



**IMPROVING EFFICIENCIES AND RECOVERY RATES**  
**IN GHANA'S SMALL AND MEDIUM WOOD BUSINESSES**

Prepared by:	Jean Bouichou
Company:	SSC Wood-Technologies S.A. (on behalf of SSC Forestry AB of the SSC group of companies)
Position:	Managing Director
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## 1 INTRODUCTION

Ghana has a now established reputation as a tropical wood exporter. This has been made possible by several large companies, mostly foreign, which have been extracting and processing Ghana's naturally precious woods. As these large companies were leading the way a large number of national enterprises and businesses have developed and grown alongside, as suppliers but also as competitors. Most of these businesses are quite small in comparison to their foreign counterparts.

Forestry in Ghana however, has been plagued by unsound practices and regulations. These unsustainable practices have been impacting the environment, and stakeholders who have not benefited as they should from forestry developments. One of the main losers due to these practices however, is likely to be national forest and wood-processing companies. As over-extraction is charging its toll, top-quality logs are now becoming unavailable in Ghana. While foreign companies have the possibility to simply displace their investments from Ghana to over neighbouring countries, nationals do not have this privilege and are now confronted to the obligation of using less-than-perfect logs for their processes. This, combined to a difficult market environment (due to the world's economical crisis) and to a lack of access to modern technologies, has been hitting Ghana's wood businesses very harshly in terms of reduced competitiveness.

SSC Support to the Kumasi Wood Cluster (KWC) has been provided by ICCO. The objectives of this assignment are twofold:

- ✓ to support small and medium forestry businesses of KWC and Ghana in general, towards more sustainable practices via Forest Certification
- ✓ to support small and medium forestry businesses of KWC and Ghana in general, in making the best possible use of whatever wood resources are still available in the country

Dr. Hubertus van Hensbergen and Jean Bouichou of the SSC group of companies visited the Kumasi area and KWC members during the second week of August 2010. Each of the consultants H. van Hensbergen and Jean Bouichou was assigned a specific focus, that of Jean Bouichou was to evaluate opportunities of improvements in Ghana's small and medium wood-processing businesses, mainly in terms of efficiencies and recovery rates (the second of the above-mentioned objectives). This report presents our findings during this visit. It is organised in four core sections: at first we report on the places and timings of the visit. We then detail our findings in terms of hardware and other machinery, our observations on Ghanaian wood business organisations, and finally summarise the opportunities we believe exist for that sector.

## 2 VISIT REPORT

The visit of Jean Bouichou was organised by KWC and in particular by its executive Mr Gustav Adu and lasted five days in Kumasi.

Reception was spent in KWC's office which is shared with member company Bibiani Logging and Lumber Company (BLLC). Mr Adu explained the structure and organisation of KWC to Jean Bouichou. An opening meeting was had with BLLC senior staff and owners, in order to detail the objectives of the project and organise the visit of Dr. van Hensbergen and Jean Bouichou in KWC members' operations.

Visited sites included:

- ✓ BLLC's industrial facility in Kumasi. This facility includes a conventional sawmill, a slice veneer mill recently put in operations, and a rotary veneer (a.k.a. "peeler"). The sawmill includes two large bandsaws of German and Italian provenance, bought with much previous use. Wood-kilns are Italian (Copcal) and quite modern like all wood-kilns observed during the visit in other companies of Ghana. The company intends to establish a dry-mill for mouldings and finger-jointing. Most dry-mill machines were not present yet and the only observed moulder was a very old 8-cutter of German making (Weining). Token machinery includes German-imported and home-made cross-cutting circular saws and old German 2-side planers and edgers.
- ✓ Sunstex's sawmill in Kumasi. This sawmill also disposes of two very large stationary bandsaws. Token machinery includes German-imported and home-made cross-cutting circular saws and old German 2-side planers and edgers.
- ✓ Other small sawmills in and around Kumasi of which the largest one was Adoam. These sawmills do not dispose of wood-kilns and therefore a large part of their income is obtained by servicing the national and African market with green and air-dried construction lumber. Their saws are essentially horizontal bandsaws (Pezolli and Woodmizer) of smaller size. These mills are designed for smaller logs and move around the log (unlike old vertical bandsaws which use a carriage to feed the log through the saw).
- ✓ Forestry operations, namely those of BLLC in the Suhuma Forest Reserve. These operations are conducted with a staff of 53 which are handling 3 forest trucks, 1 skidder, 1 loader, and 1 bulldozer.
- ✓ For comparison, a large modern sawmill (Italian) was visited: the Fabi mill. This facility is fully integrated with 2 large bandsaws, modern wood-kilns (Copcal), and a dry-mill. The specificity of this facility, other than its excellent management, is that:
  - It buys logs in the open market and does not own or run any forest concession

