COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH (CSIR)- FORESTRY RESEARCH INSTITUTE OF GHANA (FORIG) UNDER MINISTRY OF ENVIRONMENT, SCIENCE AND TECHNOLOGY

IN COLLABORATION WITH

INTERNATIONAL TROPICAL TIMBER ORGANISATION (ITTO)

ITTO PD 431/06 REV. 1 (I)

Processing and utilisation of trees on farmlands and logging residues through collaboration with local communities

IMPROVED CHAINSAW MILLING IN THE SMALL-SCALE INFOMAL TIMBER SECTOR OF GHANA USING LOGOSOL FACILITIES:

A Manual For Domestic Timber Entrepreneurs

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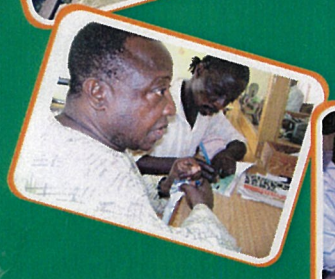

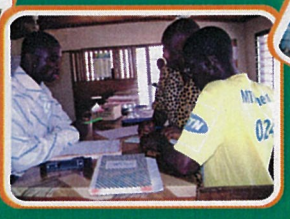

IMPROVED CHAINSAW MILLING IN THE SMALL-SCALE INFORMAL TIMBER SECTOR OF GHANA USING LOGOSOL:

A Manual for Domestic timber Entrepreneurs

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This manual has been produced as a result of a successful implementation of a Project PD 431/06 1(I) which was funded by ITTO. The aim of the manual is to encourage and assist Domestic Timber Entrepreneurs in the of logosol facilities for lumbering of trees, especially, on farmlands.

This will:

1. make lumber available to local communities who travel long distances to acquire timber for constructional purposes and the manufacture of school/room furniture.
2. minimize the rate at which trees are burnt or cut down to rot by farmers, because of non-payment of compensation to those who crops are destroyed during logging activities.

The manual gives details on the case of which timber entrepreneurs can work harmoniously with local communities, techniques in the processing of trees on farmlands, marketing of timber generated and some possible benefits to be accrued.

Let us help in sustaining our timber resource for a better tomorrow and STOP the use of freehand chain saw milling.

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ACKNOWLEDGEMENT

The project team wishes to express their profound gratitude to the ITTO for funding the project PD 431/06 1(I) "Processing and Utilization of trees on farmlands and logging residues through collaboration with local communities of which it has successfully been implemented.

Special appreciation goes to all individuals and organisations who have helped to make the implementation of the project a success, including technicians, chiefs, communities and field staff for the various roles that they played.

1.0 INTRODUCTION

Various policy measures have been put in place in the forestry sector to improve the timber resource base and sustain the timber industry. Some of these measures are encouragement in the use of lesser known timber species and value addition to timber processing. All these efforts appear to be in support of only the formal timber industry and its related actors. Not much is seen in improving access to timber resources in the informal sector, especially among forest fringe community members. Due to lack of benefit from the timber resources on their farmlands local communities are reluctant in protecting these trees. In some situation they tend to collaborate with illegal chainsaw operators and their sponsors to harvest these trees against the law. This is one of the significant factors contributing the high rate of deforestation and forest degradation in Ghana.

1.1 What is processing and utilization of trees on farmlands about?

There is an increased international demand for environmentally friendly and legally sourced timber resources. It appears this has partly contributed to the initiation and signing of VPA processes between the EU and timber producing countries in the developing nations, including Ghana. To respond to these demands, it implies that domestic timber resources will also have to be environmentally friendly and legally supplied, since some of these resources find their way into international markets. Therefore, the purpose of processing and utilization of trees on farmlands under the ITTO project PD431/06 is to support these processes. It is to contribute to minimizing the high rate of deforestation and forest degradation by increasing the benefits that local communities derive from forest resources and thereby enhance their contribution to sustainable forest management. This manual shows how this is done. It details at every stage the essential steps that need to be taken in order to establish and successfully run such a small scale improved chainsaw milling enterprise to achieve the dual objectives of minimizing deforestation and increasing timber benefits for the target beneficiaries.

