive progress so far though this cannot match the standards seen in the western world. Uganda therefore needs to borrow a leaf from the success stories in the use of ICTs to deliver forest sector governance that contributes towards national development goals.

What can ICTs do for the forestry governance in Uganda?

Borrowing from success stories in the western world, and a few African countries that have deployed ICTs in the management and proper administration of forestry, it is evident that Uganda can benefit from the following:

1. Better service delivery

- Increased ease with which people communicate with forestry organizations, using email, telephone, website and text messaging.
- Increased capacity to capture timely data and information through use of GIS and GPS technology.
- Use of established forest information management systems in monitoring performance and deviation from agreed norms and standards.

2. Better access to information for managers

- Better methods to collect, process and disseminate information and its use in the decision making process.
- Better methods to prepare information for monitoring and reporting to stakeholders.
- Better means of indentifying trends, problems and pointing to possible solutions.

3. Better financial management

- With the robust technology in place, accounting software can be used to record income and expenditure and helps take care of taxation trends.
- It is also possible to manage projects in line with agreed work plans and budgets and be able to produce timely reports.

4. Better client records

- Keeping client contact information in a database to promote/support shared work inside the organisation as well as with partners.
- Online access to information enabling staff to access up-to-date information in the management of the forest estate.

5. Better information for the organisation

- Packaging information and availing it to the public through the World Wide Web to supplement that made available through telephone and extension service delivery.
- Online information can support community campaigns, such as accessing government statistics to back advocacy and good governance initiatives.

ICTs and forest governance

The concerns regarding monitoring and managing of forest resources in Uganda can be effectively handled by establishing robust Geographic Information Systems (GIS) that is now a cornerstone for most forest management information systems in the world. In Uganda, the use of GIS is still limited to a few institutions and yet it could have wide impacts on the forest sector, from silviculture to the marketing of forest products and the recreational use of forests.

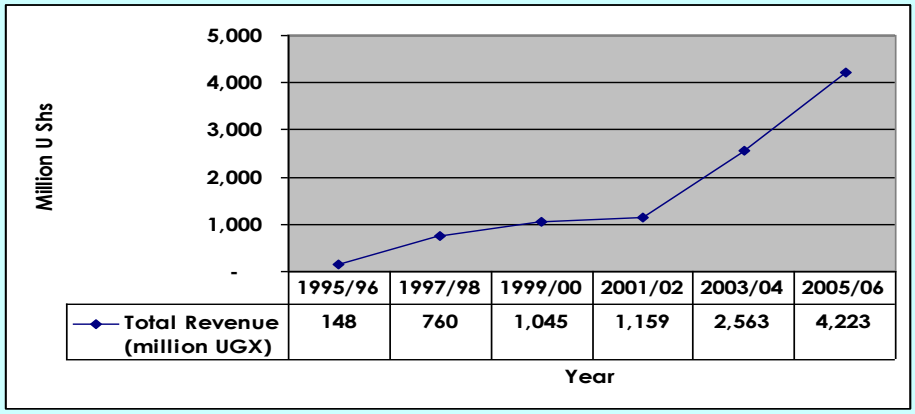
New innovations such as mobile telephones have been widely adopted by institutions but there have been unexpected consequences. For example, illegal trade is on the increase because of introduction of mobile phones (improved communication amongst illegal dealers).

At the international level, companies in the wood products industry use e-business solutions in many tasks right from design and product development through to supply chain management, promotion, and sales. There is increased flow of information through newsprint, magazine paper, and office paper methods. The launching of the internet has also seen the emergence of electronic magazines and increased electronic depositories of documents, and the reduced role of the library. Social media such as Facebook are starting to take centre stage in information sharing.

The Changing Face of Tracking the Timber Chain of Custody in Uganda

Until 1997, the chain of custody of timber was characterised by sawlogs being branded with the hammer, a movement permit issued, and receipts for payment still on paper. With the emergence of the computer on Uganda's forestry scene, changes began to be made. A database was developed to record particulars about timber harvesting and movement, including a record of timber impounded, the circumstances under which it was impounded, and who the offender was. Data going back to 1995 was entered in the database from paper records. As a result of this action, and combined with other governance actions, especially with regard to reigning in corruption, revenue shot up by 300%, from UGX 148 million (US$148,000) in 1995/96 to UGX 760 million (US$618,650) just one year later (Figure 1).

Figure 1: Trends in Revenue Collection as FLEG improved with help of ICTs



Source: NFA Records

During the same year, the percentage of revenue from sale of impounded timber dropped from 25% to 15%, showing that more people were going legal.

In the early 2000s inventory methods, which hitherto had been largely manual began to be computerized. Exploratory inventory practices were re-designed and software packages to process the information were developed and tailor-made for Uganda. In the same vein, stock survey methods were re-designed. For the first time, individual standing trees could be mapped by computer and easily identified on the ground, starting from inventory lines set up by GPS. This new practice, called integrated stock survey and management inventory (ISSMI) was developed specifically for Uganda's tropical moist forests.

Subsequently, the field inventory and stock survey practices were linked to tracking of legally obtained timber in a process for tracking the legal sources of timber from the harvesting stump to the timber shed in Kampala. This process would later persuade the British High Commission in Kampala to buy timber from Kalinzu and Bugoma Forest Reserves because they were convinced that they were using timber that had been obtained legally. Annex 1 describes the Kalinzu/Bugoma Initiative that brought together ICTs and other field practices on the road to independent verification of legal sources of timber, in line with international desired practice.

The effect of these and other forest governance measures would raise revenue collections to UGX 4,223 million (US$2.3 million) in 2005/06. The contribution of sales of illegal timber dropped down to only 8% of the revenues.

Today, there are new insights into how ICT development could change strategies for acquiring information for preparing forest management plans: soil type, topography, wildlife, growth and yield, and marketing. The tools used to collect and manage the information have changed dramatically over time, with ICT development assisting the rapid assessment and integration of data from multiple sources.

ICT has been an essential driving force in putting across advocacy messages. With the help of electronic media and the Internet, issues such as degazettement of Mabira and Kalangala forests did gain much wider attention than would have been possible through conventional print media.

There are avenues on how the sector can utilize ICT to increase productivity and improve marketing. The Internet is becoming the primary method for sharing information, including forestry related information. The forest industry in Uganda is starting to use the internet to communicate with clients, share information about products, and support other business activities. A few businesses/ forest companies in Uganda have adopted ICT technologies to help them conduct business and meet the needs of their clients. E-mail and Web pages are becoming popular and will serve to increase productivity and competitiveness. Social communication facilities such as Facebook are also used for forestry businesses – e.g Masterwood Investments on Facebook.

At community level, there is a big "digital divide" between the ICT "haves and have nots". Communities are continuously seeing themselves as secondary beneficiaries as there is limited access to internet and use of sophisticated technology such as GIS and GPS. However the most appropriate means to reach the communities is through FM Radios, which broadcast in local languages that are easily understood by the communities. There is also a proliferation of mobile phones that can be used as a means of reaching the communities.

Chapter 2: Elaborating ICT policy in Uganda

Policy and legal frameworks

Uganda's ICT needs are elaborated in the National ICT Policy, Uganda's E-government Strategy Framework, and the Uganda E-Readiness Assessment Study. The spirit of the three documents is for Uganda to have a well developed information systems infrastructure (Tusubira, 2006) and increased access - which includes equipping offices with PCs, internet connection and necessary software and hardware. In this regard, ICTs in the forest sector in Uganda have a base for operationalisation.

The Uganda Telecommunication Sector Policy of 2005 is in place and being implemented primarily to ensure presence of telecommunications infrastructure and services and to facilitate the delivery of high level information and services to all sectors of society through proper functionality of the IT Sector, Broadcasting Sector, Media Sector and Postal Sector.

Despite the above, it is still evident that ICT skills are still low. Various levels of skills are required, more so in the sectors of production such as agriculture and forestry. The situation is worse moving from the urban to the rural settings where most primary forestry activities take place.

The Rural Communications Development Policy and the Rural Communications Development Programme of government have struggled over years to ensure equitable geographical distribution of services in the country. Though there is commendable progress, there are gaps that need to be filled in order to deliver human development, good governance and timely access to information. The ICT policy has led to several ICT initiatives and investments in the country, but has had limited penetration and use in the forest sector mainly due to cost of investment. It is also thought that ISPs have, until recently, had limited penetration into the rural areas, largely because of absence of electricity and low turnover of business in the rural areas.

The E-government Strategy Framework of government strives to improve the efficiency of and access to information. Further still, access to information in the forest sector has remained wanting. Institutions with forestry information attach patent rights and ask for cost recovery fees, even for information already paid for by government and development partners.

The Uganda Communications Act, 1997 (Cap106, Laws of Uganda) established the Uganda Communications Commission (UCC) and the rights and duties of the state, enterprises, institutions, organizations and individuals in the use and management of the means of communication, in the establishment and management of communications networks, in the rendering of communications services as well as the general responsibilities if there is violation of the law. The forest sector has not exploited this opportunity in the use and management of communication. For example dedicated radio systems, FM Radio Station for tracking illegal activities are possibilities.

The Press and Journalists Statute 1995 (Cap 105), and the Electronic Media Statute, Cap 104, are in place. Even then, forestry continues to share the least share of ink and share of voice in the print and electronic media. There is an opportunity for forest resources managers to advocate for more space to cover issues of forest sector development in the media. But, forest sector managers have not positioned themselves in a manner that attracts media coverage.

Access to Information Act, 2004, makes provision for access by individuals and/or corporations to information of interest relating to a public company. Whereas institutions in the custody of this information are aware of this legal provision, they still attach a cost recovery fee limiting access. Even for information that is totally free, this information is not available in formats understandable by the general public.

The Electronic Transactions Bill, 2004, The Electronic Signatures Bill, and The Computer Misuse Bill, all create a regulatory regime for electronic transactions. They facilitate the development of e-commerce in Uganda by broadly removing existing legal impediments that may prevent a person from transacting business electronically. They provide for functional equivalence, thus paper transactions and electronic transactions are treated equally before the law. But, business establishments in the forest sector are still stuck to traditional means of transacting business; i.e. paper based trade.

The decision making space

With all the above legal frameworks in place, one would assume that there is a conducive environment for conducting business electronically and using ICTs in facilitating improved governance of the forest sector. Logically, this brings about efficiency – minimizing costs, streamlining bureaucratic procedures, making operations more efficient, freeing up resources and enabling sector institutions to deliver services in a better organized and economic manner.

Mainstreaming ICTs in the sector would promote effectiveness leading to better results and meeting development goals, increase the relevance of the sector by facilitating increased participation, resource allocation, responding to issues in a timely manner. Use of ICTs would empower the public through increased awareness and increased contribution to the development process. This makes ICTs a partner of choice for economic and social development. The use of ICTs brings about effectiveness and efficiency, hence an opportunity for improved business and attraction of investment.

The big question is, why is the use of ICTs and ICT related products neglected in the decision making space? Who are therefore influential parties in this decision making process and what are their interests? A mapping of the actors along the lines of those with influence (high or low) and alongside the axis of those that support (or do not support) use of ICTs, indicates power games, with selfish interests (see Figure 2 here below).

Often illegal dealers seek alliance with politicians at central and local government level and will fight to defy all procedure that seeks to conduct business in a transparent and accountable manner. This makes illegal trade more lucrative. For example, forest encroachers are sources of votes come election time and the political leadership will always give them cover – to alter forest reserve boundaries and settle in forest reserves and carry on with other illegalities. So, this category wields high influence against the use of ICTs.

Responsible institutions (the National Forestry Authority, Forestry Sector Support Department, National Environment Management Authority and others) in the forest sector know that it is within their mandate to ensure the smooth running of the forest sector. It is in their professional interest and professional mandate to establish Forest Management Information Systems based on the robust technologies provided by ICTs. They hold high influence in providing profession guidance in the use of ICTs since they are accountable to the public, for whom they manage the forest estate. This zeal is overpowered by the power of the political leadership. That is why politicians, in most cases, allege that

the information captured, analysed and disseminated by these institutions is faulty. The lack of positive political intervention in support of use of ICTs fails their widespread use.

Figure 2: Mapping of stakeholder influence on use of ICTs

Illegal dealers, encroachers,	**HIGH INFLUENCE**
Politicians, Local Governments	NFA, NEMA, Development partners
	FSSD, Private sector,
	Media,
CON	PRO
Women, elderly men	DFS, small scale investors
Blind, deaf	Forest dependent communities
	Forest product users,
	LOW INFLUENCE

Mapping of sector actors and their influence in use of ICTs

The Private Sector is demanding for economic efficiency, equity (in terms of opportunities for investment) and incentives. They would therefore wish to see a forest sector where the ground is leveled for business. The media, as public watch dogs, would wish to see transparency and increased public participation. ICTs can provide all that. Whereas the private sector and the media have high influence to demand for use of ICTs, they have limited muscle to override interests of politicians that ally with illegal traders.

The remaining categories of stakeholders have limited influence. In the digital divide, they are the “have nots”. In the first place they are secondary beneficiaries of ICTs and have limited muscle and knowledge to demand and advocate for streamlined means of capturing, processing and disseminating information for decision making process.

Then there are those that have no influence at all. These include the poor women, the elderly men, the blind and the deaf. They suffer most when everything goes wrong because they entirely depend on natural resources. They have no say because of their lack of knowledge on what is going in the arena of ICTs and forest governance.

Chapter 3: Forest sector stakeholders and their ICT competences

General introduction and history of ICTs in the forest sector in Uganda

There is no clear written history on the use of ICTs in the forest sector in Uganda. For a pretty long time the Forestry Department depended on the power of the fixed telephone line to communicate between headquarters and the ministry on one side, and the field on the other. Communication to the public was through radio announcements on Radio Uganda. The mode of capturing information and reporting was through the type-writer; first the manual and later the electronic type-writer. There is scattered remembrance of the emergence of computerized technologies in the forest sector but many people point to the late 1980s. This is when Personal Computers (PCs) were introduced. Around this time there was also introduction of an Out-door Broadcasting Van (OB-Van) as well, that was used as Public Address System to address communities in areas of specific interest. With increased use of computers in the country, there was emergence of internet in Uganda in the early 1990s, giving way to the use of web-based and e-mail facilities for communication. In the late 1990s, we see the emergence of mobile telephone companies, the use of Global Positioning System (GPS) and Geographic Information Systems (GIS) that turned out to be significant milestones in the management of forest resources.

There was resistance in the use of computerized technologies for some time. This was partly due to fear arising from moving from the known to the unknown. Embracing computerized approaches also meant that some people would lose their jobs. Starting with the mid-1990s, through the Natural Forest Management and Conservation project, the Forest Department started using the technologies to develop Law Enforcement Databases, Revenue Collection Databases, Exploratory Inventories (EI), Integrated Stock Surveys and Management Inventories (ISSMI) and registration of Permanent Sample Plots (PSPs).

During this time, there was a country-wide inventory of biodiversity in major forest reserves resulting into the first ever Forest Nature Conservation Master Plan (FNCMP). This Plan had GIS based maps showing the strict nature, buffer, and production zones of each of the forest reserves.

From then, there was intensive use of technologies. Around 1998 there was the start of an extensive National Biomass Study across the country that resulted into vegetation maps of the entire country. There was also increased use of GIS to convert all forest reserve boundary maps from hard copy to soft copy. This is when Global Positioning System (GPS) emerged; and were used to capture point and line data to update mainly boundary maps.

Around 1996, there was a breakthrough in the use of VHF Radio to fight illegal activities in prime areas of Bugoma and Budongo Forest Reserves. It became easy to track and impound illegal produce and easy to follow up on illegal dealers. The VHF Radio beat all the monitoring systems of the illegal dealers and reduced illegal activities at that time. The only limitation of the system was loss of signals in some parts of the management area. However its use was short lived as the illegal dealers dismantled the only available booster and the system was stopped in its tracks.