- Its dry-mill is proportionally huge as compared to other mills, which allows it a much higher recovery rate and, above all, much more value-adding. This dry-mill includes in particular, multiple but simple finger-jointing stations, and an effective moulding production which uses veneer for visible sides and finger-jointing as a core product. In other words, the mill achieves real value-adding even with its by-products.

### 3 HARDWARE

Hardware in Ghana is surprisingly homogeneous in types and brands, showing how effective the marketing penetrations has been for specific dealers, mostly Italian and sometimes German:

- ✓ All wood-kilns are the exact same brand and model even though there are at least five reliable brands available for hardwood worldwide.
- ✓ Medium-sized and large companies use vertical bandsaws of German and Italian provenance. Smaller companies use predominantly horizontal bandsaws of smaller size some of which are even portable (Woodmizer).
- ✓ Planers are essentially German.
- ✓ Cross-cutting saws are either home-made or German, in all cases very slow and inefficient.
- ✓ Veneer machinery is essentially Italian, some is German.

The common point between all this machinery is that, with the exception of the Woodmizers and Pezzoli horizontal bandsaws, the machines are all oversized and extremely old. The individual machines at best are 20 years old and the designs are basically from the mid XX<sup>th</sup> century. This has very serious implications because:

- ✓ Machines with heavy use perform poorly both in terms of reliability and in terms of product quality (dimensional stability)
- ✓ Old designs are extremely poor in terms of recovery rates, new designs have incorporated precision sawing as a basis for competitiveness and decreased volume and quality losses
- ✓ Old designs are completely oversized in terms of power requirements. It is our belief that the same job could be done, if using modern equipment, with about a third of the energy that is currently being used. This would offset the current rise of electricity prices in the country which has been gnarling on the companies' profits.
- ✓ It was observed that poorly maintained roofs were cause rain to drip onto kiln-dried bundles, resulting in their downgrade.
- ✓ In addition, it has been observed that preventive maintenance is basically absent from local practices, resulting in huge downtimes (30 - 50% of working time) and very high repair costs.

- ✓ Large bandsaws generally have a KERF of 4mm. Modern bandsaws have a KERF of 1.6 to 2.5mm with a dimensional stability of +/- 0.5mm (vs. +/- 3mm on old bandsaws). This means that losses on each cut made by an old band-saw are around 7mm, but less than 3mm on a modern bandsaw. If cutting 1-inch-thick boards the immediate savings of using modern equipment are 12%. On average considering a mix of 1-inch and thicker materials, we believe savings of using modern equipment are around 8%.



Illustration 1: Imprecise cuts due to poor maintenance and equipment cause heavy losses in Ghanaian wood businesses

- ✓ Imprecise machinery causes most problems on long products because in short products one can trim around defects. Based on this fact it is interesting to note that, in addition to its machinery being excessively old, the Ghanaian industry is exporting almost exclusively long products: Ghana's traditional shortest boards are 220cm, which is basically Chile's longest export product. This means that Ghana is more sensitive to losses caused by bad machinery.
- ✓ Rotary veneer machines are also very old but they seem well maintained, we assume because veneer represents the most profitable part of the export business. However, old machines result in very large abandoned peeler cores - approx 35cm in diameter - whereas modern machines can go down to 7cm core waste. For comparison, BLLC's waste peeler

cores are the size of Chile's best hardwood logs, and their shape is much better. Our analysis is proven by the fact that the Fabi mill, run more efficiently, is using the same "waste" peeler cores for sawing and slice veneer.