1.2 Improved chainsaw milling

Lumber production with chainsaw is making up an increasingly significant proportion of locally available timber in many tropical countries. Chainsaw machine was introduced in Ghana in the 1960s to replace the long manual blades for felling and crosscutting of trees. The operators of chainsaw machines in West Africa were introduced to the techniques of converting logs into lumber, during the late 1970s, using the free hand approach. This method has since then replaced the pit-sawing for the supply of lumber for household activities. Again, production of lumber for commercial purposes using chainsaw became widespread in the early 1980s when there was a decline in sawmill operations, which was due to the downward economic trends.

In Ghana chain saw logging and milling is an important enterprise among the deprived rural communities of which many players are involved in the lumber trade. Certainly, processing trees where they fall has some benefits over whole log extraction, and promoting the use of low capital cost. Again, the processing equipment allows opportunities for more of the local community to engage in forest operations. Chainsaws are highly portable, relatively cheap to hire or buy, very efficient, and the same tool used by one man to fell, crosscut and mill a large tree within a day. Moreover, the use of chainsaws are suitable for milling scattered trees on farms, dry lands, hilly areas and in towns, thereby reducing the pressure on forests, which are the main suppliers of timber. Chainsaw milling is economically viable in certain situations, increasing revenues for the very poor. On the other hand, freehand chainsaw milling is associated with a high risk of injury and fatal with generally poor lumber quality and low recovery. The processes have negative impacts, especially on the environment, if it is allowed to be used without any control. There are increasing concerns about illegal logging and deforestation in tropical forests where there are still high volumes of valuable timber.

There is a clear indication that the existing regulations and their enforcement are inadequate so alternatives are required, which should involve governments, local people and businesses commercially involved in timber.

The production of quality timber is technically feasible using portable sawmills if the conditions and parameters of the blade, timber and mill are matched to meet the problems each log will demonstrate during the milling process. Chainsaw attachments can convert small diameter logs, including branch wood, that cannot be processed by sawmills into lumber. Therefore the perception by some within the sawmilling industry that portable sawmills cannot produce the sawing quality in high-density timbers that is required to be merchantable in the manufacturing industry – especially the higher value

sectors such as furniture has no justification. Promoting the use of such chainsaw mills and adequate training offered are observed to be a means of persuading freehand operators to give up their currently dangerous, inefficient and largely illegal activities.

There exists a wide range of frames or guides that attach to a chainsaw making it safer, accurate and more efficient, but unfortunately these are rarely used in the tropics. Frame mills are simple frames or guides that are fixed parallel to the chainsaw bar and can be adjusted to be set at different distances from the bar, thus allowing for various cutting depths. Carriage mills are the type of which the chainsaw is fixed onto or into a carriage, which rides along a frame or set of rails. Most of these mills make horizontal cuts, while others of a few models make a vertical cut. Rail mills, with some variation, comprise of a small attachment that fixes onto the bar and rides along a 'rail' fixed onto the length of the log.

To be able to promote the use of any improved chainsaw milling facilities, there is the need to develop more information on the equipment, handling/operational techniques as well as the social, economic and environmental impacts.

1.3 Assumptions

The main assumptions underlying this work are that forest fringe communities are the major stakeholders of these forest resources and are therefore expected to benefit from these resources.

That working with forest communities to extract, process and utilise lumber and lumber products from logging residues and trees on farmlands, these forest community members will have the confidence and the zeal to assist both the timber industry and the Forestry Commission in the sustainable management of the Ghanaian forest. It is assumed that their activities and outputs could serve as demonstration for other communities to learn from and thereby become beneficiaries of the forest resources and also support sustainable forest management through nurturing and protecting timber trees on their land areas.

2.0 ORGANIZATION

2.1 Planning and implementation

Agreement should be reached in all actions that need to be taken on the community project

There should be participatory planning before the implementation of the community project

Actions

A meeting between the major stakeholders including forestry officers and government officials at the local level should be held.

The rights and responsibilities of all stakeholders should be determined and agreed upon.