The emergence of mobile telephone networks in the late 1990s came with its pros and cons. Whereas there was improved communication, reduced costs and ease of information exchange, in terms of forest law enforcement and governance, the mobile telephone accelerated illegal activities in the forest sector. Illegal operators were able to network with ease starting from the Forestry Department Headquarters itself to the forest.

The National Forestry Authority

Information Technology (IT) Infrastructure

The National Forestry Authority has a well established IT infrastructure. With a web server, mail server, data server, financial system server and GIS server. The capacities of these servers are in terabytes. It has a well managed IT department headed by an IT Manager and an IT Officer. NFA also has a work plan and budget line embedded in the overall planning of the institution. The entire headquarters building is interconnected through a Local Area Network with over 70 workstations sharing accessory gadgets (printers, plotters, scanners) and equipments.

It has a platform for intranet communication though not currently utilized. Inter-personal, inter-departmental and communication with the general public is also carried out through e-mail. Uganda Telcom, one of Uganda's best Internet Service Provider (ISP) provides internet connectivity through routers to the external world. NFA's domain name is registered with a reputable firm (Computer Frontiers International) and subscription is renewed annually to allow for flow of information.

Estimates extracted from draft proposals for establishing NFA's IT infrastructure show that it required a staggering (or more) USD 200,000 to establish the above infrastructure (Table 1) and the IT Department spent almost the same amount of money (Table 2) soon after the NFA was established.

Table 1: Planned expenditure on IT infrastructure before its establishment in 2003

Item	Unit	Description	Unit Cost	Total	Total (USD)
LAN Network	1	lump sum	50,000,000	50,000,000	29,412
ISP (Annual)	1	Lump sum	3,000,000	3,000,000	1,765
Servers	5	units	2,000,000	60,000,000	35,294
Switches	10	units	3,000,000	30,000,000	17,647
PCs	80	units	2,000,000	160,000,000	94,118
Software licenses	1	Lump sum	10,000,000	10,000,000	5,882
Laptops	10	units	2,500,000	25,000,000	14,706
Telephone System	1	Lump sum	20,000,000	20,000,000	11,765

Extracted from draft business plan for the National Forestry Authority (2003)

Table 2: Expenditure figures for NFA's IT Department for 2004

Item	Expense (UGX)	Expense (USD)
Hardware	92,900,000	54,647
Software	13,300,000	7,824
Consumables	68,750,000	40,441
Services	157,918,000	92,893
IT Training	13,000,000	7,647
Zonal Offices	9,600,000	5,647
	355,468,000	209,099

GIS and mapping

NFA has the most robust GIS Unit in the country; well equipped in terms of software and hardware. The Unit has 5 workstations, a dedicated GIS Server (with a capacity of 5 terabytes), 2 plotters capable of printing large formats of up to A0 paper size. The Unit also has ArcGIS 9.3, the most robust version of GIS software at ARCINFO level. In addition to that, it has valid licences for ArcView and ArcEdit for vector and raster analyses. For complicated raster GIS analyses, the Unit uses Eradas Imagine 2010.

The main source of data for raster analyses is Landsat Imagery with a 28.5 meter resolution, which are now available at no cost online (for the 2009 and 2010 images). The Unit does procure Spot images with a resolution of 5 meters for selected areas of choice or interest. Each scene costs 1,400 Euro. This is an expensive price for an interested member of the public to buy. It must therefore be provided for under the public good element that the GIS Unit provides. But this depends on availability of funds; usually donor funds. And because NFA has for a long time had shortages of funds, the NFA cannot procure such images.

In terms of investment for GIS and Mapping, it is not possible to trace the cost as most of the equipment and gadgets were inherited from the Forest Department. Documentation related to procurement of the equipment cannot be traced, and staff have moved-on/changed jobs.

Field inventories

The GIS Unit is also responsible for biomass monitoring. This involves field visits to capture biomass inventories from inventory plots, undertake digital capture of all inventory field data, undertake data entry, processing, analysis, and report, and update and maintain biomass monitoring databases to support the decision making process. Part of the product of these inventories is the production of grid maps that details the biomass resources in a given area. This is crucial in studying vegetation change.

The Unit also undertakes external forest reserve boundary surveys, boundary maintenance, and for internal boundary zonation such as those for Strict Nature Reserve, Buffer Zones and Production Zones. The product from these processes are periodic reports and boundary maps for forest reserves and zonation maps as detailed in the FNCMP.

The Unit also plans, executes and supervises field inventories (field data collection and quality control) in the field of Integrated Stock Survey and Management Inventory (ISSMI), plantation couping in various mature plantations to demarcate felling coupes and measurement of various tree parameters for volume computation, establishment and re measurement of Permanent Sample Plots (PSPs) in both natural and plantation forests. The Unit also undertakes Exploratory Inventory studies resulting into Exploratory Inventory blocks, rapid assessment of young crop and diagnostic sampling of stocks to enhance management planning and preparation of harvesting plans based Annual Allowable Cut (AAC). These harvesting plans are supposed to guide the harvesting for forest resources in the country.

All the above assessment, computations and exploratory activities are undertaken using sophisticated technology – that allows for easy storage, analysis and retrieval.

Functions of the Survey and Inventories section.

- Ensure coloration between ground/field data and available data at headquarters.
- Provide validation of field data against the background of legal provisions.
- Capture field data using GPS data (against the background of existing maps) and use it for updating available databases
- The section serves to sort out forest reserve boundary conflicts with neighbouring communities.
- Assist the legal office in executing legal instruments in relation with boundary data.
- Produce new boundary plans for inventorying and for production of management plans for both plantations and natural forest reserves.
- Collect and align boundaries of plots belonging to licensed private tree farmer's operating in central forest reserves.
- Liaising with Lands and Surveys Department to streamline Forest Reserve Boundary Plans in digital and hard copy formats;
- Develop and maintain a catalogue of hard copy and digital maps particularly those relating to vegetation and landuse changes.

Database Management Systems

The National Forestry Authority inherited databases developed in the early 1990s by the then Forest Department. These databases include among others:

i. Biodiversity databases for key forest reserves – these had been used to produce nature conservation maps.
ii. Timber movement database – used to track the chain of custody of timber (from source to market)
iii. Revenue collection database – use to track revenue general and inform the national level processes on the contribution of forestry to the economic growth of the country
iv. Timber harvesting in plantation and natural forests – again used to track the chain of custody.

The escalating levels of illegalities in the forest sector in Uganda have made the collection of data for the above data bases rather difficult.

NFA's ICT infrastructure for Field Stations – example of the field office in Gulu

The National Forestry Authority field office in Gulu is not connected to the headquarters. However there is a mechanism for communication between the field office and the headquarters. In the first place, an internet connection has been established for all the 7 management range offices and e-mail facilities form a major means of communication on top of the well established mobile telephone network.

Even if there is internet connectivity, there is no web based processing of data. NFA has the capacity for online viewing of maps through the ArcReader of Arc GIS but this has not been fully implemented and rolled out. Maps and inventories data can only be accessed and updated by headquarter staff. For a field officer requiring a map, he/she can only access it as a bit map or potable document file or any other format readable by the recipient.

The challenges

- The GIS Unit is solely dependent on donor funding and as donor funding to the NFA slumps, activities of the GIS Unit are also slumping. Survey and Management Inventories are therefore not being carried out now.
- The equipment used for inventory surveys is obsolete. The equipment is aging, the camping gear is tired, the computers and software are also out of date. Inventories to date are only done for activities that will generate income and all the traditional inventory studies have been put to a halt.
- Lack of funds to undertake the surveys is becoming chronic – For example it requires USD 45,000 to undertake a plot by plot inventory that covers one third of the country. This is rather expensive.
- The technology of using GIS and Inventories is liked by the Senior Management Team of the National Forestry Authority but funding for such is the least considered.

Opportunities

- The GIS Unit is at liberty to make money; bid for contractual work and professional writing of consultancy proposals but there is a limitation in taking up large consultancies; partly caused by low staffing. For example, the unit recently took a consultancy for Rangeland Inventorying awarded by the Ministry of Agriculture, Animal Industry and Fisheries
- The unit will undertake a wildlife study and vegetation mapping for Queen Elizabeth National Park on behalf of Uganda Wildlife Authority.
- The centre is undertaking a GIS Mapping of Schools and Health Centres for Plan International Uganda.
- A wide array of clients needing maps including the Forestry Sector Support Department, various Ministries, Uganda Bureau of Statistics, and National Environment Management Authority, among others.

Information governance issues at the NFA

1. Accuracy of the data and maps produced by the national forestry authority is questioned by many stakeholders – often times the data causes conflicts because many do not consider the data to be accurate.

2. Access to information – whereas all information is available to the public, there is a cost recovery on data requiring that users pay for data. This is a deterrent to using that data, especially so by the poor forest dependent communities.

District Forest Services

The District Forest Services is the local government arm responsible for managing forest resources that are in the hands of private owners, community level and local forest reserves. In this respect they need ICTs.

There are over 110 districts in Uganda. The proliferation of districts has made it difficult to implement forestry policy in this country. District Local Governments have continued to look at forestry as a revenue base. Issues related to transparency, accountability and public participation are enormous.

The Districts are not well equipped with ICT facilities required for forest resources management. The demand for use of ICTs exists, the DFSs have institutional needs that can be met by use of ICTs. They have clients that need timely information to market their products, to settle conflicts such as boundary problems. But they cannot answer the many calls and requests from the public to improve access to information.

Gulu District Forest Services

The District Forestry Office in Gulu has a computer, a printer and a photocopier and these were received in 2009 through the Farm Income Enhancement and Forest Conservation Project. The computer is not connected to the internet. The facility is mainly used for typing.

The district is in need of tracking down funds but there is no financial system installed on this computer. The district wants to undertake simple GIS operations to detect vegetation changes in the post war district, forest reserve boundaries, and tracking law enforcement initiatives. The limitation is availability of the software and the necessary training to build their human resource capacity.

Northern Uganda is getting out of war. There are several programs for peace and reconciliation. In the forest sector people are talking about ecological restoration of ecosystems destroyed in times of war. There are variations in weather and the drive is for communities to plant trees as a resilience mechanism to cope with climate change. This requires extensive use of radio programming that requires a lot of money which the district local governments cannot afford.

Pader District Forest Services

The District of Pader has a District Forest Officer (DFO) and no additional staff. This DFO has an office but does not have any ICT equipment to implement his work. He has no computer, no budget for forestry activities in the district yet he has training in GIS and use of financial systems to manage forest resources.

Many of the new districts in Uganda are in a similar situation as Pader District. The officers are overwhelmed by the demand for ICT based forest resources management approaches cannot be afforded by the districts.

National Environment Management Authority

The National Environment Management Authority (NEMA) is a semi-autonomous institution, charged with the responsibility of coordinating, monitoring, regulating and supervising environmental management in the country. It has the responsibility to spearhead the development of environmental policies, laws, regulations, standards and guidelines; and guides Government on sound environmental management in Uganda. Through its Environmental Monitoring and Compliance Department, NEMA ensures effective implementation of procedures and guidelines and provides technical guidance in the area of Environment Impact Assessment (EIA); carries out environmental audits and inspections to ensure compliance with environmental standards and regulations.

Through its Department of Policy, Planning and Information, NEMA ensures integration of environmental concerns in the planning process and coordinates the management of environment information systems, including those of the local governments, undertakes research and data collection, maintains a website (www.nemaug.org) as a means of sharing information and is charged with the production of the National State of Environment Report once every two years. It also publishes a sensitivity atlas that provides environmental planners with tools to identify resources at risk, establish protection priorities and identify timely appropriate response and clean-up strategies.

NEMA has a well developed IT infrastructure used to undertake and supervise Environmental Impact Assessment Studies, supervise Environmental Enforcement, Environmental Audits and compile the State of the Environment Reports as well as District Environment Reports. Forestry as a subsector of the bigger environment and natural resources sector benefits from ICT related activities of NEMA.

The Forest Sector Support Department

The Forest Sector Support Department (FSSD) has a responsibility to oversee all the forestry institutions in the country. Specifically, it oversees the National Forestry Authority and the District Forest Services. The National Forest Plan assigns FSSD the responsibility to establish and operationalize an information hub to serve the entire forest sector. However, this has not been implemented due to lack of financial and human resources. For this reason, the FSSD has not fulfilled its mandate of providing information to the forest sector.

The Private Sector/NGOs

The private sector has undertaken investment in establishment of forest plantations. Important to note is the fact that they are all interested in monitoring progress of the investment made. A number of them, especially the medium to large scale establishments, have established Forest Management Information Systems. The small scale investors however cannot afford the cost of the technology. The Non-Government Organisations on the other hand are using ICTs to track implementation of forestry policy and enhancement of forest governance and law enforcement. The sections here below provide snap shots of what each of the organizations has done, and the limitations/challenges they face.

Green Resources

Green Resources has established forest plantations in Bukaleba (Eastern Uganda) and Kachung (Northern Uganda). It is a rapidly growing forest products and energy business in Uganda.

Green Resources is keen on administering and maintaining a Forest Information Systems database that integrates a robust forest management inventory. It is intended that this will be supervised at all levels of the forest plantations establishment and will collect and collate, and analyse information that will serve as a baseline for the Clean Development Mechanisms projects. The system will also be utilised to maintain forest boundaries, maintain forest management plans, process and submit reports and guide management on suitable silvicultural treatments and general forest management practices. This is a typical example of integrating ICTs in forest resources management.

New Forest Company

The New Forests Company has a target to establish rapidly growing plantations and intends to be a key supplier of a diversified product base for local and regional export markets. In establishing these plantations, the New Forest Company has taken root into establishing an information system; detailing plantations establishment, growth rates, market projections, baseline for clean development mechanisms and corporate social responsibility. This will make it easier to establish mechanisms for economic efficiency and better returns on investment.

Nile Ply Ltd

Nile Ply Limited is the leading timber extractor in the country and the only plywood processor in the country. Amaply, Budongo Saw Mills, Techna Sawmills are among the numerous small scale timber dealers.

It is in the interest of these sawmilling companies to improve the profitability of their business. Currently the profit margin per cubic meter of round wood is low (see Table 3).

Table 3: Average profitability of sawn timber

Sector	**Value/selling price/cubic meter/USD**	**Margin (USD per cubic meter**	**Margin**
Standing pine	49	6.85	14
Sawed log	61	12.2	20
Dealing	168.5	107.3	63.7
Retailing	232	62.9	27.5

Source: Kallweit (2005).

The profit margin is low because of low capacity and technical standards for processing sawlogs. These companies use cheap sawmills, lack skilled personnel and therefore incur a lot of waste during conversion of wood into timber. It is only through a well registered digital value chain analysis that these companies can improve their products

Uganda Timber Growers Association (UTGA)

UTGA is an umbrella organisation that brings together commercial timber growers in the country. Since 2007, members of the association boast of having planted over 20,000 hectares of plantation; an investment in excess of USD 100 million.

The leadership of the association believes that it is through ICTs that all the challenges of commercial forestry (see http://www.utga.net/index.php?option=com_content&view=article&id=4&Itemid=5) can be handled, to the satisfaction of the investors and the public that consumes the products and serves.

Community Development and Conservation Agency (CODECA)

Originally known as Budongo Community Development Organisation (BUCODO), this is a purely community based organization promoting sustainable utilization of forest resources and reduction of dependence on forest resources for livelihoods.

In 2002, BUCODO had its first go at the use of ICTs in its establishment- it procured a car, four computers, a server and was able to connect to the internet. The initial investment was approximate USD 20,000, which was quite expensive for a small organization at that time. Table 4 shows the equipment that was procured.