Illustration 2: An efficient sawmill is capable of turning another one's waste into a valuable raw material



## **4 ORGANISATION**

### **4.1 LAYOUTS AND STORAGE AREAS**

The layout of sawmills is usually poor because cheap labour allows moving wood products around without extra costs and because regular downtimes (in fixing machines) give plenty of time to transport the wood between working stations. If machinery was used efficiently, wood conveying would be a major bottleneck in Ghanaian sawmills and proper investments and layouts would be required to overcome this obstacle.

The other issue when wood is systematically moved by a forklift and not by conveyor belts and chains, is that much more space is required (bundle length determines the width of alleys, this means that all alleys for long-products must be at least 6 meters-wide and the building size is at least doubled as compared to a more automated system. This impacts on the limited space that is left for actual sawnwood piles. Although most companies claim to have an effective stock recording system, the reality is that they are having a hard time finding a given bundle when container consolidation is to be done under time constraints. They are having an even harder time withdrawing that given bundle because it might be at the bottom of a huge pile of other bundles. This means that certain times more wood has to be processed in order to make up for volumes of wood that are not found on time. In modern pine sawmills of Chile the amount of extra stock required for these purposes is approximately 5%, we believe that in the case of Ghana it is more likely 10-20%.



Illustration 3: Poor storage of wood bundles results in hazards for workers, deterioration of products (see bent boards on the picture) and excessive stock-holding.

## 4.2 HEALTH AND SAFETY

Health and safety practices in Ghana are terrible. None of the workers observed had appropriate safety equipment. Very often protective guards on machinery had been removed (these protective guards are designed for a good reason: to prevent staff limbs from physically getting into dangerous areas). Poor maintenance on machinery also means there is a higher possibility of sharp objects being propelled out. Emergency repairs are more prone to accidents than preventive maintenance because they are operated under pressure and there is an incentive for staff to use dangerous methods they would otherwise avoid, this means that the lack of preventive maintenance is causing excessive risks to staff.



Illustration 4: The band-saw is often running while workers are within a dangerous area



Illustration 5: The workers on this workstation have to remove slice veneer while the machine is operating. This is because there is no system to eject the veneer. The risk is their hands being chopped off.



Illustration 6: All workers in a sawmill should always wear protective gear, this includes steel-toe shoes

### 4.3 INTEGRATION AND VALUE-ADDING

#### 4.3.1 INTEGRATION

General organization of the industries in Ghana is typically as follows:

- ✓ The Managing Director negotiates and obtains a forest concession and cutting permit for a certain compartment.
- ✓ The Managing Director negotiates and receives a purchase order from an international buyer.
- ✓ The Managing Director transmits the species and dimensions requirements to the Sawmill / Industry Manager.
- ✓ The Sawmill / Industry Manager tells the Forestry Manager what species and volume logs he needs.
- ✓ The Forestry Manager transmits these orders to the Bush Manager, who sends his "Tree Hunters" out to the bush.
- ✓ The Tree Hunters report or directly fell the trees that might produce the log volumes needed.
- ✓ The skidder goes and fetches the trees felled, sometimes whole and sometimes cross-cut in two large logs.
- ✓ In the forest landing, the cross-cutters split the trees/logs in such a way as to fit as much wood volume onto the forest truck. That is, usually around 50 tons per truck.

- ✓ The trucks are dispatched to the sawmill / industry where each production manager (sawmill manager, peeler manager, slice veneer manager) comes and chooses the logs that best fit their needs.
- ✓ The slice veneer manager generally has priority along with the peeler manager, the sawmill manager has to use the remaining logs.
- ✓ Sawing / slicing / peeling begins.
- ✓ The whole process usually takes 2 months from the moment a purchase order is received, of which the first 10 days happen between receiving the purchase order and the beginning of “log hunting”.