All stakeholders should know of the period of starting, the option selected.
Implementation of alternative (improved) chainsaw milling option should take cognizance of biodiversity, conservation as well as prevailing international issues.

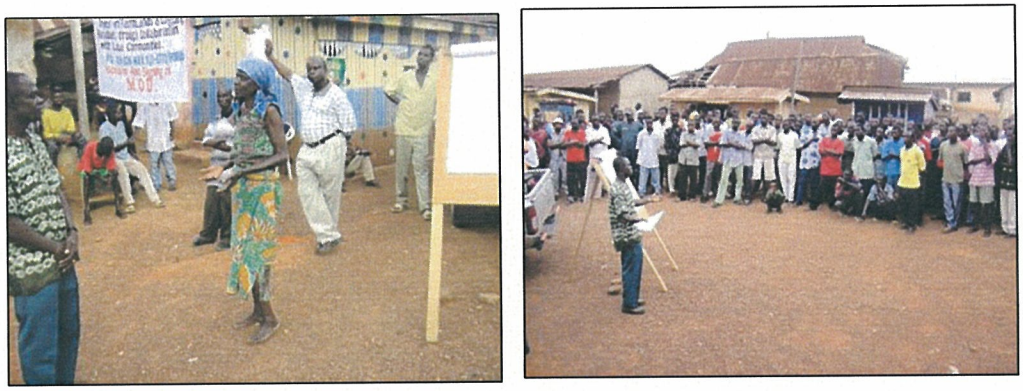


Figure 1: Discussion on MOU with a Community

2.1.1 Assessment of the availability of trees resources at selected project site

- Assess the availability of unreserved forest in some forest districts in your locality
- Select some of the forest districts that have unreserved forests which are free and not allotted to concessionaires.
- Propose some sites for the project and assess the availability of timber trees in terms of species, diameter and height on farmlands at those sites.

2.1.2 Reaching agreement with resource stakeholders

Reach an agreement with the stakeholders of the timber resources (leaders of target forest communities (chiefs), Government forest management authority (FSD), and target timber companies (for logging residues)). Do this by drafting and signing a memorandum of understanding with these parties. Also jointly establish rules and regulations with target local communities to govern the felling, processing and marketing of the lumber to be generated. The purpose of this is to minimize and show how future conflicts are to be resolved in the course of the work.

2.1.3 Memorandum of understanding (MOU)

Jointly agree with the parties involved, the content of the MOU. Make a draft of MOU and discuss with the parties again. Refine the draft and arrange a date for the signing of the MOU. On date of the signing make sure all relevant individuals selected by their parties to sign with their accompanying witnesses are available to append their signatures. Provide all parties involved with copies of these signed MOU (see box 1) in well bound form.

Box 1: Memorandum of Understanding (MOU) for Processing and utilization of Trees on Farmlands and Logging Residues Through Collaboration with Local Communities

I. Introduction

Purpose of the MOU
Outputs of the project
Responsible partners [EA and Local Community]

II. Relationship with Executing Agency (EA) and the local community (LC)

III. Roles of the LC [name]

IV. Reporting requirements

A monitoring team as detailed under administrative arrangement (Article VII) shall supervise the local community on these activities and present quarterly report to the project leader who will incorporate these in his half yearly reports to ITTO

V. Methodology to be used eg:

1. Nominated members (Y) of the community will be trained on the handling and maintenance of the processing machine.
2. The processing will be done in-situ by the project team in collaboration with trained members of the local communities.
3. Nominated members (X) will trained in marketing and book keeping related to the timber industry trade

VI. Financial implication

a) A team nominated from EA and community shall be responsible for the sale of lumber and maintenance of current bank accounts to be opened where money realized from the sale of lumber shall be deposited.

b) A team nominated from EA and community shall be responsible for the disbursement of proceeds from trees on farmlands and it shall be done as follows:

i)	Farmer (Person on whose farmland tree is taken for processing)	a%
ii)	Local chief of the community where the farmer resides	b%
iii)	Paramount chief to this local chief	c%
iv)	Maintenance/depreciation cost of the machine for processing the trees	d%
v)	Community development	e%
vi.)	Miscellaneous	f%

VII. Administrative arrangements

- Set up a Monitoring team composed of government, EA and Community to monitor the activities of the project, and resolve all conflicts and disputes that may arise.
- The points of contact responsible for administration of the MOU are:

[Community]: [Name] [Title] [Address] [Telephone Number]
[EA]: [Name] [Project Leader] [Address] [Telephone Number]

This memorandum shall remain in effect until terminated by either party upon 60 days notice to the other party. In the event of termination, however, this agreement shall continue to apply to all ongoing activities covered by the agreement.