Table 4: Initial investment in ICTs by BUCODO

	Quantity	Unit Cost	Amount
Computers	4	2,200,000	8,800,000
Server	1	12,000,000	12,000,000
Internet connection	1	4,000,000	4,000,000
Software	Lumpsum	10,000,000	10,000,000
		28,200,000	34,800,000

1 USD = 1800 shillings in 2002

ICTs have been used to generate information and support research. It has been an integrated approach to communicating with stakeholders (local governments, forestry parastatals, donors). The engagement has been largely with the youth; to lure them towards environment and natural resources management. ICTs have been used to disseminate information to stakeholders in advocacy drives. Some of the information has been made available on the website which has facilitated flow of information

The youth have benefited a lot from ICT programs at community level though women and a segment of illiterate members have been secondary beneficiaries.

BUCODO Markets products using ICTs

BUCODO is a local community development initiative whose members are forest dependent communities found around Budongo Central Forest Reserve in the district of Masindi. Many of the members have indigenous knowledge on herbal medicine. For a long time, they have been selling raw materials extracted from the forests to consumers within the district, as well as distant consumers. For the distant customers, the process had been hectic and often times they would incur losses. With internet connection in 2002, BUCODO was now able to enter into international market.

They advertised their products online and got clients from as far as Nairobi, Kenya. This is a typical example of e-business. Agreements to transact business are finalized by e-mail. The raw material is then packed and sent to Nairobi by bus. Acknowledgement of receipt of the raw materials is made by e-mail. Payments are also made through electronic transfer systems. The process is less tedious and cost effective. The profit margin is also better because there are no costs related to people moving up and down chasing deals.

In 2006, the community sold maize to FINCA-Uganda, a company located in Kampala. Initially, the entire maize product from the community would be sold to local consumers and the profit margin would be little. As BUCODO started marketing itself online, they were able to get in touch with FINCA-Uganda. All transactions were finalized by e-mail and money wired back to the communities.

Another interesting way of doing business has been use of the local FM Radio Station. Whereas this has enriched radio programming with a new line of content (on natural resources), members of the community have used their slot to market their products. They also use the program to pass on messages for mutual co-existence between forests, trees and people. Whereas it not possible to acquire figures from the community, overall, there has been increases in sales and improvement in quality of life of the members of BUCODO.

A more recent innovation is the use of SMS text messages to members that have cell phones and this is mainly to communicate meeting dates, advertising products available among community members. Whereas there are no success stories on using SMS text messaging at the moment, members of the community believe that this will one day yield results.

Environment Alert

Environmental Alert (EA) is a Non Governmental Organization engaged in policy advocacy in Uganda. Its strength is on packaging of information and knowledge products that are made available to the public, either in hard or soft copy forms. These include among others posters, policy briefs and supplements in the print and electronic media. Many of these products are also made available on the website (see www.envalert.org), some are circulated through virtual e-mail groups and others tracked by social media – flicker, facebook.

Environment Alert , ACODE and other CSOs used ICTs in advocacy campaigns

In 2007, government of Uganda wanted to giveaway a third of Mabira Central Forest Reserves to Sugar Corporation of Uganda, Lugazi (SCOUL) after the Sugar company asked government to de-gazette the forest and allocate the land to the factory which would subsequently increase the sugar output.

Efforts of saving Mabira brought in the Kabaka (king) of Buganda, Ronald Muwenda Mutebi who allocated 7000 hectares of his land to save Mabira. This landed on deaf ears and instead the SCOUL bosses set arrogant conditions for alternative land. This did not go down well with most Ugandans, whose sensitiveness to environmental matters had been heightened by the sensitisation campaigns about the link of forests to floods, unpredictable weather, and rising food prices.

To save Mabira, Civil Society Organisations took social activism to another level. They used of ICTs to mobilise, disseminate and alert individuals about official actions that would affect them adversely. With government playing hide and seek, on top of giving contradictory statements about the whole saga, environmentalists took their fight to FM Radio Stations, discussion groups and resorted to using Short Message Services (SMS) to campaign against buying Lugazi Sugar if their desire to grab part of Mabira Forest was not dropped.

SMS were particularly effective. Packets of Lugazi Sugar started piling up in supermarkets, and some business owners started withdrawing them from their stalls. Environmentalists argued that apportioning part of Mabira Forest would bring more adverse effects than the sugar shortage. Opposition politicians also picked up the slack and started de-campaigning government for the lack of concern.

In this particular example, SMS's helped in alerting people what would happen next if they did not join the move to de-campaign the forest giveaway. Later, government dropped the idea but it would take other social actions like public demonstrations and pressure from development partners for government to finally accept the folly of converting the forest reserve into a sugar estate. The ICTs had done their job in galvanizing action at all levels.

Conservation Through Public Health (CTPH)

CTPH's Protected Areas Initiative on ICT for Development established a Conservation ICT Kiosk in Buhoma Village, in Bwindi in 2004. It was designed to build capacity in the use of ICT applications, develop local content, facilitate research on human and animal disease and improve access to information in local communities surrounding protected areas with a potential to provide economic and social benefits as well as an incentive to conserve wildlife and improve public health.

The initiative has incorporated ICT work into other complimentary sectors such as, community education and ecotourism and aims at attaining a greater impact in tackling health issues associated with transmission of diseases such as, TB, brucellosis, scabies and rabies between people and animals in protected areas.

The Sawlog Production Grant Scheme (SPGS)

The Sawlog Production Grant Scheme (SPGS) funds the establishment of commercial timber plantations, both at large and small scales. It also provides professional technical advice, training and research grants to support private growers throughout Uganda. SPGS is tackling head-on the looming timber crisis in Uganda, and at the same time, it is addressing key development goals – notably, rural poverty, mitigating climate change and ultimately (by taking the pressure off natural forests to supply timber) biodiversity conservation.

It has a well established IT Department with an IT/GIS Officer, a developing Geographical Information Systems, a well established Local Area Network (LAN) infrastructure, robust E-mail Systems, Servers, and functional Internet Technologies. The IT department supports effective communication for both the internal and external clients. With a developing GIS system at SPGS, progress of planting and growth patterns of the plantations are monitored. Consequently, future actions can be planned.

Products of GIS operations are however not web-based. This is an opportunity that awaits exploitation, especially when the beneficiary tree farmers gain sufficient expertise for online operations. However there is a wealth of information on plantation establishment and management on the website (www.sawlog.ug) that cannot be found elsewhere in Uganda. The website is also constantly reviewed and updated to meet customer requirements.

SPGS looks into the future – ICTs will support planning and implementation of plantation forests

Many of the plantations supported by the SPGS are still young. Many of them are less than 5 years. With all the investment made, based on thorough planning, it is becoming necessary that investors start looking into the use of a comprehensive Forest Management Information System (FMIS) to support the planning, implementation and monitoring of plantations.

The FMIS can be used for strategic, tactical and operational planning and implementation. FMIS have an embedded component that oversees operation/administrative costs. With FMIS one can generate reports for decision making. FMIS maintains forest inventories and generates maps with attribute information. It would be good if each of the SPGS beneficiaries started using FMIS at an early stage. Beneficiaries will then be able to plan for the future of their plantations.

C.D Langoya, one of the beneficiaries suggests that this is the time to start looking at ICTs if these plantations are to make a profit margin in future. “This will help us in decision making, setting the right economic worth of the investment, have focused management and run an economic model in a business manner”, says Langoya.

The REDD process

Uganda is in the process of preparing its REDD Readiness Preparation Proposal (R-PP) that will see the country benefit from global initiatives to curb deforestation and forest destruction. Consultations have been made across the country, targeting a wide array of stakeholders. Emerging views indicate that much of the problems that Uganda’s forest sector faces fall within the governance domain. Specifically, anecdotal information indicates flaws in access to information, public participation and access to justice.

The question is, how can ICTs be exploited to respond to the drivers of deforestation and forest destruction?

There is already virtual communication being utilized, with a yahoo group that is being utilized (http://groups.yahoo.com/group/ugandareddwg) for communication between working group members. All components of the REDD are ICT supported with emphasis on Information and Communication. The T-component of the ICTs is considered as a mechanism to deliver information and perfect communication. For example, setting of carbondioxide emission baselines will definitely require use of ICT tools. Measurement of performance, infrastructure for reporting REDD progress and registration of participation in REDD will require uses of ICT tools. Monitoring and Evaluation of REDD can only be successfully accomplished through use of ICTs. ICT is being taken for granted in the REDD Readiness Preparation Proposal process.

Currently, ICTs are used in sharing, disseminating and receiving of information and also conflict resolution arising from participation and consultation. The entire process of awareness raising and avenues for communication are ICT based.

Carbon markets and negotiations for carbon trading are pretty much online based. Market places for carbon are e-based and mechanisms for registration of carbon beneficiaries will soon be web based. In no way will Uganda dissociate itself from web-based mechanisms of the REDD process, if it has to inform and involve the wide array of stakeholders involved.

One observation though is that whereas the REDD process in Uganda embraces uses of ICTs in all the components of REDD, it is also known that ICT related activities, tools and equipments are accorded low budgets, and are always assumed to be easy.

The National Forest Plan Process

In 2002, government of Uganda endorsed the National Forest Plan as a strategic document that would transform forest policy aspirations into action. The new forest policy had provided for a divestment of the forest sector, to demobilize the Forestry Department and distribute roles and responsibilities of managing the forest sector among different actors. This included the Forest Sector Support Department at the Ministry of Water and Environment which was assigned an oversight responsibility, the National Forestry Authority charged with overseeing Uganda's prime forest estate in 506 central forest reserves, the District Forest Services to oversee the local forest reserves and forests on private land. The other categories were the private forest owners and the communities.

Down the road, the implementation of the plan has been a success with a few areas lagging behind. The Plan is now out of date, and is being up-dated. This also provides an opportunity to take into consideration new innovation and thinking, new issues such as climate change and anticipate the foreseeable future of the forest sector.

The proposal in the draft of the revised National Forest Plan is to strengthen the use of ICTs in the collection, storage, processing and dissemination of timely information to support decision making. It is also proposed that ICTs form an integral part of the monitoring and evaluation of performance indicators that observe trends in forest cover, consumption, illegalities and governance. Lastly, the new

version of the National Forest Plan looks forward to an improved approach to communication, education and public awareness – components that strongly rely on exploiting the power of ICTs.

To deliver the above strategies, the NFP proposes:

- To have an information centre – the problem will be funding, technical staffing as people in the current FSSD have limited capacity to develop along ICT thinking and have low interest
- Link specialized centres – such as the National Forestry Authority GIS Unit, the National Forestry Resources Research Institute and encourage such centres to work together and draw from each others strengths
- To package information to serve the interest of the public, rather than serve internal interests
- Strengthen partnerships with the ICT ministry and the media to disseminate and effectively utilize the information generated.
- Invest in media and public relations as a mechanism to bridge the gap between information source and information users.

Chapter 4: Governance Failures and ICTs

Background to forest sector reforms

Government of Uganda, in 1998 undertook a major restructuring programme in all government institutions and ministries. The objective was to address governance issues raised at that time and therefore create conditions for long-term economic growth. In the forest sector, comprehensive reforms were undertaken that saw Uganda adopt a new forestry policy in 2001, establish new institutional structures with new roles & responsibilities, develop a strategic plan (the National Forest Plan, 2002), and enact a new forestry law (the National Forestry and Tree Planting Act 2003).

The new institutions created during the reforms raised hopes of a revitalized forest sector, free from mismanagement and forest resource loss and wastage. Efforts at tree planting by the National Forestry Authority and the Saw-log Production Grant Scheme, began to yield results.

One of the new institutions, the National Forestry Authority, has now gone through a spell of poor governance, and this has reversed the trends and undone the dividends achieved so far. Media reports point to mismanagement, flaws in the implementation of agreed forest sector development strategies, and corruption in the management and administration of the forest resources.

Whereas all seems all right on paper (good policies, good laws, good institutional roles and mandates) the sector is under-performing in practice. This is happening at a time when Uganda is counting on its forests to contribute more to the nation's economy. Forestry is one of the key primary growth sectors in Uganda's economy (Republic of Uganda, 2010)1. Further, the country is planning on generating additional income through joining international efforts to reduce deforestation and degradation (REDD+). REDD+ will require long-term commitments to maintain and increase forest cover. The widely mentioned obstacles to good forest management include political pressure on forest managers to act contrary to the interests of Sustainable Forest Management, corruption and low respect for the rule of law.

Involvement of the World Bank

Independent of the ongoing governance flaws in Uganda, the World Bank instituted a study as an early step in what promises to be an ongoing process of forest governance dialogue and reform in Uganda.
The Bank has helped the Ministry of Water and Environment to identify governance issues needing reform.

The Bank and the Ministry jointly organized a workshop to tap the knowledge of a broad range of forest experts in the country. In part this would help the ministry shape reforms and to help the Bank improve its diagnostic tools on forest governance. Governance issues requiring attention are highlighted in the section here below.

Overview of governance failures

The Forestry Governance Strategy Note, 2010, developed by the Ministry of Water and Environment takes note that Uganda has good forestry policies, laws, and strategic plans but its reputation for

[1] National Development Plan (2010/11 – 2014/15), 2010

translating those documents into action is wanting by far. It also takes note that there are opportunities to use ICTs to improve on the quality of governance in the sector. Among the governance failures highlighted in the strategy note are the following:

- Political Intervention - political pressure to act contrary to the interests of sustainable forest management manifested by increasing levels of encroachment in forest reserves especially, at times of elections.
- Corruption – money is stolen, and forest products and services are mismanaged by their custodians. All these are fueled by greed, bribery and influence peddling by people in positions of power.
- The Forest Sector Support Department and the Local Government forestry departments are limited in operation with limited resources (personnel, money, equipment & tools).
- Inadequate emphasis on private & community forests - no resources are allocated to the responsible institutions to promote development of these forests. Even some private forest owners do not have the incentives to keep these forests or to develop them.
- Pressure on forestry institutions to generate revenue – the National Forestry Authority is supposed to be self-accounting and the Local Government forest departments are supposed to finance many of their activities from locally generated revenues. These institutions treat forests as the cash cow, milking them even to levels of un-sustainability.
- There is a general lack of professional leadership at the helm of some forest institutions. There is lack of professional skills, ethics and a spirit characterized by resignation from duty and extravagance.

ICTS and forest governance

Earlier sections of this paper provide indication of how ICTs can be used to strengthen governance of the forest sector. Within the framework of the tools developed by the World Bank, it is clear that adhering to use of ICTs will improve:

- Transparency, accountability and public participation – by improving access and use of information and reaching a wider audience.
- stability of forest institutions and conflict management - through exposing flaws in the institutions managing the forest estate
- Quality of forest administration – automated data is easy use, highly accessible, easy to update and often times reliable.
- Coherence of forest legislation and rule of law – ICTs could be used to popularize forestry policy and law.
- Economic efficiency, equity and incentives – by using ICTs, one is able to access information, use it for planning and for marketing products which makes more economic sense.