This process and organisation presents several problems.

Current organization in the Ghanaian wood industry can be vertically and horizontally integrated in its corporate structure, but not in its actual functioning. The reason is that product classification and grading, alongside with incentives of the various operators in the production chain, are conflicting.

Organization might seem very clear within a given productive area (for example within a sawmill or within a veneer mill) but it is not when one looks at how these different areas relate between each other. Downstream areas are not properly feeding information to their supplying departments or companies in terms of what raw materials are most valuable to them. The above-mentioned is shown by the following flowchart:

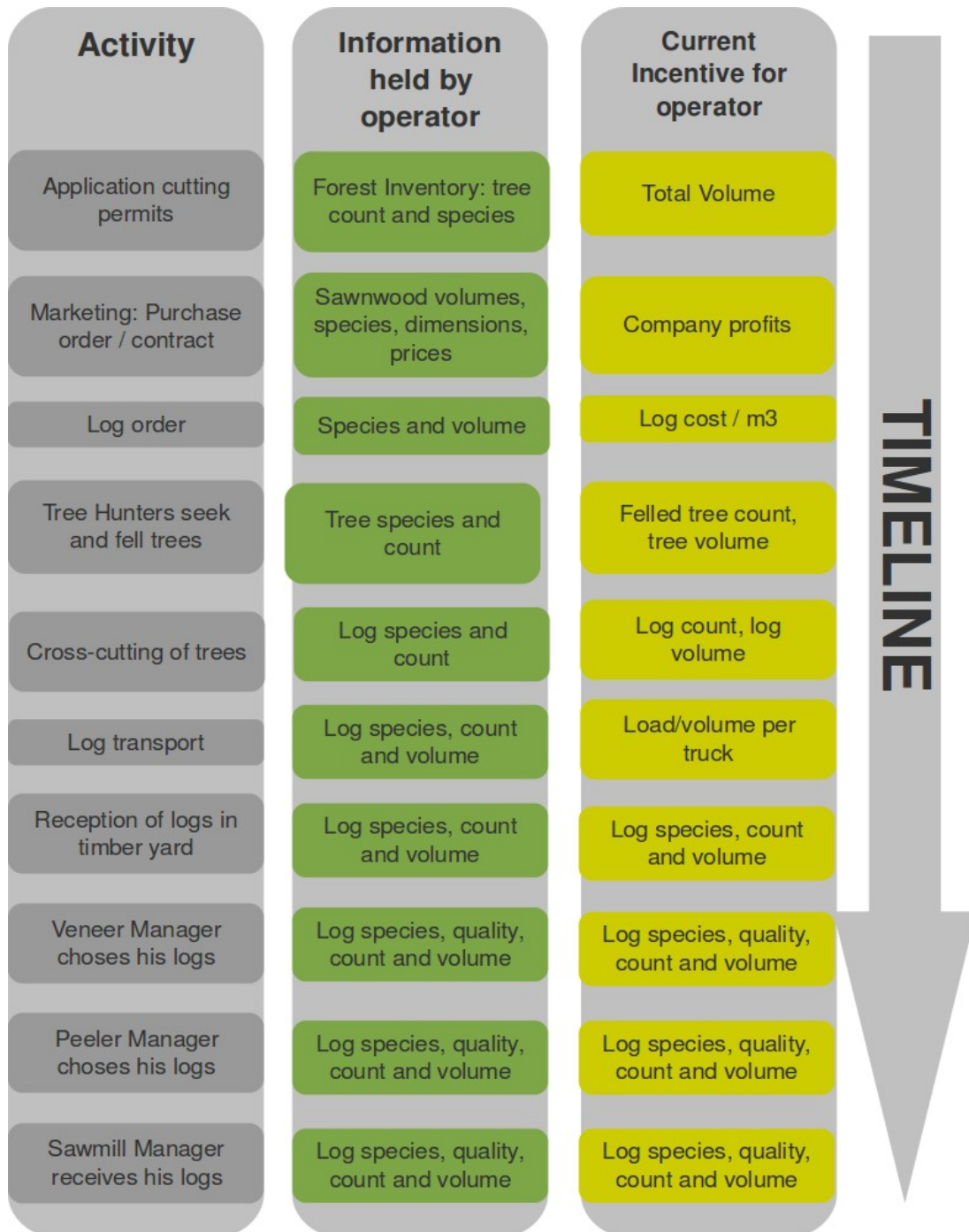


Illustration 7: The current organisation and incentives system along the production chain