[Local community] **In the presence of (Witness)**
Signature: Name, Title & date. Signature, Name, Title & Date
EA: **In the presence of (Witness)**
Signature: Name, Title & date. Signature, Name, Title & Date

2.1.4 Rules and regulations governing the felling, processing and marketing

Establish with target forest communities rules and regulations to govern the felling & processing and marketing. First hold a forum with these communities on what they expect these rules to be. Make draft of these rules following from the discussion at the first forum. Discuss the draft rules with communities the second time. Refine the draft into a main document. Make copies (see box 2) for the target community leaders.

Box 2: Rules and regulations for processing and marketing of wood from trees on farmland and logging residues for [name] Local Community

Introduction

These rules and regulations were prepared by the committee set up by the local community in [name] in collaborations with the project team and signed by leadership of the community to guide the processing and marketing of lumber to be generated from the project. In preparing these Rules and Regulations, the Committee took into account issues/concerns raised by the community members at the sensitization workshop held with the various communities on [dates]. The structure of these rules and regulation is in two parts. Part I provides the rules and regulations for processing, while part II covers the marketing aspect.

PART I: Rules and Regulations for Processing

Question 1: Apart from the farmer's percentage (40%), what happens if crops are destroyed in the farmer's field during processing?

Solution: No compensation will be paid to such a beneficiary farmer. However, all efforts will be made to avoid crops damage on farms in the process of felling the trees and milling of the logs. In addition, a tree that will destroy crops will not be felled unless the particular farmer insists for its felling and signs an agreement form to that effect.

Question 2: Will the acquisition of the machines and fuel for the work be at the cost of the community or the project?

Solution: The machine and fuel for the work will be at the cost of the project. However, where project funds are exhausted, the project team and community will discuss the possibility of using the 10% miscellaneous fund for this.

PART II: Rules and Regulation for Marketing

Question 1: If a tree on a farmer's field is felled will he be paid immediately or after selling?

Solution: Payments will be done only after the lumber is sold. However, these payments will be made to the beneficiary farmers on monthly basis. Only cheques will be used in the payments.

Figure 2: Interviewing a community nominee for selection as an operator

2.1.6 Field testing of improved chainsaw milling machines and accessories

Logosol facilities or any of its equivalents to be used should be tested for its effectiveness (quality of lumber produced, fuel consumption, rate of processing, ease of assembling and disassembling, handling and safeness) before the machines could be used to train the operators.

2.1.7 Training of chainsaw operators and marketing officers

The selected chainsaw operators and the marketing officers should be given some technical training to enable them perform better.

Both theory and practical training should be given but with emphasis on the latter. Therefore trainees must have their hands on the machines to enable their competence and or expertees assessed. The training period will depend on the trainees and the trainers.

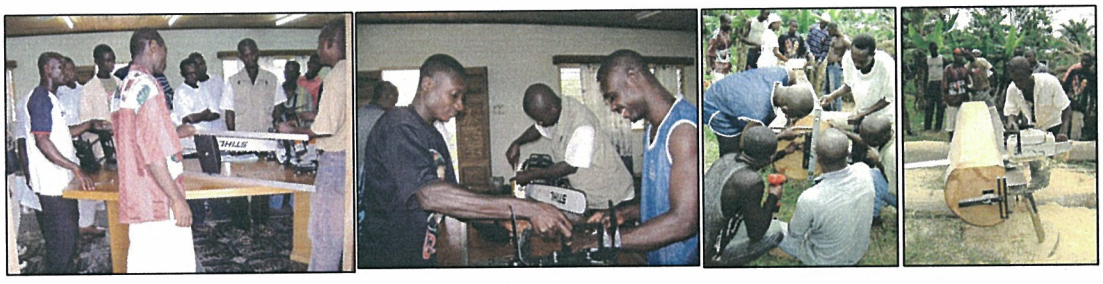


Figure 3: Training of selected operators and marketing officers

2.1.8 Construction of drying sheds

An agreed design of a lumber drying shed should be constructed at the community and should be roofed with roofing sheet. The shed is where the lumber to be generated will be stacked for air-drying and sale.