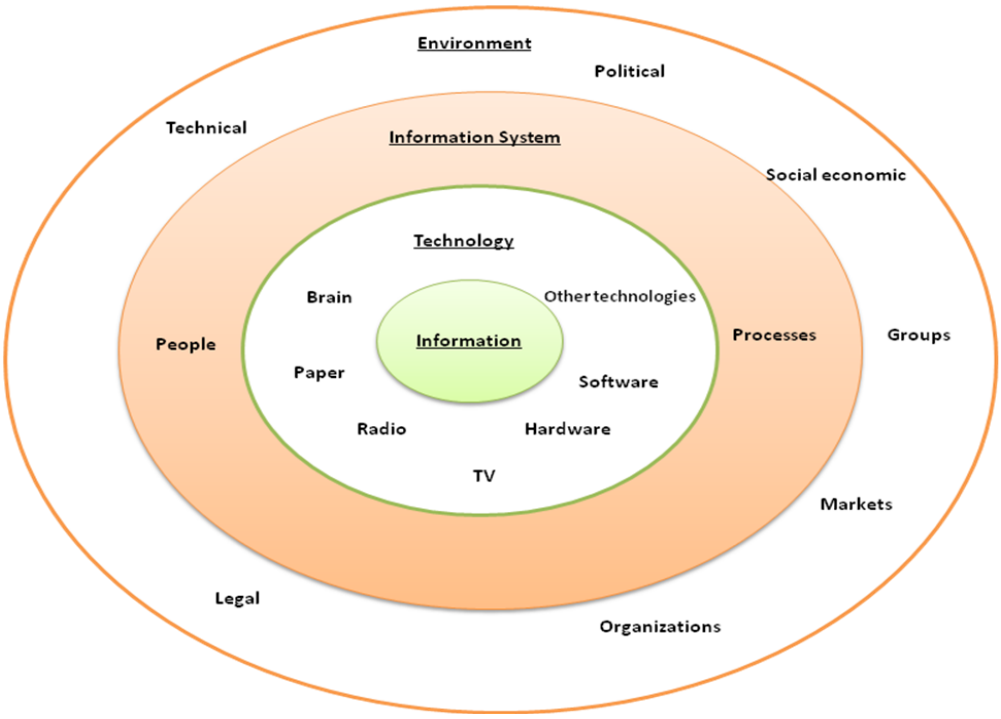
Annex 2 provides responses and ICT interventions that support the relevance of ICTs in forest governance.

Chapter 5: Future strategies and recommendations

From the above, forest sector agencies need to take a systemic approach to ICTs. This will help them handle information, considering that most of the time data is not available. Forest sector agencies must track the entire forest management and administration chain to ensure data delivered by ICTs is accurate and can actually be used and acted upon.

It is also important that they become information-centred, recognizing that the value of ICTs comes from their new abilities to handle information and make it readily available for decision making. This is the way to go if forest sector institutions are to contribute towards improving governance of the sector.

An integrated approach requiring the use of a full range of technologies to acquire, store, process and disseminate information is necessary. Not just digital ICTs but also intermediate (radio, TV, telephone), literate (books, newspapers, manuals), internet based (website, e-mail) and telephone systems (sms, voice). Figure 3 provides the complexity of the environment surrounding use of ICTs that needs to be reflected upon before investment in use of ICTs.



Adopted and modified from Walker, 2007

Specifically, the following recommendations are made in order to improve the links between ICTs and forest governance:

1. Set up mobile facilities for email and internet facilities in rural areas

Although the fixed telephone is one of the most cost-effective communication technologies that forestry institutions and users of forestry related information can use to contact clients & stakeholders, market forest produce, obtain information from suppliers and customers, report and track forest crime, this is feasible only where the fixed line infrastructure has reached, and for private forest owners and local communities who can afford to set up the system. Email and internet systems have traditionally been based on fixed telephone lines but today there are mobile solutions which can be operated in rural areas. Because they are expensive (within the context of the rural economy) to set up, the starting point would be to set up the facilities at selected forest stations in key forest management unit areas (FMU). For example, the NFA would typically need about UGX 2 million (US$900) to purchase a laptop computer, a solar power charger and an internet modem for one FMU. Thereafter, it would need only UGX 50,000 (US$23) in monthly subscriptions to run this information system but the dividends in terms of communicating key information on law enforcement would be great. And these technologies are getting cheaper. Not much training would be needed. Actually some field staff already have their own private mobile internet systems.

Throw in another UGX 3 million (US$1,360) for a simple hand held GPS, the relevant software, a digital camera, and an Excel or Access-based database and the benefits would multiply immensely. In this connection, the big question would be: does NFA top management have the will to go this route? It would take probably a sacrifice of allowances for one board meeting to equip one FMU. However, use of basic processing of GPS data would require some training.

2. Set up Mobile Phone Networks

Mobile phones are particularly suited for exchange of information given its current wide usage. The Uganda Bureau of Statistics indicates that mobile cellular services are increasing rapidly. They provide an option for international coverage and use, and ability to send text messages.

The telecommunications providers are already giving concessionary rates for group communications. The NFA staff already use the mobile phone a lot for voice and SMS communication. What is needed is to bring into the network members of the local community who are prepared to supply intelligence information regarding forest crime. Buying phones for them might be problematic in terms of sustainability and security but many people already have their own mobile phones. What they would need is a regular supply of airtime. This would only require about UGX 50,000 (US$23) per month per person. With 10 reliable people living among the communities, tracking of illegal activities can be greatly enhanced. It would link not only FMU staff with local communities but it would also link the local communities with Headquarters to report field staff and other government functionaries who abet illegal forest activities. This is already happening but to a very limited extent.

3. Revamp and Expand Internet and E-mail Connections between Headquarters and the Field Offices

This would provide the cheapest, quickest and most reliable way to exchange information and would allow for a variety of information to be sent – not just messages but documents, photographs, drawings, etc. It requires access to internet and many forest sector actors are increasingly accessing e-mails and have adopted its use. Civil society organizations have used it in the campaign against the give away of Mabira Forest to SCOUL.

NFA already has infrastructure at all the seven Range Offices in Uganda, but most of them were based on wireless transmission. What is needed is to retool these setups in view of the expanding fibre optic broad band systems into the countryside. Where the fibre optic lines pass near forest stations, the mobile internet solutions recommended above can be replaced by fixed facilities. It is not clear what would be needed to re-tool these stations but the initial costs would probably exceed UGX 500 million (US$230,000) and monthly running costs (servicing and repairs, paper, printer cartridges, etc. would be in the range of UGX 1million (US$455) per Range office. This is rather high for the NFA but it would be worth it if it was installed in major forest plantation areas and the flagship biodiversity central forest reserves.

This would also be the basis for extending **World Wide Web** into the FMUs to enable the staff and communities around them to access globally available information. Government institutions would also use the web to make available information pertaining to the management of the forest resources, law enforcement, concessions, licenses and permits. They would also avail information online about forest cover changes and interactive maps and databases for users to access.

However, this would also require training of technicians and users so that servicing of these internet systems would be within reach of the FMU.

As the ICT infrastructure in Uganda continues to improve, forest sector institutions should prepare to adopt e-commerce. This means undertaking business transactions electronically. The costs of setting up e-commerce are high, and requires computerized processes and high-bandwidth network connections that are not yet efficient in Uganda, but overall, business operates better when there is data/information. It is only through ICTs that we can capture data, retrieve it and process it quickly for a decision making process.

4. Equip the Local Government District Forestry Offices with Computers and Related Communication Systems

The District Forestry Offices are supposed to be the hub of forestry operations within the district local governments. They are supposed to all the forests outside protected areas (64% of all the forests in Uganda). One of the biggest problems they have is capacity to collect information, store it and re-produce it for use by the local governments and private forest owners. Therefore, it is important that their offices are equipped with computers and internet communication (mobile where fibre optics are not available). Typically, one office would require at least one desk top computer and its accessories costing about UG 3 million

(US$1,360) and about UGX 100,000 (US$45) monthly to run. It would also require training of staff in database management (excel and Access databases to start with).

5. Regular Programmes on Local FM Radio Stations

Most families in rural area own transistor radios, and virtually every district in Uganda has its own FM radio coverage, in addition to the big radios which cover big swathes of the country. on these radios, call-in programmes have become very popular but the dominant programmes are to do with politics. The forestry sector can take advantage of this by promoting similar programmes on forestry issues of governance. To galvanise their popularity, it is important that the popular politicians in the localities are encouraged to participate in the discussions regarding forestry governance, even if it they are likely to take swipes at forestry people.

Discussions of this nature tend to restrain people who engage in forest crime or those who abet it, especially government officials who tend to over-power the local forestry officials. These radio programmes are better coordinated by the NFA (for protected areas) and Forestry Sector Support Department (for forestry outside protected areas) but they would implemented by the District Forestry Offices (local governments) and Range Offices (NFA).

An hour's call in programme on a rural radio costs about UGX 200,000-500,000 (US$90-230) depending on the radio station. Running one programme every month would require about UGX 2.4 – 6 million (US$1,000 – 2,750) annually per radio station.

6. Tracking the Chain of custody of Timber and other forestry products

As has been discussed above, considerable work has already been done to develop the systems for tracking the chain of custody of timber. These systems should be reviewed with a view to computerising some of its components like timber marking. However, the extra costs of operating the system require that there is somebody who is willing to prioritise buying timber of known legal origin. This should not be difficult to achieve with support of Government and its Development Partners who finance the bulk of the construction work in the country.

The system can also be piloted for charcoal, especially in the areas where the World Bank is piloting reducing of carbon emissions through improved charcoal production. Later, the system can be extended to cover honey and craft material with potential for export.

Initiating Action

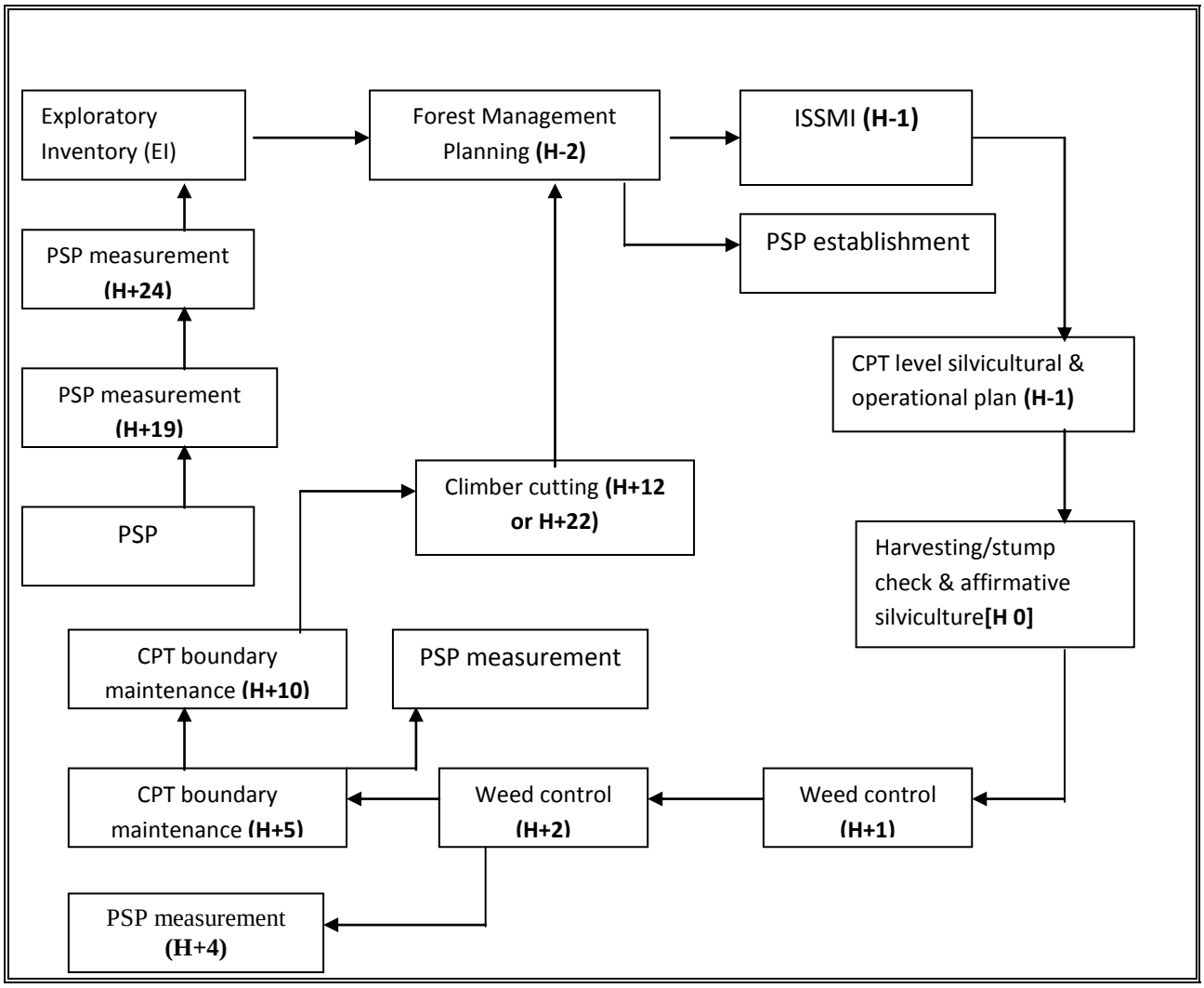
In order to initiate action and develop lasting activities, it is necessary to start small, learn from implementation experiences and gradually expand to cover the entire country. The main approach would be decentralized trial runs to take advantage of the different local conditions.

Annex 1: Progress Towards Sustainable Forest Management In The Tropical Moist Forests In Forest Reserves In Uganda – The Bugoma Forest Reserve Initiative

The Integrated Selection System (ISS) of Managing the Tropical High Forests in Uganda

Development of this system started in 1998. It builds on the older **uniform forest management system**, which had been used since the 1950's with varying levels of success. The System is composed of a silvicultural cycle of 15 or 25 years and a felling cycle of 60 or 75 years, depending on the nature of the forest (Figure 1).

Figure 1: The 15 or 25 Year Silvicultural Cycle



- Typically within the natural forest, it may take 50-100 years for trees to grow from seedling to 50 cm diameter. Therefore, the forest is operated with 3-4 silvicultural cycles for each regeneration cycle.

- A 4-ha block is the smallest unit for silvicultural management.
- During the first felling of a compartment, only blocks of the highest stocking are selected for felling (average 5-6 trees ≅ 15 m^3). This is based on a conservative yield estimate of 1m3/ha/year.
- Felling is followed by other silvicultural operations (felling damage repair, utilization of lop and top, gap planting, weed control, climber cutting). 15 years later, the operations are repeated (Silvicultural cycle).
- After 60 years, the blocks that were felled first can now be felled again (the felling cycle)

The Bugoma Initiative

Bugoma (41,144 ha) is one of the largest natural forests CFR in Uganda, which has been zoned for production of timber. The FMP will be prepared under the current annual work plan. In the meantime, management is guided by the provisions of the Forest Nature Conservation Master Plan, 2003 **(Appendix 3).** The plan provides for a Production Zone, which covers 24,800 ha ha. Other zones for biodiversity conservation include the Strict Nature Reserves (10,000 ha) and buffer zones and the Buffer Zone (7,100 ha). The map in **Appendix 4** shows the zonation according to the Forest Nature Conservation Master Plan.

Legal Compliance with National Legislation

Gazzeting the Forest Reserve

Bugoma FR is gazetted as a Central Forest Reserve in The Forest Reserves (Declaration) Order (Statutory Instrument 1998 No. 63) with an area of 41,144ha. Map Sheets reference Nos. 47/2, 4 & 48/1, 3 and Boundary Plan Nos. BP 1507 & 1637 describe its location in Uganda. The Statutory Instrument is available separately.

The Forest Management Plan

The National Forestry and Tree Planting Act, 2003 (a copy is enclosed) requires a Responsible Body (the FD/NFA in this case) to prepare a forest management plan (FMP), which, among others, states the type of activities to be carried out in the forest (Section 28). The same section binds "…all persons having dealings with or interests in the forest" (sub-section 4). The FMP for Bugoma will be prepared under the current annual work plan in a participatory manner. At present the Forest Nature Conservation Master Plan, which was endorsed by the Minister in 2002, provides the basis for managing the FR.