The issue under this system is best proven by the following example:

- ✓ Let us take the example of a tree whose trunk contains 16 meters of straight log. That tree is harvested and the 16 meter-log is brought to the landing.
- ✓ Let us assume that a log for slice veneer must be 3-meter long, and a saw-log must be 4 meters or more (the technical term is “variable length >4m”).
- ✓ Because slice veneer is several times more profitable than saw-milling, the single best way for the company to maximise its profits is to produce as much veneer as possible out of that tree. That means, the cross-cutters' mission is to produce as many veneer logs as possible out of that given tree and fit as many saw-logs into whatever remains of the tree. Firewood value is basically negligible in Ghana as compared to the rest of the tree.
- ✓ Since the tree measures 16 meters, the best value is obtained by producing 4 veneer logs of 3 meters each and 1 saw-log of 4 meters.
- ✓ However as we observed, the cross-cutters actually just split the tree into 2 logs of 8 meters each because that is what fits best onto a forest truck. These 8 meter logs will give either a total of 4 saw-logs or 4 veneer logs and 2 abandoned but-logs of 2 meters each, sold as firewood.
- ✓ This is the best way to reduce the cost per m<sup>3</sup> of logs delivered at the mill. It is not the best way however to maximise log value and it is even worse in terms of company profits.
- ✓ A cross-cutter has the capacity to pulverise tree value in just 5 minutes if he does not hold the right information and does not receive the right incentives.
- ✓ In addition there is a significant amount of wood abandoned in the forest because no-one is properly charged for what is left there: tree-fellers and cross-cutters only take out whatever is easiest to remove.

We believe that a much better system should look like the following:

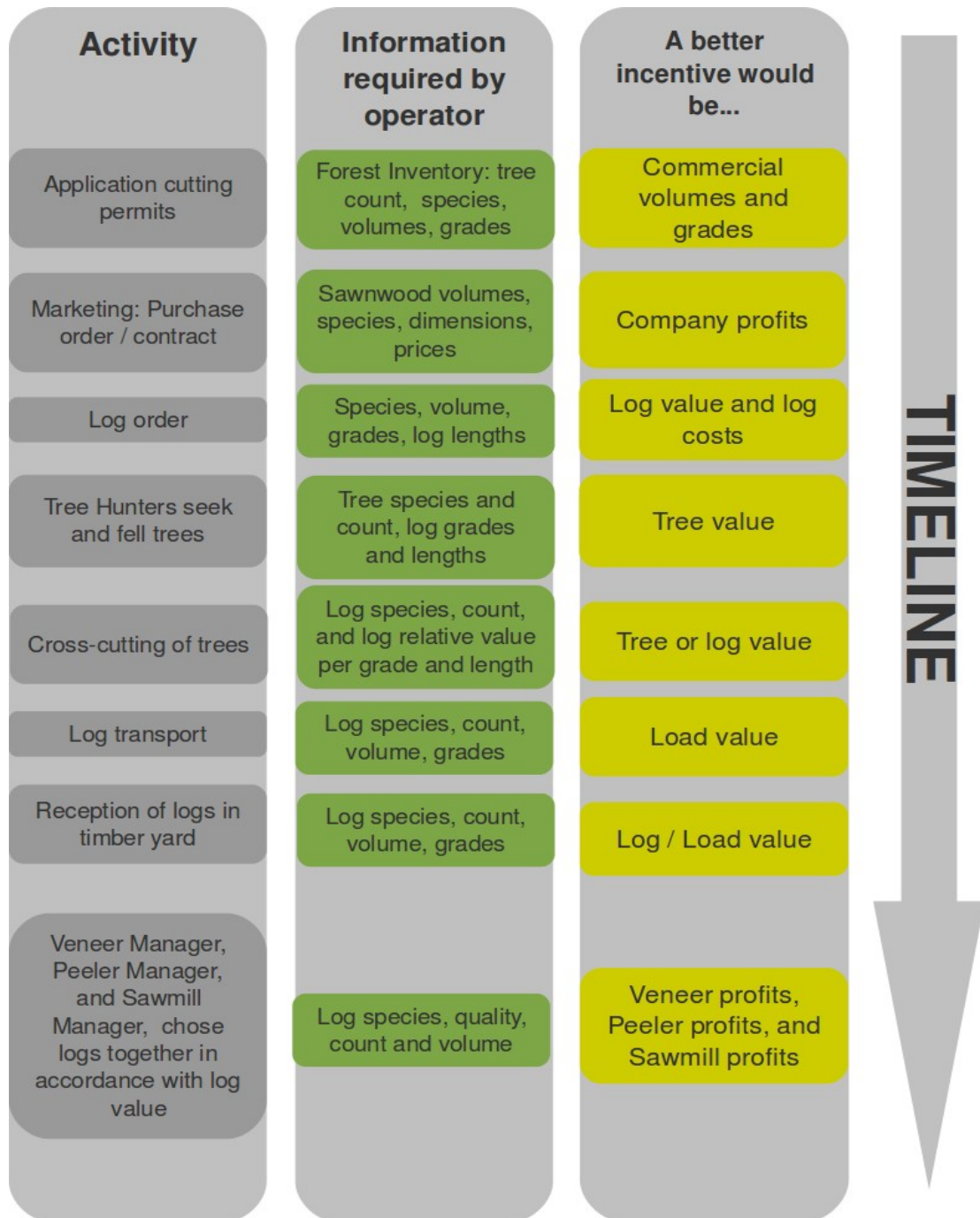


Illustration 8: A well-integrated system makes sure that it is everyone's best interest to maximise company profits



#### 4.3.2 OTHER VALUE-ADDING ISSUES

##### ✓ AT THE SAW-MILL YARD

The bigger a log the higher the recovery rates because the easier it is to fit different board dimensions in it and optimise the amount of wood that is properly used. However there is a limit to log size and it is usually its weight. Log stackers are quite powerful but when it comes to setting up a log onto a saw carriage, cranes are often used. The issue however is that cranes have a weight limitation (usually 5 tons) which is easy to reach in big logs. This means that often-times, a big log has to be cut in half in order to be able to move it with a crane.

Now, when a big log is cut in half it can only produce short boards. Because purchase orders almost always include a mixture of long and short-length boards, the sawmill operator now finds itself in a position where he needs to produce long boards but cannot use big logs for that matter. This means that long boards have to be produced with smaller logs. This dramatically drops recovery rates because, as we have already implied, big logs should produce the longest boards and small logs should be used preferentially for smaller products.

The solution is in the sawmill layout: carriages must reach out of the building in a place where stackers can load them, without the need for a crane to do it. The other option is more expensive (and slower) and it is simply to have more powerful cranes.

Also in all cases, log yards should be paved at least in the area where cross-cutting is done, this is because mud-less environments are 1. better for cross-cutters and log graders to judge log quality and 2. less damaging to sawing equipment which is altered by dirty logs.



**Illustration 9:** Log cranes cause limitations in log size and reduce recovery rates. They also are slow as compared to log stackers.



Illustration 10: A paved and clean log-yard is the first step towards doing a good job at cross-cutting, log sorting and log grading

✓ LOG INVENTORY AND MANAGEMENT

There are clear examples of valuable logs being attacked by rot and fungi because they have spent way too much time either in the forest or in the log-yard. Log downgrading is a serious issue and can be avoided with a good and updated log inventory.