Figure 4: Lumber drying sheds in construction at two communities

2.1.9 Organization of the trained operators for extraction and processing of trees

This should center on the welfare of the operators to make them comfortable in the performance of their duties.

2.1.9.1 Accommodation

Since the project field staff will come from the community, accommodation will not be a problem to the project stakeholders. But where an operator has an accommodation problem, the community will have to provide him with one.

2.1.9.2 Insurance

The risk involved in chainsaw milling activities makes it necessary for the field staff to be registered with the National Health Insurance so that they can receive immediate attention in case of any injury. This will also reduce medical expenditure.

2.1.9.3 Allowances for field operators

The project team, trustees and the field operators should discuss and agree on the allowances to be paid to the operators on monthly basis. This will minimize corruption, laxity and lack lukewarm attitude to the work.

2.1.9.4 Personal protective equipment

Both the operators and marketing officers should be provided with personal protective equipment (PPE) and first aid kit (see fig. 6). The PPE refers to protective clothing, helmets, goggles, or other garment designed to protect the wearer's body from injury by blunt impacts, electrical hazards, heat, chemicals, and infection, for job-related occupational safety and health purposes. Rain coats, as shown in Fig 6-right, could also be provided. These will help the staff to work efficiently for the achievement of the set objective(s).

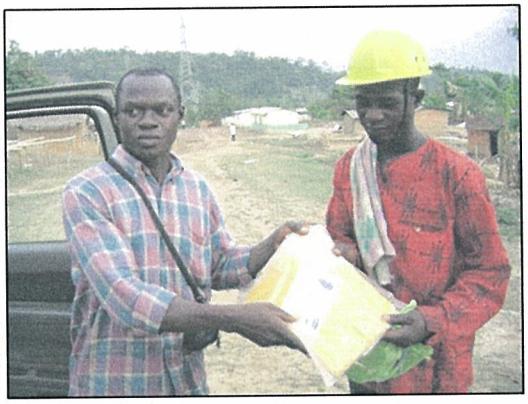


Figure 5: Some PPE acquired for field operators

2.1.9.5 Opening of Bank accounts

To ensure transparency and confidence among the target stakeholders, especially the community members, open bank accounts with the nearest bank (see box 2.1 & fig 7). Deposit the proceeds from the sale of lumber that is generated in the course of the processing. At an agreed date with all parties, withdraw these monies and share among the expected beneficiaries according to the agreed formula.

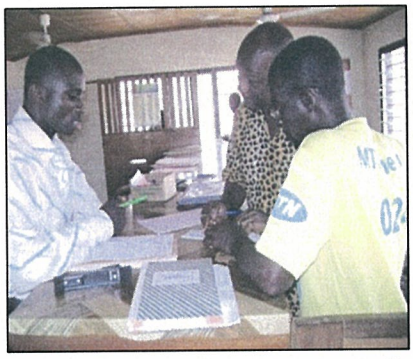


Figure 6: Opening of bank accounts for the communities

Box 2.1: RESOLUTION FOR OPENING OF BANK ACCOUNTS

At the last meeting of the members of ITTO project PD431/06 and ..... community held on.....February 2007 at the chief's palace in ....., we resolved the following;

a) The project team members and .....community open accounts with.....Bank
b) The names and signatories to the accounts are as follows:

1. Name:.....
   Village/locality:.....
   Signature/Thumprint:.....

2. Name:.....
   Village/locality:.....
   Signature/Thumprint:.....

3. Name:.....
   Institution:.....
   Signature/Thumprint:.....

4. Name:.....
   Institution:.....
   Signature/Thumprint:.....

c) That two of the representatives named and signed persons can effect withdrawals; but it should be one representative each from ..... Community and the project team members at FORIG. We emphasized that either of the two(2) representatives from .....community or the project team members at FORIG alone can not effect withdrawals.