Harvesting of Forest Produce

The Act allows a Responsible Body (the NFA in case of Bugoma FR), subject to the management plan, to grant a license to harvest forest produce from a FR, and prescribe, in accordance with regulations, terms, conditions, rights, and fees (Section 41, sub-sections 1 and 2). Before the regulations under this Act have been gazetted, Section 92 sub-section (2) of the Act carries forward the Forests Rules (Statutory Instrument No. 246-2) and the Forest Produce Fees and Licenses (Statutory Instrument 2000 No. 16). The two Statutory Instruments are available separately.

The format for a license to harvest has been prescribed in the Second Schedule of the Forests Rules (S.I 246-2). Additional special conditions have been developed by the FD and adapted by the NFA to cover legal, technical, administrative and social aspects that are important in sustainable forest management. These will continue to be improved as guidelines and standards being developed become operational. The NFA has embarked on the process of developing its standards for *"…the sustainable management and utilization of forests"* {Section 92, sub-section 2 (o)} and *"…certification of forests and labeling of forest produce to verify its legal origin from sustainable sources of supply"* {Section 92, sub-section 2 (v)}.

Efficiency in Harvesting

At present, harvesting is carried out by handsaws (pitsawying). The practice leads to little damage to the forest because the conversion into timber is done close to where the tree is felled **(see photo).** However, it is a strenuous practice, and wasteful in milling of timber. Therefore, the NFA is starting to improve the technology in a phased approach, leading to institutionalization of small mobile sawmills. The first pilot under the Kalinzu Initiative has shown that this is the right way to go.

When Compartments 29 and 30 were harvested in Kalinzu, the poor form of the trees, early branching nature and heart rots for over-mature trees (mainly *Carapa grandiflora* and *Strombosia scheffleri),* there was a lot of woody biomass that was left. The only way to increase efficient use and clean up the lop and top from the harvesting area to make it ready for planting of large gaps was to dispose of this woody biomass as firewood and/or charcoal. But it had been earlier argued that allowing charcoal burners in a natural forest would lead to massive clearing of the forest and consequent rapid degradation.

We were able to show that under strict control, the remaining woody biomass can be collected for firewood or converted into charcoal by local people, as income generating activities. This was achieved through a strong local community based organisation. Its 200 plus strong membership is drawn from local people who are pitsawyers, timber traders, charcoal burners, tree growers and other people who use the forest for income generation. It has a strong leadership, works closely with the FD staff and demonstrates their commitment to protecting the forest (it is a major source of their income and livelihood). The Bugoma Initiative will try to replicate this arrangement. However, charcoal burning may not be economically viable in this area and therefore, the Initiative will have to discuss other possibilities for the local communities to earn income from the forest. One such possibility is to license some of the people to harvest timber.

Stock survey includes all species that have reached a minimum diameter for harvesting (40-50 cm). However, not all the species are readily accepted on the market, and so, the harvesting intensity, in practice, is much lower than the allowable1m^3/ha/year. So, FRMCP has embarked on promoting these

lesser-known species on the market. Today, *Carapa grandiflora* and *Strombosia scheffleri* are being accepted after 5 years of steady promotion. We have now started on *Drypetes spp*. However, the Kalinzu Initiative has showed that:

- The species are very difficult to handle. The nature of the species leads to checking and splitting.
- Kiln drying requires following a strict seasoning schedule
- Boards of thick sizes (e.g. 75x50mm, 100x50mm) do not check as easily as the thinner (25 mm thick) boards. Therefore, they may not be used for some purposes.

Therefore, another addition to the Kalinzu and Bugoma Initiatives will be to explore possibilities for further research in handling of the lesser-known species, which tend to dominate the harvestable trees in most of the CFRs.

Gap Planting in Harvested Areas

There have been a number of opinions on enrichment planting following harvesting of timber in natural forests. Some opinions suggest that such planting is expensive and results do not justify the expenditure. Others suggest that given the small area of the timber production zones in Uganda's natural forests in forest reserves (about 248,000 ha in total), it is necessary to carry out affirmative silviculture to boost the quality of timber (species, form and spatial distribution). The NFA identifies itself with this second opinion.

The Natural Forest Management and Conservation Project (predecessor to FRMCP) decided to develop a strategy of enrichment planting that would target gaps of a certain minimum size (400 m^2), carry out planting as part of the normal management activities and use the stock survey infrastructure to keep track of the plants (for weeding and monitoring of growth). **(see mahogany sapling in the photo).**

However, the harvest trees are distributed in a way that avoids as much as possible large gaps. Nevertheless, it will be necessary to plant some gaps that may result from trees that inevitably fall with others which were not targeted.

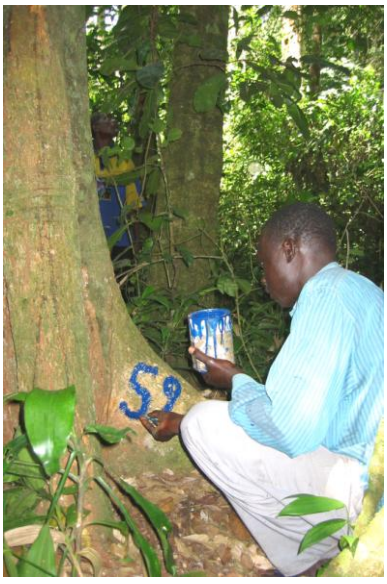
The NFA intends to plant in the large gaps that may be created in the process of harvesting. Approximate costs involved are:

Procure 1500 mahogany seedling @ Shs. 500/-	750,000
Plant the seedlings @ 200/-	300,000
Maintain 1000 plants (some will die) for 3 years @ 3000/-	3,000,000
Total (UG Shs.)	**4,050,000**
Total (GB £)	**1,250**

The Timber Trail

Stock Survey

- A total inventory of harvestable trees is carried out using 4-ha blocks. This block is the smallest unit of management in a compartment. Trees of 10 cm diameter and above are also measured on samples (1.25% for trees ≥ 10 cm dbh and 2.5% on trees ≥ 20 cm dbh).
- The minimum diameter for harvestable trees varies between 40 cm – 80 cm depending on growth characteristics. At first, only *Funtumia spp* had a minimum diameter of 40 cm but later, experience showed that *Strombosia scheffleri* is at its best when its diameter is between 40-50 cm. So its minimum diameter has been lowered to 40 cm.
- For each tree, a stock number is painted at the base of the tree, making sure that the number will remain after felling **(see photo).**



- During the inventory process, tree quality in terms of timber production is recorded (among many other things) so that seed trees can be selected later.
- A computer programme selects seed trees, those earmarked for harvesting and those reserved for harvesting during subsequent silvicultural or felling cycles. This List of Stock Trees records each tree by species, total number of trees for each species, stock numbers, and expected volume for each species **(Appendix 5).**
- All the trees are shown on a Stock Map **(appendix 6)** for each 4-ha block. The map shows individual trees by stock numbers, species, and relative girth. These trees can then be located on the ground using the grid on the map.

Licensing of Harvesting

The NFA is moving towards competitive bidding in licensing harvesting in CFRs. This has now started in the plantations. Lessons learnt so far show that a lot more caution is needed in adapting this method to the natural forests. For example:

- There is a lot more uncertainty about the quality of the sawlogs in natural forests (rots are often hidden, deformities are much more varied and mistakes in allotting quality scores more common)

- Local community participation is much more crucial
- Natural forests are selectively harvested as opposed to clearfelling in plantations
- Environmental considerations are much more sensitive and mitigation of negative impacts is more complex in natural forests

Therefore the Bugoma Initiative will start with the process which licenses clients on the strength of their application as was being done previously. Applications for licenses to harvest are submitted to the Executive Director, NFA. Staff in the Forest Products Section in the vet all the applications according to a set of agreed criteria. The criteria cover technical, legal and administrative aspects that will be important in managing the activities of the licensee. They include:

- Availability of resource according to ISSMI
- Past performance/track record of the applicant
- Production capacity of the sawmill
- Evidence of legality of the Company
- Evidence of trained personnel

- A copy of the license is sent to the Zone Manager (ZM) who in turn gives copies his Sector Managers (SM) and Forest Supervisors (FS) below him.
- The license is normally valid for one year, but shorter periods can be licensed to cater for applications for small volumes. It is subject to revision if the licensee does not contravene the conditions of the license and the law established.
- A separate license, spelling out strict control measures, is required for conversion of lop and top and offcuts into charcoal and/or firewood.

<u>Harvesting</u>

- The licensee pays for the trees before felling them. Payment is made on the basis of volumes shown in the List of Stock Trees. The royalty is paid at the NFA Headquarters, where a receipt is issued and a license for a given volume of trees prepared.
- Harvesting is done using mainly handsaws (commonly known as pitsawying). It is a low impact harvesting method but it can be wasteful if it is not properly controlled and regulated[2]. Today, there is only one large, stationary sawmill in Uganda. It tries to harvest *Cynometra alexandrii* in Budongo FR for floor parquets but its operations are at a very low level (less than 500 m^3 in 2000/2001 and hardly anything since then).
- The licensee introduces her/himself to the ZM who in turn introduces her/him to the SM and FS.
- The ZM and the SM determine the order of harvesting the blocks inventoried.
- Each licensee is given one block at a time. She/he must fell all the trees earmarked for harvesting before moving on to another block.
- However, in many cases, all the trees marked for harvesting are not readily marketable. In practice these are not harvested, resulting in lower harvesting intensities than those envisaged.

[2] Study on improving harvesting practices in natural forests. It was sponsored by FRMCP in 2003.

- Felling is done with a combination of handsaws and axes and conversion into timber is done by hand saws. Chainsaws can be used under strict control so that they are not used for conversion into timber.
- Monitoring is done by staff from NFA Headquarters, the ZM's Office and the field staff. The main monitoring tools include the Stock Maps (for field checks and verifying that trees earmarked for felling are actually the ones felled) and databases at FD Headquarters (including revenue receipts, THVMFs, FPMP, forms recording details of forest offences, public auctions of impounded timber).

From the Forest to the ZM's Office

- The tree (as shown on the stock map) is felled in such a way that the stock number is left on the tree stump. If this is not possible (as in certain species), the NFA staff in charge paints it again on top of the stump after felling.
- The responsible NFA staff takes measurements for diameter and log lengths and records them on the Timber Harvesting Volume Measurement Forms (THVMF) shown in **appendix 7**. This will be used to compute volumes for comparison with volumes generated by the computer on the List of Stock Trees.
- After conversion, each piece of timber is marked with a stamp in indelible ink showing coded information as follows:

Information	**Code**	**Remarks**
Compartment No.	01	The compartment being harvested as it is known in the FMP
Block No.	00	According to ISSMI
ISSMI tree stock number	000	According to ISSMI
Staff responsible	0	FD staff engaged directly in supervising the harvesting operation

- The Forest Manager maintains a database in a spreadsheet form showing the information above, the species, number of pieces of timber cut from each log for each tree (shown by its stock number) and their sizes **(appendix 8).**
- The sawmiller fills in a BHC Sawn Timber Record, which is submitted once every week to Ridge and Partners Inc. **(appendix 9).**
- When the timber is loaded on the vehicle, the Forest Manager:
  - Hammers each piece of timber (at the ends) with the FR code shown in figure 2.
  - Issues a Forest Produce Declaration Form (FPDF) showing the species, timber sizes, and licensee particulars among others **(appendix 10)**. The FPDF is addressed to the ZM.

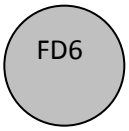
Each vehicle is allowed to load only timber whose origin can be verified through this system.

At the ZM's Office

- The ZM checks the FPDF and the labels on each piece of timber to make sure that the details correspond. He also ensures that payment for royalty has been made.

- If he/she is satisfied, he/she stamps each piece of timber with a hammer putting on the district code (commonly called the district seal). **Figure 3** shows the seal for Bushenyi District.

Figure 3: Seal for Bushenyi District

One side 

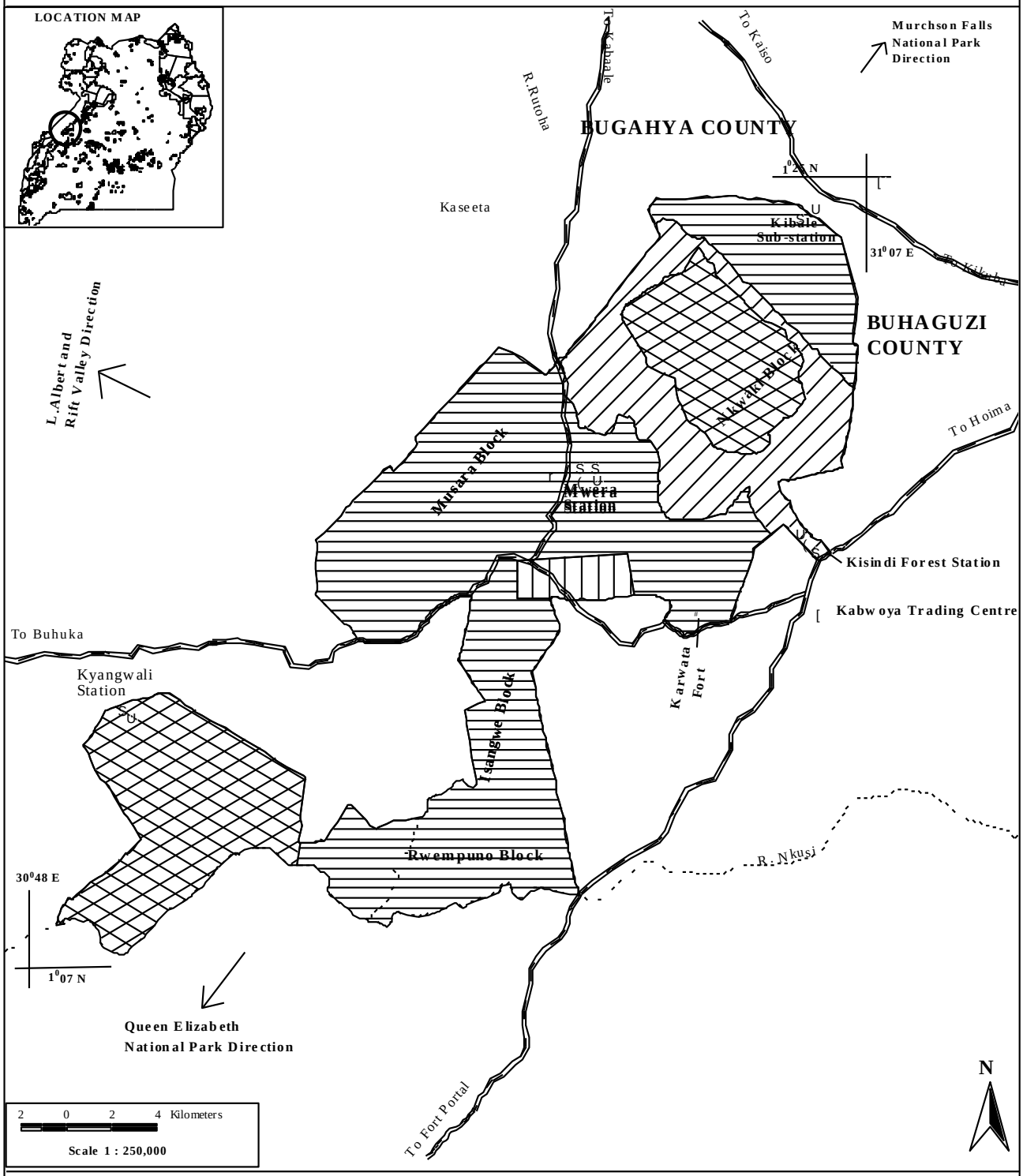
The other side 

- He/she then issues a Forest Produce Movement Permit (FPMP) showing the details on the declaration form, the estimated market value, VAT, details of the vehicle and driver and destination among others **(appendix 11).**

Timber in Transit and in the Market

- **Any vehicle moving timber from the ZM's office must have a valid FPMP, a general receipt on which payment of royalty was made, and the timber must have hammer marks showing the code of the forest of origin and the district seal.**
- The destination of the timber (stores of Cementers) will maintain an independent database recording particulars of the timber received from the forest. This will enable crosschecking information with the field databases by independent auditors.