This inventory should include log-yard management, this means that the log-yard must be divided into areas or compartments and the position of each log and log number must be recorded within the log-yard as well as its date of felling and date of entry into the log-yard. The person in charge of log-yard management must keep track of all the logs that are in danger of downgrading due to excessively long storage, this period varies obviously with each species and with the season of the year.



Illustration 11: When there is no record of how long a log is kept in the yard or forest, there is serious risk of downgrading by insect or fungus attack

## 5 OPPORTUNITIES

### 5.1 "SOFT" OPPORTUNITIES

We define soft opportunities as opportunities in the management and re-organisation of the businesses, as opposed to hardware and investment-based opportunities.

The soft opportunities we have identified are in the areas of marketing, integration, and yield analysis.

#### 5.1.1 *MARKETING*

The smallest sawmills we have seen are actually those some of the best-run considering their capital limitations. They have focused onto markets of West-Africa and the achieved prices are excellent if we consider the relatively low quality of the products. Construction wood seems to reach about USD200/m<sup>3</sup> green, this is double what similar products can achieve in a country like Chile. Log prices are almost the same and Chilean sawmills usually run on a USD10 to 30 profit margin per m<sup>3</sup>, this leaves a potential profit margin of over USD100 for Ghanaian sawmills if they achieve Chilean efficiency and focus onto West-African markets. We believe this is doable because we are talking about low-quality products.



Illustration 12: Construction grades and lesser-known species for West-African markets are a forgiving and profitable option.

Another quick and easy way of achieving better prices is via better packaging. This is for practical reasons (plastic wrapping preserves from moisture pick-up and therefore guarantees a better final quality) and also for psychological reasons. A better presentation lowers the amount of criticism that a buyer may raise on a given batch and therefore gives him less arguments to negotiate the price down. Better packaging includes plastic wrapping, extra or better slings for tighter/safer bundling, built-in skates for easy handling, and nice logos and paint marks.



Illustration 13: Nicely-packaged products stand out in a buyer's stockyard and draw better prices.

### 5.1.2 INTEGRATION

Foresters need to perfectly understand and value the needs of their downstream users such as sawmills, or veneer mills. For this it is essential that all Bush Managers, Tree Fellers, forest Cross-Cutters to be trained in log grading and to receive incentives that promote their using this grading. For this we recommend that Ghanaian businesses implement the following:

- ✓ To create a log-grading working group, which will include the Sawmill and Veneer Mill Managers or their representatives as well as the Forest Manager.
- ✓ To agree on a definition of what most valuable uses a given log can be given: a log-grading system.
- ✓ To select a pilot bush team including at least 1 Tree Feller, 1 forest Cross-Cutter, and 1 Bush Manager.

- ✓ To send that pilot team to a sawmill where they will be shown what their logs look like when they are sawn and what issues (defects, dimensions) are important to the sawmill / veneer mills.
- ✓ To subsequently send log graders or representatives of the log users to the forest (sawmill grader or operator, veneer grader). These will be following the Tree Fellers and forest Cross-Cutter thus helping them identify opportunities for better utilisation of a given tree.
- ✓ To establish a remuneration / bonus incentive system for the forest people, that follow not only their productivity but more importantly their optimisation of tree values. The best way in our opinion, is to create incentives that are proportional or exponential to log value (for example if a veneer log is 3 times as valuable as a saw-log, then the incentive of producing a veneer log must be at least three times as high as that of a saw-log).

### 5.1.3 YIELD ANALYSIS

Current yield analysis in Ghana is based on compliance to legal requirements and in certain cases on sawmill efficiency. That is, there is a degree of control from log volumes in the forest until export volumes, there is a better degree of control from truck entrance at a sawmill until container loading at the given mill.



Illustration 14: This abandoned butt log contains plenty of valuable wood. The only way to reduce wastage is to start measuring it from its earliest stage which is tree-felling.

We believe there are great opportunities by implementing a proper (even if internal) yield analysis starting at an earlier stage of production, namely from standing tree volume estimates. Knowing how much volume is being left out at different stages is the only way to reduce wastage.