The Manager

.....Rural Bank

.....

.....

2.1.10 Tree hunters

The community should nominate a tree hunter who will lead the operators to the trees in beneficiaries farms (those trees enumerated during the inventory exercise)

2.1.11 Involvement of local chiefs, elders and local committees

The local chiefs, elders and local committees of the community should be involved in all discussions and decisions that need to be made. This will avoid conflicts and enable the project gain the full support of the community.

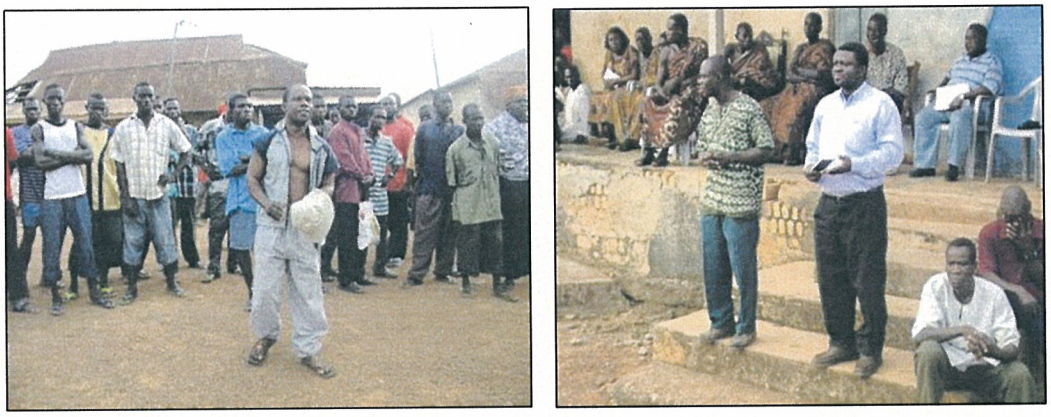


Figure 7: Holding discussion with community chief, elders and local committee

2.1.12 Petrol and lubricants

For transparency and timely supply of petrol and engine oil to the project field chainsaw operators, the project leaders should negotiate with the nearest fuel filling company within the locality for consistent supply with terms that will be convenient to both parties.

2.1.13 List of farmers with trees marked on their farmlands

To enumerate trees on farmland in the community, discuss it with the farmers and seek their consent first. Secondly, officers from FSD, and tree spotter(s) (nominee by the community) should keep record of the inventory. Such record will be used by operators during the felling and processing exercise.

3.0 FELLING

3.1 Quantity of trees removed per beneficiary farmer

The number of trees to be removed from a farmer's land will depend on the trees enumerated by the Forestry experts and that minimum canopy opening should be allowed.

3.2 Felling techniques and safety precautions

3.2.1 Before felling (Fig. 9)

The following should be noted: 1) The natural lean of the tree 2) Any unusual heavy limb structure 3) The wind direction and speed (should not fell in high winds) 4) Maintain a distance of at least 2.5 tree lengths from the next felling site 5) Clear the tree base and area from interfering limbs and brush 6) Clean lower portion of tree base 7) Determine the direction of fall 8) Establish paths of escape for everyone concerned. This should be opposite to direction of fall at about 45°. 9) Remove all obstacles from escape path. 10) Place all tools and equipment at safe distance away from the tree but not on the escape paths

Figure 8: Preparations towards felling of trees

3.2.2 During felling (Fig. 10)

1. Make a notch at right angle to planned direction of fall
2. Notch should be close to the ground as possible
3. Cut notch to a depth of about 1/5 of the trunk diameter
4. Height of notch opening should not be more than depth
5. Felling cut should be slightly higher than bottom of felling notch
6. Felling cut should be made horizontally
7. The hinge (diameter of tree left uncut after felling cut is made) should be a tenth (1/10) of the tree diameter
8. Do not cut through the hinge as you may lose control of the direction of fall.
9. Wedges could be used during felling and that wedges could be driven into the felling cut in good time. Material to be used as wedge include Wood, aluminum and plastic
10. Always keep to the side of the falling tree. When the tree starts to fall, withdraw the bar, shut off the engine and walk away on the preplanned escape path.
11. Watch out for falling limbs