Appendix 4: Zonation of Bugoma Forest Reserve



Management Zones

- Nature Reserve
- Protection (Buffer) Zone
- Recreation Zone
- Other Uses

Infrastructure

- g Guard's house (proposed)
- [Guard's non-departmental house
- # Officer/ranger house (occupied)
- S Officer/ranger house (proposed)
- r Sawmill
- Motorable track/road (major)
- Motorable track/road (minor)
- River/stream

Appendix 5: ISSMI list of stock trees

Bugoma Cpt. NK5, Block 1

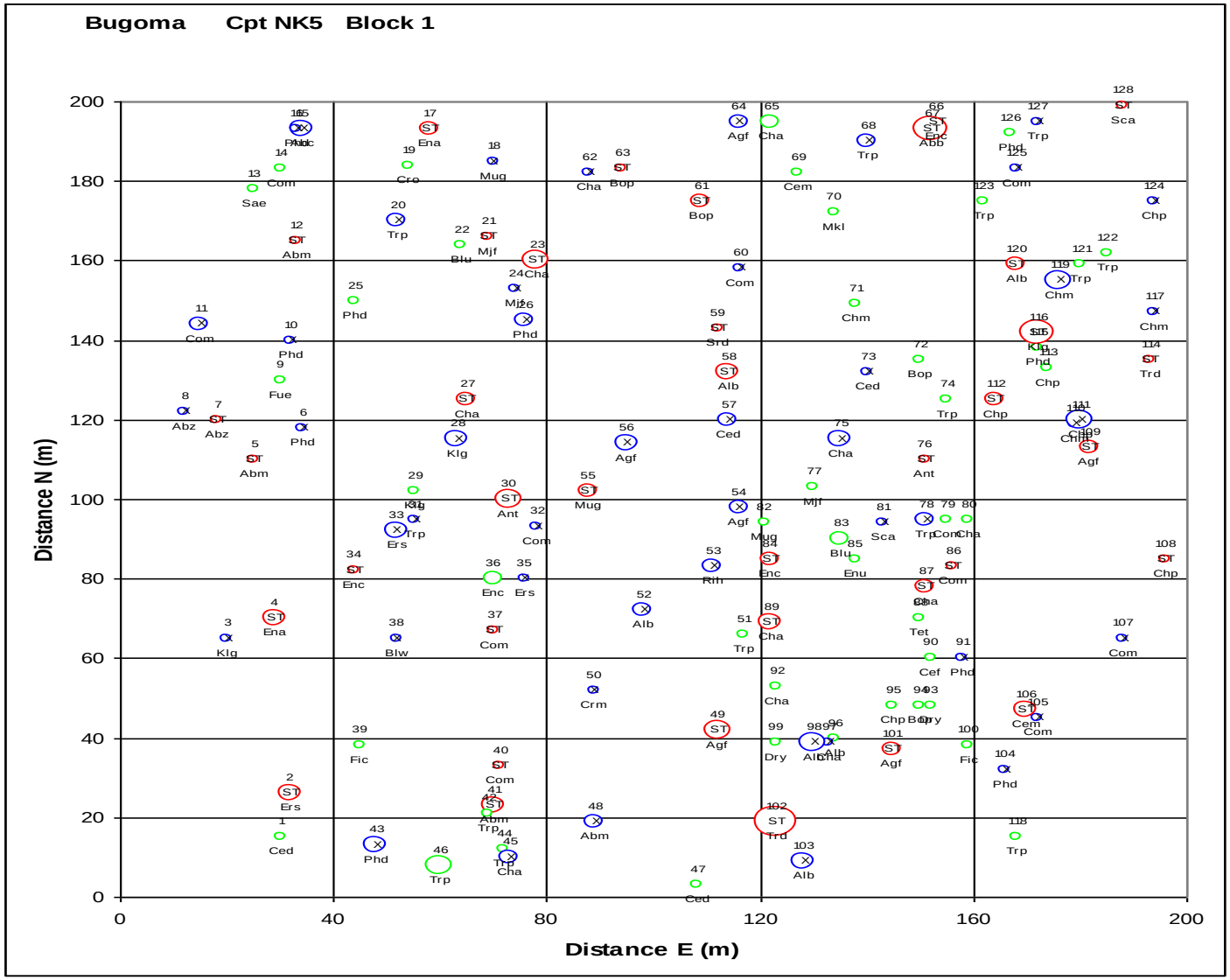
Based on stock survey of 4 ha, performed 01-Sep-2004 to 01-Sep-2004

Silviculture	Species	Trees	Volume	Stock numbers
Block 1				
Harvest	285 Schrebera arborea	1	2.5	81
	243 Chrysophyllum albidum	6	19.6	45, 62, 65, 75, 92, 97
	545 Trichilia prieuriana	5	12.5	20, 31, 68, 78, 127
	519 Ricinodendron heudelotii	1	3.0	53
	510 Phyllanthus discoideus	7	10.9	6, 10, 16, 26, 43, 91, 104
	487 Majidea fosteri	2	2.8	24, 77
	444 Croton macrostachys	1	1.7	50
	399 Klainedoxa gabunensis	3	8.0	3, 28, 29
	261 Erythrophleum suaveolens	2	5.3	33, 35
	238 Celtis durandii	3	10.1	47, 57, 73
	228 Alstonia boonei	3	15.9	52, 98, 103
	290 Tetrapleura tetraptera	1	1.4	88
	245 Chrysophyllum mnerense	3	11.1	110, 117, 119
	423 Bosquiea phoberos	1	2.7	72
	247 Chrysophyllum perpulchrum	2	7.6	111, 124
	493 Mimusops bagshawei	1	1.4	18
	201 Albizzia coriaria	1	3.9	15
	204 Albizzia gummifera	1	3.2	48
	205 Albizzia zygia	1	1.3	8
	207 Cordia millenii	7	14.9	11, 14, 32, 60, 105, 107, 125

	229	Aningeria adolfi-friederici	3	9.2	54, 56, 64
	421	Blighia welwitschii	1	1.7	38
Reserved	236	Celtis adolfi-frederici	1	2.1	90
	238	Celtis durandii	1	1.7	1
	243	Chrysophyllum albidum	1	1.5	80
	247	Chrysophyllum perpulchrum	1	2.1	95
	264	Funtumia elastica	1	1.0	9
	207	Cordia millenii	1	1.5	79
	420	Blighia unijugata	1	1.4	22
	493	Mimusops bagshawei	1	1.1	82
	212	Markhamia (platycalyx) lutea	1	1.8	70
	240	Celtis (soyauzi) milbraedii	1	3.4	69
	255	Drypetes spp.	2	3.7	93, 99
	510	Phyllanthus discoideus	3	3.3	25, 115, 126
	521	Sapium ellipticum	1	2.0	13
	545	Trichilia prieuriana	9	17.7	42, 44, 46, 51, 74, 118, 121, 122, 123
	604	Croton oxypetalus	1	1.3	19
	106	Entandrophragma utile	1	1.4	85
	465	Ficus spp.	2	2.5	39, 100
	228	Alstonia boonei	1	1.4	96
Seed trees	103	Entandrophragma angolense	2	8.2	4, 17
	493	Mimusops bagshawei	1	2.8	55
	228	Alstonia boonei	2	7.9	58, 120
14					

Silviculture	Species		Trees	Volume	Stock numbers
Seed trees	240	Celtis (soyauzi) milbraedii	1	5.1	106
	261	Erythrophleum suaveolens	1	3.4	2
	285	Schrebera arborea	1	1.9	128
	399	Klainedoxa gabunensis	1	7.4	116
	420	Blighia unijugata	1	1.8	83
	487	Majidea fosteri	1	1.5	21
	205	Albizzia zygia	1	1.7	7
	423	Bosquiea phoberos	3	8.0	61, 63, 94
	287	Sterculia dawei	1	2.2	59
	231	Antiaris (toxicaria) africana	2	9.5	30, 76
	229	Aningeria adolfi-friederici	3	11.8	49, 101, 109
	207	Cordia millenii	3	7.7	37, 40, 86
	104	Entandrophragma cylindricum	4	10.7	34, 36, 66, 84
	204	Albizzia gummifera	3	9.1	5, 12, 41
	247	Chrysophyllum perpulchrum	3	8.0	108, 112, 113
	245	Chrysophyllum mnerense	1	1.8	71
	243	Chrysophyllum albidum	4	19.8	23, 27, 87, 89
	222	Trichilia dregeana	2	13.3	102, 114
	225	Albizzia glaberrima	1	7.8	67

Appendix 6: ISSMI Block Map



Species on block		**Nh**	**Vol**	**Nt**
Trp	Trichilia prieuriana	5	12.5	14
Cha	Chrysophyllum albidum	4	14.3	11
Com	Cordia millenii	6	13.5	11
Phd	Phyllanthus discoideus	7	10.9	10
Agf	Aningeria adolfi-friederici	3	9.2	6
Alb	Alstonia boonei	3	15.9	6
Chp	Chrysophyllum perpulchrum	2	7.6	6
Abm	Albizzia gummifera	1	3.2	4
Bop	Bosquiea phoberos			4
Ced	Celtis durandii	2	7.6	4
Chm	Chrysophyllum mnerense	3	11.1	4
Enc	Entandrophragma cylindricum			4
Klg	Klainedoxa gabunensis	2	6.2	4
Ers	Erythrophleum suaveolens	2	5.3	3
Mjf	Majidea fosteri	1	1.4	3
Mug	Mimusops bagshawei	1	1.4	3
Abz	Albizzia zygia	1	1.3	2
Ant	Antiaris (toxicaria) africana			2
Blu	Blighia unijugata			2
Cem	Celtis (soyauzi) milbraedii			2
Dry	Drypetes spp.			2
Ena	Entandrophragma angolense			2
Fic	Ficus spp.			2
Sca	Schrebera arborea	1	2.5	2
Trd	Trichilia dregeana			2
Abb	Albizzia glaberrima			1
Abc	Albizzia coriaria	1	3.9	1

Species on block		**Nh**	**Vol**	**Nt**
Blw	Blighia welwitschii	1	1.7	1
Cef	Celtis adolfi-frederici			1
Crm	Croton macrostachys	1	1.7	1
Cro	Croton oxypetalus			1
Enu	Entandrophragma utile			1
Fue	Funtumia elastica			1
Mkl	Markhamia (platycalyx) lutea			1
Rih	Ricinodendron heudelotii	1	3.0	1
Sae	Sapium ellipticum			1
Srd	Sterculia dawei			1
Tet	Tetrapleura tetraptera			1
Total		**48**	**134.4**	**128**

Appendix 7: Timber Harvesting Volume Measurement Form

Appendix 8: Record of Sawn Timber

Kalinzu Initiative - Details of Timber Produced

District and (code) _____ Forest Reserve and (Code) _____ Compartment No. ___ Block No. _____

			Timber Size (mm)						
Species	Tree No.	Log No.	width (mm)	Thickness (mm)	Length (mm)	No. of pieces	Volume (m3)	Grade[1]	Remarks

Appendix 11: Sawn Timber Delivered to BHC Site

Record of Sawn Timber Delivered to the Building Timber Sheds

Forest: | **Species:**

Compartment	Block	Tree number	Width (mm)	Thickness (mm)	Plank Lengths (m)	Nr of planks

District Seal: | Felling permit:

Movement permit: | Date left Forest:

C:\Steve1\Forest Certification\Uganda Initiative\Kalinzu Initiative\[Form_Consignment to Cementers stores.xls]Harvest

Appendix 10: Forest Produce Declaration Form

Appendix 13: The Forest Produce Movement Permit

Bugoma Forest Reserve
Stand table of Total volume (m3) for Cpt Nkwa (7,200.0 ha, 643 plots)

Species		Diameter class (cm)											Quality (50cm+)		
Code	Botanical name	10-30	30-50	50-70	70-90	90+	30+	RME	40+	RME	50+	RME	Relict	Fair	Good
292	*Acacia polycantha*		182				182	-	182	-		-			
223	*Alangium chinense*	363	76				76	-		-		-			
201	*Albizia coriaria*	122	414	543		1,686	2,643	-	2,460	-	2,229	-	1,950		279
202	*Albizia ferruginea*	350	595	1,297	4,125	2,833	8,851	2,859	8,255	2,282	8,255	2,282	588		7,667
225	*Albizia glaberrima*	5,868	6,413	8,070	4,134	11,686	30,303	20,106	27,969	17,859	23,890	13,995	2,488	6,037	15,365
203	*Albizia grandibracteata*		345				345	-	185	-		-			
204	*Albizia gummifera*	1,268	2,191	1,570	1,749		5,510	2,203	3,862	755	3,319	301	1,247	617	1,456
205	*Albizia zygia*	4,805	6,097	12,171	2,792	1,239	22,299	15,909	19,017	12,973	16,202	10,545	1,507	8,706	5,989
781	*Alcornia floribunda*	1,448						-		-		-			
784	*Alcornia laxiflora*	174						-		-		-			
705	*Allophylus dummeri*	199						-		-		-			
227	*Allophylus macrobotrys*	63						-		-		-			
228	*Alstonia boonei*	629	1,229	4,511	8,233	8,629	22,602	12,248	21,855	11,581	21,373	11,194	6,222	9,495	5,656
230	*Aningeria altissima*	233	786	1,940	588	1,171	4,484	1,413	4,018	982	3,698	693	243	606	2,850
304	*Anona senegalensis*	67						-		-		-			
231	*Antiaris toxicaria*	1,957	1,178	3,161	4,846	3,805	12,991	5,523	12,705	5,283	11,812	4,451		5,770	6,042
592	*Antidesma laciniatum*	1,185	115				115	-		-		-			
413	*Aphania senegalensis*	128						-		-		-			

Bugoma Forest Reserve
Stand table of Total volume (m3) for Cpt Nkwa (7,200.0 ha, 643 plots)

Species		Diameter class (cm)											Quality (50cm+)		
Code	*Botanical name*	*10-30*	*30-50*	*50-70*	*70-90*	*90+*	*30+*	*RME*	*40+*	*RME*	*50+*	*RME*	*Relict*	*Fair*	*Good*
414	*Apodytes dimidiata*	161	251				251	-	144	-		-			
232	*Balanites wilsoniana*	590	1,520	1,192	4,784	2,730	10,225	3,864	9,292	2,981	8,705	2,444	7,108	1,597	
416	*Balsamocitrus dawei*	40						-		-		-			
708	*Bathiopsis paviflora*	252						-		-		-			
418	*Beilschmiedia ugandensis*	47						-		-		-			
710	*Belanophora hypoglauca*	86						-		-		-			
420	*Blighia unijugata*	1,680	1,091	998	963	724	3,776	1,463	3,337	1,065	2,685	482	906	1,326	453
421	*Blighia welwitschii*	86	708	377			1,086	147	795	-	377	-		377	
423	*Bosquiea phoberos*	6,850	2,014	1,768	808		4,590	1,805	3,415	859	2,577	214		1,768	808
425	*Bridelia micrantha*	756						-		-		-			
564	*Caloncoba schweinfurthii*	2,743	1,657	376			2,032	935	1,177	349	376	-	196	179	
427	*Casearia engleri*	184						-		-		-			
234	*Cassia mannii*		117				117	-		-		-			
2223	*Cassia spectabilis*	121	68				68	-		-		-			
430	*Cassipaurea gummifera*	116		542			542	-	542	-	542	-	542		
429	*Cassipourea melanosa*	309			797		797	-	797	-	797	-		797	
716	*Cassipourea rwensorensis*	35						-		-		-			