## **5.2 “HARD” OPPORTUNITIES**

### *5.2.1 SHORT-LENGTH PRODUCTS*

Traditional export dimensions in Ghana start at 2.2 meters in length (usually 2-inch thickness, for doors). This is basically Chile's longest export dimension. Ghana needs to adapt and explore shorter products which will allow the use of shorter logs, thus increasing the amount of usable wood from the current felled volume. In our opinion opportunities for short-length products include:

- ✓ Solid wood parquets (redwood in particular)
- ✓ Blanks for finger-jointed panels, beams and linings
- ✓ Veneer-lined mouldings with finger-jointed cores
- ✓ Engineered woods and floors in general

These opportunities will require investment in specific dry-mill machinery (finger-jointing, glueing, planers/moulders) and improvement in current machinery, specifically trimmers (also called cross-cut saws) and planers because glueing requires the assembled components to fit perfectly onto each other: dimensional stability is key.

The other type of investment required for the development of short-length product capacity is marketing, currently Ghana companies tend to negotiate with whatever representatives of buyers are active at the Accra harbour, these buyers' interest is to purchase cheap rough products and add value by further processing themselves. Marketing directly into the consuming countries will be required if Ghanaian companies want to start bypassing the above-mentioned obstacle.

If short-length products become possible, the recovery rates of Ghana's wood industries will easily achieve a very minimum of 50% (from tree commercial volume to sawnwood) as compared to the figures of 25 to 40% currently observed.

### *5.2.2 USING PEELER CORES*

As we already have mentioned, Ghana's rotary veneer machines are old and leave peeler cores of average 35cm in diameter, whereas modern rotary veneer machines only leave 7cm residual cores.

One option is obviously to purchase more modern rotary veneer machinery. Another option when investment capacity is limited, is simply to use the peeler cores for saw-milling. This will require the use of lighter and more modern saw-milling equipment than conventionally used in Ghana. We recommend the use of Swedish manufacturer's Logosol Laks framesaw (specifically model 500)

because they are cheap, sturdy and easy to service, and above all they are extremely accurate and energy-efficient.

These machines are so efficient that we believe they likely will end-up being more efficient than conventional bandsaws even for big logs, provided that a big band-saw prepares simple blocks of approximately 30cm by 20cm section.



Illustration 15: The Logosol Laks framesaw is a cheap and very efficient way to produce quality small-dimension boards, ideal to use "waste" peeler logs



### 5.2.3 CERTIFICATION

Finally, we believe that one very effective way for Ghana's small and medium-sized wood industries to escape from the commodity market and achieve higher prices is to stand out of the bunch via Forest Certification. This will impact positively on both ends: market opportunities will significantly improve, and sustainable forest management will reduce log shortage. This is further developed in SSC Forestry's other consultant report, by Dr. Hubertus van Hensbergen's.

## 6 CONCLUSION

Kumasi Wood Cluster member companies and Ghana's small and medium wood businesses in general, have established a reputation for export of valuable tropical wood in West Africa. They are however facing challenges as their quality log supply fades out and as competing countries develop more modern industries. If their forest practices and industrial methods are not adapted, it is likely that business as it has been known for them, will disappear within possibly a decade.

Renovation is required and is possible. The very start is to enforce real Sustainable Forest Management practices, best verified through Forest Certification. So far only theoretical strategies have been implemented. A parallel action is to develop methods for better wood utilisation.

It is our belief that better wood utilisation should start with a better integration of wood/log usage and values, from the forest until the market and through the industries. Horizontal integration is also required by pushing through opportunities in the West-African markets. Finally, machinery improvements are essential and must start with proper maintenance and health and safety training and enforcement. In order to minimise investment risks, machinery replacement should start with simple and cheap options such as the Logosol Laks frame-saw in using "waste" peeler cores. Further developments should include short-length products such as parquets and blanks for engineered products. Finally, if technical and capital capacity are confirmed then engineered products should obviously be implemented locally for further value-adding in general.