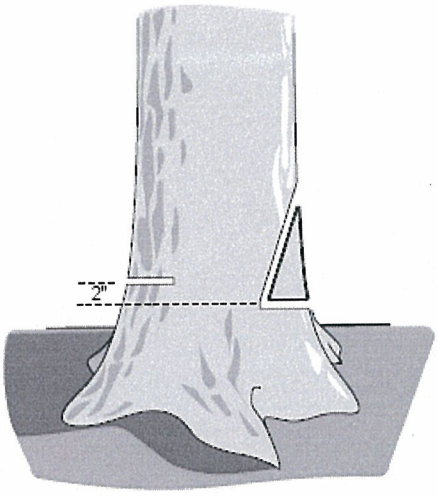


Figure 9: Making of a notch and felling cut as felling techniques

Figure 10: Tree felling techniques

4.0 PROCESSING

4.1 Facility for processing (Figs. 12 & 13)

A Logosol product, Bigbmill mobile system, is a sawing system with a well thought out line of components makes it possible to extend and suit the sawing equipment to a particular need. This system is available in four packages, which include Big mill timmerjig (mills log diameter of maximum 60cm), Big mill Basic (mills log diameter of maximum 80cm), Big mill PRO (mills log diameter of maximum 135cm) and Big mill LSG (mills log diameter of maximum 135cm). The first two systems aim at sawing normal-sized logs while the last two are used to saw oversized logs. Most of the components are the same for the different systems and can thereby be used for different applications. All the

Figure 11: Logosol milling accessories

aluminum components have been anodized to offer a smooth, hard surface. Some of the steel components are treated with nitrogen gas and hardened in oil, which gives the steel increased corrosion resistance, higher durability, low friction and a characteristic black colour.

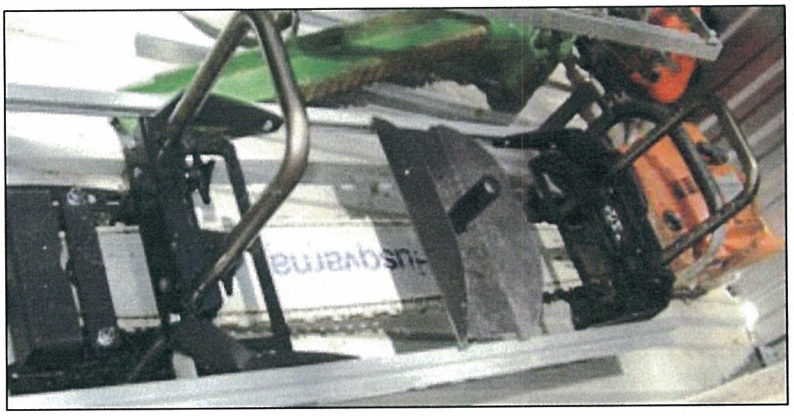


Figure 12: Bigmill PRO/LSG for milling of logs

4.2 Lumber production

4.2.1 Clearing around a felled tree

After felling a tree a cutlass is used to clear around its surroundings to make it easier and safe for further processing.

4.2.2 Cross-cutting of felled tree into logs

The felled tree is cross-cut into logs of required/appropriate lengths that will increase both the logs and lumber recoveries / minimize waste or residues.

4.2.3 Use of timber jack and log support

A timber jack is used, where necessary, to turn a log to a suitable side or position that will avoid rolling (Fig. 14). This will facilitate milling and reduce residue generation. Logs are placed across two parallel, smooth and level poles of length not more than 60cm (24 inches) to act as work bench or supports. These could be kept from further rolling using wood wedges (Fig. 15).