Bugoma Forest Reserve Stand table of Total volume (m3) for Cpt Nkwa (7,200.0 ha, 643 plots)															
Species		**Diameter class (cm)**											**Quality (50cm+)**		
Code	*Botanical name*	*10-30*	*30-50*	*50-70*	*70-90*	*90+*	*30+*	*RME*	*40+*	*RME*	*50+*	*RME*	*Relict*	*Fair*	*Good*
572	*Cathium vulgane*	239						-		-		-			
236	*Celtis adolfi-frederici*	7,903	5,400	974	3,130		9,504	5,138	5,511	1,413	4,104	220		1,352	2,752
237	*Celtis africana*	115		500			500	-	500	-	500	-	500		
238	*Celtis durandii*	5,497	21,299	25,719	4,900	1,576	53,493	42,220	45,353	34,614	32,194	22,501	9,741	21,235	1,218
240	*Celtis mildbraedii*	50,644	47,417	28,891	18,156	10,287	104,751	85,185	80,581	62,083	57,334	39,761	1,317	18,889	37,128
242	*Celtis wightii*	1,884	552				552	8		-		-			
241	*Celtis zenkeri*	4,707	5,432	1,354	970		7,756	4,533	5,108	2,126	2,324	7		1,647	677
570	*Chaetacme aristata*	3,024	1,182			1,842	3,025	-	2,062	-	1,842	-	1,842		
243	*Chrysophyllum albidum*	1,187	1,924	2,588	1,423	1,546	7,481	3,091	6,867	2,505	5,557	1,371	309	2,952	2,297
244	*Chrysophyllum gorungosanum*		219				219	-	219	-		-			
245	*Chrysophyllum mnerense*	368	739	2,041	4,251	1,766	8,797	2,620	8,297	2,166	8,058	1,943		4,106	3,952
247	*Chrysophyllum perpulchrum*	1,057	4,061	7,073	3,632		14,766	7,431	13,148	5,989	10,705	4,200		2,982	7,723
558	*Coffea spp*	33						-		-		-			
442	*Cola gigantea*	173	791	1,407	709		2,907	648	2,398	192	2,116	-		992	1,124
571	*Combretum spp*	4,127	133				133	-		-		-			
573	*Compretum molle*	1,330						-		-		-			
132	*Cordia millenii*	321	1,679	2,171	2,561		6,410	2,784	5,854	2,250	4,732	1,407	657	2,003	2,072

Bugoma Forest Reserve
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Species		Diameter class (cm)											Quality (50cm+)		
Code	*Botanical name*	*10-30*	*30-50*	*50-70*	*70-90*	*90+*	*30+*	*RME*	*40+*	*RME*	*50+*	*RME*	*Relict*	*Fair*	*Good*
444	*Croton macrostachys*		239				239	-	239	-		-			
445	*Croton megalocarpus*	111	112				112	-		-		-			
604	*Croton oxypetalus*	6,487	5,959	2,467			8,426	5,463	3,507	1,278	2,467	427	306	2,160	
249	*Cynometra alexandrii*	5,546	20,415	45,861	58,979	85,542	210,796	178,912	203,357	172,075	190,381	160,403	93,055	83,882	13,444
253	*Dambeya goetzenii*	92						-		-		-			
449	*Desplasia deweii*	969	643				643	55	327	-		-			
450	*Dialium bipindense*	137						-		-		-			
569	*Dichrostachy cinerea*	594	145				145	-		-		-			
565	*Dictyndra arborescens*	1,015						-		-		-			
250	*Diospyros abyssinica*	208	271	479			750	-	479	-	479	-		479	
2224	*Diphasia angolensis*	1,418	540	254			794	128	254	-	254	-	254		
254	*Dombeya mukole*	442	523	1,945	791		3,259	851	2,950	565	2,736	387	2,188	548	
255	*Drypetes spp*	8,946	2,132				2,132	728	770	-		-			
456	*Ehretia cymosa*	1,260	635	248			883	123	452	-	248	-	248		
103	*Entandrophragma angolense*	45	316	1,017			1,333	-	1,202	-	1,017	-		343	674
104	*Entandrophragma cylindricum*	437	1,640	3,030	1,508		6,179	2,687	5,782	2,316	4,538	1,295			4,538
106	*Entandrophragma utile*	331	455	2,198			2,654	422	2,198	26	2,198	26		1,028	1,170

Bugoma Forest Reserve
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Species		Diameter class (cm)											Quality (50cm+)		
Code	*Botanical name*	*10-30*	*30-50*	*50-70*	*70-90*	*90+*	*30+*	*RME*	*40+*	*RME*	*50+*	*RME*	*Relict*	*Fair*	*Good*
258	*Erythrina abyssinica*	271						-		-		-			
259	*Erythrina excelsa*	80						-		-		-			
261	*Erythrophleum sauveolens*	225	849	1,524	2,188	935	5,497	1,971	5,025	1,526	4,648	1,186	1,651	2,997	
107	*Fagara leprieurii*	2,141	3,104	3,259			6,364	3,795	5,209	2,768	3,259	1,194	1,767	1,492	
108	*Fagara macrophylla*	211	527	259			787	-	698	-	259	-		259	
208	*Fagaropsis angolensis*	533	397				397	-	303	-		-			
465	*Ficus spp*	2,666	3,509	1,945	2,058	2,130	9,643	4,771	8,371	3,570	6,134	1,524	2,436	1,919	1,779
263	*Funtumia africana*	553	485				485	-	222	-		-			
264	*Funtumia elastica*	23,790	7,963		824		8,787	5,782	1,835	-	824	-		824	
566	*Glyphaea brevis*	643						-		-		-			
470	*Greenwayodendron suaveolens*	86						-		-		-			
740	*Grewia similis*	64						-		-		-			
117	*Guarea cedrata*	405	845	447			1,291	-	1,114	-	447	-			447
121	*Hallea stipulosa*			251			251	-	251	-	251	-		251	
474	*Haronga madagascariensis*	26						-		-		-			
741	*Harrisonia abysinica.*	478						-		-		-			
742	*Harrisonia occidentalis*	47						-		-		-			

Bugoma Forest Reserve
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Species		Diameter class (cm)											Quality (50cm+)		
Code	*Botanical name*	*10-30*	*30-50*	*50-70*	*70-90*	*90+*	*30+*	*RME*	*40+*	*RME*	*50+*	*RME*	*Relict*	*Fair*	*Good*
119	*Holoptelea grandis*	180	437	1,373	1,090	1,365	4,264	469	3,827	61	3,827	61		2,455	1,373
591	*Hymenocardia acida*	234						-		-		-			
265	*Ilex mitis*		76				76	-		-		-			
599	*Kigelia africana*	109						-		-		-			
406	*Klainedoxa gabonensis*	154	594	2,363	841	5,968	9,766	3,140	9,524	2,901	9,172	2,614	492	2,551	6,129
477	*Lannea welwitschii*	474	652				652	-	430	-		-			
567	*Lasiodiscus mildbraedii*	24,696	2,984				2,984	1,909	112	-		-			
1113	*Leptaulus daphnoides*	340	84				84	-		-		-			
560	*Linociera johnsonii*	670	65	338			403	-	338	-	338	-	338		
113	*Lovoa trichiliodes*	991	982	943			1,925	337	1,449	-	943	-			943
482	*Lychnodiscus cerospermus*	2,952	364				364	43		-		-			
269	*Macaranga schweinfurthii*	568	90				90	-		-		-			
583	*Maerua duchensii*	5,387	532				532	92		-		-			
211	*Maesopsis eminii*	287	1,045	530			1,575	179	1,040	-	530	-	530		
487	*Majidea fosteri*	440	267	263			530	-	411	-	263	-			263
490	*Manilkara obovata*	94	218				218	-	218	-		-			
212	*Markhamia lutea (platycalyx)*	657	135				135	-		-		-			

Bugoma Forest Reserve
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Species		Diameter class (cm)											Quality (50cm+)		
Code	*Botanical name*	*10-30*	*30-50*	*50-70*	*70-90*	*90+*	*30+*	*RME*	*40+*	*RME*	*50+*	*RME*	*Relict*	*Fair*	*Good*
581	*Maytenus unbata*	237						-		-		-			
1115	*Memecylon jasminoides*	44						-		-		-			
270	*Mildbraediodendron excelsum*		193	563	1,205		1,961	-	1,961	-	1,768	-		563	1,205
102	*Milicia excelsum (chlorophora)*	162	243			2,097	2,340	-	2,097	-	2,097	-			2,097
493	*Mimusops bagshawei*	577	1,036	803	535		2,375	635	1,783	120	1,338	-		897	441
494	*Monodora myristica*	65	137				137	-	137	-		-			
271	*Morinda lucida*	21	123				123	-		-		-			
272	*Morus lactea (mesozygia)*	1,591	2,712	2,086			4,798	2,275	3,406	1,027	2,086	-		532	1,554
1006	*Myrianthus arboreus*	1,945	783	255			1,038	219	398	-	255	-	255		
274	*Myrianthus holstii*	901	402				402	-	141	-		-			
501	*Neoboutonia macrocalyx*	79	319				319	-		-		-			
115	*Olea welwitschii*	813	2,418	2,622	709		5,749	2,797	4,809	2,083	3,332	891	1,414	757	1,161
574	*Oncoba spinosa*	242	327				327	-	185	-		-			
780	*Oxyanthus spp*	597						-		-		-			
505	*Pachystela brevipes*	889						-		-		-			
506	*Pachystela msolo*	195	79				79	-		-		-			
278	*Parkia filicoidea*	545	879	793		4,748	6,420	-	5,829	-	5,541	-	2,467	3,074	

Bugoma Forest Reserve
Stand table of Total volume (m3) for Cpt Nkwa (7,200.0 ha, 643 plots)

Species		Diameter class (cm)											Quality (50cm+)		
Code	*Botanical name*	*10-30*	*30-50*	*50-70*	*70-90*	*90+*	*30+*	*RME*	*40+*	*RME*	*50+*	*RME*	*Relict*	*Fair*	*Good*
595	*Pauridiantha holstii*	278						-		-		-			
1119	*Pauridiantha viridiflora*	811	145				145	-		-		-			
219	*Peptadeniastrum africanum*	372	151				151	-		-		-			
510	*Phyllanthus discoideus (magaritaria)*	4,247	7,710	1,641	1,577	1,146	12,074	8,364	7,819	4,410	4,364	1,203	4,131	233	
509	*Porposia guineensis*	136	351	494			846	-	494	-	494	-		494	
220	*Prunus africana*	473	780	843	630		2,253	534	1,899	227	1,473	-	884	589	
281	*Pseudospondias microcarpa*	950	67	447	463		977	-	910	-	910	-	910		
282	*Pterygota mildbraedii*			679	1,042	1,446	3,167	-	3,167	-	3,167	-	679	2,488	
283	*Pycnanthus angolensis*	430	507	633	1,177		2,317	-	2,112	-	1,810	-		633	1,177
518	*Rauvolfia oxyphylla*		193				193	-	193	-		-			
769	*Rauvolfia vomitora*	28						-		-		-			
783	*Rawsonia spp*	29						-		-		-			
519	*Ricinodendron heudelotii*	562	1,960	866	3,678	9,366	15,870	5,545	14,447	4,145	13,910	3,631		8,791	5,120
1005	*Rinorea ardicifolia*	278						-		-		-			
561	*Ritchiea albersii*	61						-		-		-			
1000	*Rothamania urcelliformis*	133						-		-		-			
521	*Sapium ellipticum*	882	3,242	1,269			4,511	2,350	3,053	1,075	1,269	-	1,269		

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Species		Diameter class (cm)											Quality (50cm+)		
Code	*Botanical name*	*10-30*	*30-50*	*50-70*	*70-90*	*90+*	*30+*	*RME*	*40+*	*RME*	*50+*	*RME*	*Relict*	*Fair*	*Good*
284	*Schrebera alata*	39	160				160	-	160	-		-			
285	*Schrebera arborea*	28	262				262	-	173	-		-			
1116	*Scolopia rhamnophylla*	878	152				152	-	152	-		-			
286	*Spathodea campanulata*	242	170				170	-		-		-			
770	*Stauditia kamerunensis*	93						-		-		-			
287	*Sterculia dawei*	119	409	948	1,825		3,183	804	2,987	623	2,773	445	588	938	1,248
289	*Syzigium guineense*	73		656			656	-	656	-	656	-		656	
532	*Tabernaemontana holstii*	372						-		-		-			
536	*Tapura fischeri*	1,927	2,041	531			2,573	1,026	824	-	531	-	531		
537	*Teclea nobilis*	4,076	1,820	433			2,253	999	922	-	433	-	433		
303	*Terminalia macroptera*	417	458				458	-		-		-			
290	*Tetrapleura tetraptera*	1,411	765	762			1,527	304	911	-	762	-	279	482	
540	*Tetrorchidium didymostemon*	96	136				136	-		-		-			
541	*Treculia africana*	153	181	311			492	-	311	-	311	-		311	
542	*Trema orientalis*	354						-		-		-			
222	*Trichilia dregeana*	213	991	482		1,764	3,238	-	2,649	-	2,246	-		482	1,764
544	*Trichilia mantineana*	38	173	604			777	-	777	-	604	-		306	298

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Species		Diameter class (cm)											Quality (50cm+)		
Code	*Botanical name*	*10-30*	*30-50*	*50-70*	*70-90*	*90+*	*30+*	*RME*	*40+*	*RME*	*50+*	*RME*	*Relict*	*Fair*	*Good*
545	*Trichilia prieuriana*	2,686	4,613	12,410	2,938		19,960	14,074	18,445	12,658	15,347	9,859	5,828	9,519	
546	*Trichilia rubenscens*	27						-		-		-			
587	*Trichilia spp*	790	342				342	-	156	-		-			
562	*Turraea floribunda*	153						-		-		-			
563	*Turraea mbosta*		137				137	-	137	-		-			
777	*unknown*	2,035	861				861	16	600	-		-			
549	*Uvariopsis congensis*	919						-		-		-			
578	*Vangueria spp*	214						-		-		-			
550	*Vitex amboniensis*	494	642				642	58	196	-		-			
291	*Warbugia ugandensis*		219				219	-		-		-			
553	*Xylopia aethiopica*	356	193				193	-		-		-			
556	*Zanha golungensis*	218	455	654			1,109	-	1,037	-	654	-		301	354
TOTAL		**251,011**	**218,047**	**214,012**	**157,608**	**168,027**	**757,694**	**709,414**	**643,732**	**596,895**	**539,647**	**494,840**	**160,295**	**226,668**	**152,684**
Sampling error %		**2.3%**	**3.5%**	**4.9%**	**7.3%**	**10.0%**	**3.2%**		**3.7%**		**4.2%**		**8.1%**	**6.5%**	**8.2%**
RME (P=95.0%)		**239,736**	**203,099**	**193,267**	**135,003**	**134,882**	**709,414**		**596,895**		**494,840**		**134,905**	**197,517**	**128,217**

Annex 2: Responses to questions guiding development of the pillars of forest governance

Question (from the questionnaire)	ICT intervention
1) **Question [1]A.1.1:** Are inventory data, management plans, laws, and budgets for government-owned forests easily accessible to the public in a user-friendly format?	• Inventory data not available to the public. Opportunity to have online interactive inventory data on the internet. Something similar to google maps. The NFA website (www.nfa.or.ug) could be expanded to provide details forest resources data such as forest area, forest change dynamics, forest characteristics. • According to the National Forest Plan, it is the responsibility of the FSSD to establish and information shop for all forestry sector information. The website established under the FAO/NFPP program (www.ugandaforests.or.ug) is no longer online because of failure to subscribe for domain name registration and hosting of the site. There are no likely plans in the near future to revitalize the site. • The Ministry of Water and Environment has a website (www.mwe.gov.ug) with each department having one or two pages. The Forest Sector departmental pages (http://www.mwe.go.ug/DEA/77/DEA_Departments/Forest_Sector_Support_Department) only has information about functions of the department; a clear indication of lack of prioritization for forestry data and information.
2) **Question [1]A.2.1**: Do relevant authorities give public notice of proposed forest policies, programs, laws, and projects?	• There is a number of places where one can find Uganda's forestry policy and legal framework online such as www.nfa.or.ug, www.sawlog.ug, www.fao.org and many others. There are also online scholarly articles on forestry policy, security of tenure, enforcement of laws, forestry policy and poverty , general conservation, land use systems and climate change. • However, the double standards and contradiction between having good forestry policy and laws and on the contrary promoting degazettement, illegal logging and encroachment have limited presence online (see example http://www.illegal-logging.info/approach.php?a_id=112 • It is also the time to use social media such as blogs, facebook to bring forestry policy discussion to the public domain • The Daily Monitor and the New Vision dailies have provided online commentaries and discussions on topical issues arising in forestry. For example the attempted degazettement of Mabira central forest reserve and the Executive Director having 900 million shillings in his bedroom were given sufficient share of

Question (from the questionnaire)	ICT intervention
	ink and space, especially so through online chatting with editors. • Consequently radio picked on the stories and rallied the public to participate demanding to halt the degazettement of the forests and the termination of services of the executive director.
3) **Question: [1]A.3.1:** Are commercial timber forest products allocations from public forests open and transparent?	• The National Forest Authority, which is the only responsible body with merchantable trees has a well laid out process for issuance of concessions, license and permits. All these have remained on paper and cannot be easily accessed. Word document files are also traceable on isolated computers and not shared within the institution. • There is an opportunity to avail such details online. Then the public, especially those with interest get to know the procedure. It gives limited chance to the National Forestry Authority to bend rules if the general public knows details in the procedure. • There is an opportunity for such information to be made available online at www.utga.net or www.sawlog.ug, sites that are managed with an inclination to serve interests of the private sector.
4) **Question [1]B.1.1:** For people who are affected by forest policy are there any formal mechanisms for them to influence it?	• People affected by forestry policy have limited formal mechanism to influence changes since most of the decisions are made by government. The only way to appeal to government is through written letters directly delivered to the targeted party. Even when delivered it always takes time to get a response. • However to date there is a chance to send e-mail to the targeted government officials. For example all e-mail addresses of members of Parliament are publicized online (http://www.parliament.go.ug). For issues within the forest sector, e-mails can directly be sent to the sessional committee of natural resources seeking audience and creating impetus for action. • The other option is to use *Short Message Service* (*SMS*), a text communication service component of mobile phones. It is claimed that 90% of text messages are read, 95% reach the targeted audience and it is easy to deliver bulk messages. There are a number of SMS Media companies www.**smsone**.co.ug, www.smsmedia.ug, and telecommunication companies, too, offer sms messaging services.
5) **Question [1]B.1.2:** Are forest dependent	• There are collaborative forest management (CFM) arrangements between forest dependent communities and the

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communities actively involved in forest management and planning?	National Forestry Authority. associations have established a network. These have formed a network called Uganda Network of Collaborative Forest Management Associations (UNETCOFA). UNETCOFA is housed by the Community Development and Conservation Agency (CODECA); see www.codecauganda.org. • CFM groups have limited access to internet because of a number of factors. The cost of the computer, monthly subscription to Internet Service Providers (ISPs) and literacy level. To try to use internet based mechanism to rich these communities is to deny them information. • The best ICT for communities is the radio. In 2009, the International Labour Organisation through it Small Enterprise Media in Africa Project undertook to promote audience led programming, encouraging journalists to cover issues of interest to communities. ILO engaged FM Radio Stations and the National Forestry Authority to forest based enterprises through radio. This was done through training sessions organised in four selected areas with CFM arrangement and are covered by FM Radio stations. The CFM groups have used this as an opportunity to market their produce, voice their complaints to the public. Radio stations on the other hand have a new audience segment, new sources of news and are seen by the public to be environmentally sensitive which adds to their corporate image. •
6) **Question [1]B.1.3:** Are local communities knowledgeable about formal rules regarding ownership, access, and use of forest land?	• There is a general observation that extension service delivery in the forest sector is constrained by being housed in the Ministry of Agriculture under the National Agricultural Advisory Services (NAADS), there is low sensitization and high illiteracy levels among people living around forests. • Looking at the NAADS website (www.naads.or.ug) one can clearly see that forestry is sidelined. There are well developed databases on agricultural market information and an Agricultural Market Information System but forestry commodities do not feature at all. • There is an opportunity to influence NAADS to develop a Forestry Market Information System or to integrate forest based enterprises and commodities in the already existing information systems.
7) **Question [1]B.3.1:** For public forests, are	• It is within the policy framework that stakeholders are consulted on projects, programs, policies, laws and ordinances. However the methodology is not prescribed. Often forest

Question (from the questionnaire)	ICT intervention
consultations with stakeholders carried out and is the feedback used in decision making?	resources managers have used the workshop/conference approach for consultations and the result is that this is expensive. In fact, development partners do complain about the cost of consultation. • There is an opportunity to cut down costs through use of ICTs. In the expanded consultation for the REDD process in Northern Uganda, Tree Talk is using is using the radio stations from consultations. Two approaches are used. One, is where an announcement is made requesting the public to register their views about the escalating levels of deforestation by calling a given telephone number or sending an sms text message. The other is an expert moderated interactive radio talk show where issues are presented and the public give their views by calling in. The views will be compiled and presented to the REDD secretariat. • For the elites, there is an opportunity to undertake online consultation. Ask selected respondents to fill in an electronic form that is sent back to the consulting institution. Or even have an online questionnaire to be filled in by visitors to your site.
8) **Question [1]C.1.1:** Are there avenues for stakeholders to report issues of concern about the agency and its management of the forests?	• Sms and e-mails can be used to report issues of concern about the agency and its style of management. Care must be taken not to misuse the opportunity on petty issues
9) **Question [1]C.1.2:** Are the media independent and free to publish reports on forests and their management in a format widely accessible to the public?	• The print media institutions today are online, see www.newvision.co.ug and www.monitor.co.ug. Whereas there is freedom for the media to report forestry issues, forestry stories are often outcompeted by political stories, gossip, entertainment and sports. Whereas print media claim to have environmental pages, these are often used to cover agriculture and tourism that are more appealing to the public. The commercialization of the media has affected its role of being a watchdog. For example, civil society organization have to pay large sum of money to place a press-release in the media. Otherwise a press release may not attract the attention of the editor. • Media house have established blogs, twitter, facebook, flicker that have a lot of following. This is an opportunity to get forestry governance issues in this domain to attract free

Question (from the questionnaire)	ICT intervention
	publicity and coverage by reporters • NTV Uganda has a dedicated program called Eco-Talk, see www.ntvuganda.co.ug . Whereas what is aired on that program falls within the news category, there is an opportunity to expound on the content to undertake investigative pieces that fall with the forest governance domain.
10) **Question [2]A.1.1:** Does the forest agency's spending follow its published budget?	• It s clear from the recently concluded Joint Sector Reviews that forestry institutions are underfunded. The Forest Sector Support Department, the District Forestry Services and the National Forestry Authority are all under-funded. Their ability to fundraise is limited and yet there are opportunities for funding worldwide. The internet is an important source of links to funding agencies. Going through online inventories of funding institutions there is a whole lot of institutions that are willing to support forestry. For example the Financial Information Engine on Land and Degradation (www.gmfield.info)
11) **Question [2]B.1.2:** Are there serious conflicts between different communities and user groups in the context of forest access and use?	• The radio can be used to negotiate and resolve conflicts between different communities and user groups to improve on forest access and use.
12) **Question [3]A.1.1:** Does the country have a national forest policy/strategy?	• The National Forest Plan, which is the main strategy document for the forest sector is under review. Due consideration should be given to use ICTs in improving the image of forestry in Uganda • Related to that is the REDD process where Uganda is now preparing the REDD Readiness Preparation Proposal. ICTs should be given a central role in information access, public participation and access to justice.
13) **Question [3]A.1.2:** Is the government actively pursuing sustainable management of forests?	• The spirit for sustainable forest resources management in entreneched in the forestry policy and law. But there are flaws in the practice. The chain of custody should be the easiest to adhere to in case the T-component of ICTs is emphasized. There is need to step up use of technology for certification, for logging, for transportation, for marketing, for inventories (ISSMI, PSPs, Exploratory Inventories). And there is need to publicize use through information and communication technologies.
14) **Question [3]A.1.4:** Are	• The NFA has developed standards and guidelines – opportunity

Question (from the questionnaire)	ICT intervention
forest sector activities (as shown in the national forest plan) required to meet sustainability safeguards and standards?	to avail them online • The Sawlog Production Grant Scheme has standards and guidelines for managing plantations – see www.sawlog.ug. There is clear indication that the online documents are accessed locally and internationally.
15) **Question [3]B.3.4:** Do forest agencies use information technology (e.g., computers & appropriate software, GPS, GIS) appropriately to carry out their responsibilities?	• FSSD – has access to computers, which are limited to and used for word processing, simple worksheets in Ms Excel and internet. There is no well established IT infrastructure with central serve capable of sharing folders. Therefore access to information stored on someones' computer may be cumbersome. • The National Forestry Authority has a well established IT infrastructure and an IT Department. It also has a specialized wing that handles technical issues such as GIS, Mapping and Intergrated Stock Surveys, Exploratory Inventories, PSPs that is relevant to technical forest resources management. • NFA does charge the public for processed maps and data as a mechanism to plough back on investments on data collection, synthesis, processing. This has a limitation on access to information especially for those that cannot afford. • Communication between field offices and the headquarters is facilitated by e-mail. Each of the NFA's field office is equipped with the necessary IT facilities including internet connections. • Data and information that within the public domain is not made available online despite having the capacity to do so. There is a general feeling that the leadership of NFA is not sophisticated and would rather have date processing going on that way. • Even management data is not shared among staff. For example it is not possible to update a map while in the field. It is not possible to access the financial systems from the field offices. • The use of ICTs in the District Forestry Services leaves a lot to be desired. Some DFS have computers on their desks that are no longer functional. Those that are functional are used for word processing. In Pader district for example, whereas the District Forest Officer has received specialized training in GIS and database management systems, he does not have a computer, does not have a database of the forest resources in the district. The district to has limited funding for the DFS. •
16) **Question [3]B.3.7:** Are forest-related fees uniformly and	• The National Forestry Authority used to collect and document forest related fees but since 2007, this hasn't been done. It however takes stock of its own generated revenue through

Question (from the questionnaire)	ICT intervention
systematically collected?	harvesting licenses, tree planting permits and revenue accruing from eco-tourism. This revenue database also served the Districts. • The pricing committee of the National Forestry Authority does not publicize prices of its products on the website. This is a great opportunity. • Public auctions are however advertised in the print and electronic media. FM Radio stations actually read out the adverts in local languages
17) **Question [3]B.4.1:** Is the forest inventory and growth information comprehensive (all you need for its application), up-to-date (according to accepted cycles), and used in decision making and planning by the agency?	• Forestry inventory data is only located at the National Forestry Authoruty. It is not up to date however as per the recommended cycles. It is also unfortunate that it is not used in the decision making processes. For example the current harvesting in the natural forests does not follow the the AAC recommended. Even in plantations, young crops are harvested before there expected due date.
18) **Question [3]B.4.2:** In its planning and management activities, does the forest agency draw upon traditional and indigenous knowledge about the forest?	• There is no documentation of indigenous knowledge and no trace of it being used in the planning process
19) **Question [3]B.4.3:** In forest sector planning, do the ministries in charge take into consideration activities on private forestlands?	• The extensive studies made on forest cover could be used in the planning process. The mapping data available could be used in every aspect of forest resource management. It could be used in the decision making processes – the cabinet, the board, senior government official and the general public.
20) **Question [3]B.4.4:** Do public forests have valid management plans and are they implemented?	The information used in the development of forest management plans is not accurate. Often estimated are made as opposed to empirical measuring using computerized gadgets that the NFA actually has.

Question (from the questionnaire)	ICT intervention
21) **Question [3]B.6.1:** Are training and education services offered at times, places and in formats that are appropriate for the public?	Specifically related to ICT training in Nyabyeya Forestry College and Faculty of Forestry and Nature Conservation at Makerere University, one finds that most of the practical trainings are based on traditional (not computerized) approaches. Students often find it difficult to fit into a computerized environment when they graduate.
22) **Question [3]C.1.2:** Does the public have an opportunity to report corrupt practices to an appropriate authority?	ICTs provide several opportunities for this. Sending e-mails to targeted recipients to name and shame. Sending sms text messages to the appropriate authority.
23) **Question [3]D.1.1:** Is the permanent sample plot (PSP) network adequate and well monitored?	The National Forestry Authority has a database for PSPs. What is interesting is that many of the PSPs have been harvested by illegal dealers. Added to that, is the general lack of funds to undertake routine monitoring surveys.
24) **Question: [4] D.3.2** Are forest boundaries clearly surveyed and demarcated on the ground?	• The National Forestry Authority has digital versions of most of the forest reserve boundaries and these have been updated from time to time. The problem is that of politicians conniving with enchroachers to initiate processes leading into discussions as to whether the digital maps are as accurate compared to what the only survivor of world war II remembers
25) **Question [5]A.1.1:** Are there current and reliable estimates of illegal activities?	• The National Forestry Authority has an inventory of illegal activities in forest reserves with their location captured by GPS. In some forest reserves the acreage enchroached is known. The decision to flash out encroachers cannot be effected because of a presidential directive to stay forest eviction.
26) **Question [5]A.2.1:** Does the government use supply and demand information in making commercial forest and industrial development policies and plans?	• The private sector is demanding for a Market Information System; that will provide details of which tree farmer has what products at what price. This Information System should link Ugandan forest industry practitioners to those of the neighbouring countries.
27) **Question: [5]B.1.1:** Do government policies	• There is an initiative for payment for ecosystem services that are being tried by various practitioners. There are database owned by

Question (from the questionnaire)	ICT intervention
and decision making consider non-market values, such as ecosystem services and traditional social uses of the forest?	different stakeholders prospecting carbon trade through clean development mechanisms.
28) **Question [5]B.2.1:** Are market-based incentive schemes for forest markets achieving their objectives?	• The National Forestry Authority for example licenses tree planting in forest reserves as an incentive to those that want to grow trees. But this is not well publicized; not on its website. The Sawlog Production Grant Scheme on the hand provides incentives and these are well laid out on the site.
29) **Question [5]C.2.1:** Do the market prices of forest products and services reflect environmental costs incurred in their production and use?	• No standard market prices. The proposed market information system proposed above should provide for this
30) **Question [5]C.3.1:** Does government support the adoption of certification and use of chain of custody systems?	• There is a possibility to transform the current chain of custody from hard copy to computerized system of tracking. However, this may not be favoured given that the trend of events in illegal dealing.
31) Question [5]F.1.2: How does forest technology in the country compare to the global best practices particularly with regard to minimizing costs and wastes?	• The forestry industry is still wasteful. There is need for mechanisation/computerization of all process right from tree felling, to round wood processing to conversion into final products. This will improve on efficiency and make economic sense.

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