Figure 13: Using a timber jack to turn a log

Figure 14: Logs resting on two wooden poles with wedges to facilitate milling

4.2.4 Mounting of logosol frame to chainsaw machine

Any one of the assembled logosol systems (Big mill timberjig, Big mill basic, Big mill PRO and Big mill LSG) available for use are mounted on any chainsaw machine of minimum capacity 50cc before starting the engine (Box 4.1).

Box 4.1: Fixing of logosol unto a chainsaw machine

- Loosen the two guide bar nuts on the chainsaw and remove the guide bar cover. Remove the two bark guards, but leave their bolts and tighten their nuts.
- Refit the guide bar cover, and replace the guide bar nuts which came with the chainsawwith two Logosol nuts. (The guide bar nuts will later be used for mounting the chainsaw on the Timberjig)
- The maximum distance from the outer edge of the chainsaw to the inner guide bar bolt may not exceed 100 mm (4 inches). Mount the chainsaw on the Timberjig. Insert the two logosol nuts into the track in the bottom plate and fasten them by using M8 washers and the original guide bar nuts on the underside of the plate. NOTE: The saw should be mounted as far forward as possible, leaving space for the motion of both the dimension plate and the chain brake (kickback guard).

4.2.5 Fixing of Big mill basic accessories onto a log

In the Big Mill PRO kit two guide rails are included. One can either mount the guide rails on each side of the log, or mount the guide rails in a line for sawing twice as long logs. When double guide rails are mounted, one on each side of the log, choose the Arm -EXT that corresponds to the length of the guide bar (90 or 120 cm). See box 4.2 and fig. 20

Box 4.2: Big mill basic components

The components include: Timberjig, short arm compl, T-bar kit, Board fitting kit, front guide rail holder (U400 kpl), 2.75m guide rail and sliding block kit.

A. Fix short/medium/long (depending upon diameter of log) arm component on the two faces of the log.

B. Connect the T-bar kit, which has a scale reading on it, onto the arm component at both faces of the log.

C. Fix the front guide rail holders at the bottom ends of the 2.75m guide rail. Then connect the holders to the T-bar (at the log faces). Again, fix the board fitting kit to the holders at the opposite side where the T-bar has been connected at both ends of the guide rail, hence a 2.75 guide rail connecting both faces of the log.

- The guide rail, preferably, should lie against the log
- The scale readings at both log faces are checked to make sure that they are the same in order to make a cut with a uniform thickness throughout the length.
- Two sliding blocks are then fixed at the bottom of the timberjig.
- The chainsaw with the bar and chain are then mounted onto the timberjig to make a complete milling unit.
- The engine of the unit is then started and lifted onto one end of the 2.75m guide rail
- With the help of the sliding blocks beneath the timberjig, the complete unit is pushed into two gloves under the 2.75m guide rail, which run through to the end

4.3 Milling of logs begins
4.3.1 Making the first cut

Fold the support leg down to the ground so that the log is securely supported. Bring the guide rail towards the log. Make sure there is a 5-mm space along the upper edge of the guide rail.

Figure 15: Milling of logs with Bigmill Basic to make the 1st cut

After sawing take note to always engage the chain brake before removing the Timberjig/ chainsaw from the guide rail. Must always remove the piece you just cut to make sure it is not in the way of the next cut.

4.3.2 Making the second cut

Remove the Timberjig from the guide rail. Make sure you have about one metre (approx. 3.5 feet) of free space on the log bed in front of the log. Loosen the wing knob on the short arm. Move the guide rail outwards on the T-bar to make clearance for rotating the log. Roll the log forwards. Let the support leg drag over the ground so that the guide rail retains its approximate angle as the log is rotated.

Stop rotating when the cradle foot reaches the next notch in the screw plate, and tighten the knob on the short arm. Set up for your second cut.

If the log is heavy, remove the guide rail from the T-bars before rotating the log

Watch out so that the log does not roll off the log bed when you rotate it.

1. Turn the log 90°
2. Set the desired sawing height.
3. Fold the support leg down against the ground so that the log is securely supported.
4. Perform the safety check and make the cut.

Figure 16: After a 2nd cut of a log

5. Engage the chain brake before removing the chainsaw from the guide rail.
   If you intend to use the Timberjig's dimension plate for sawing the block, you should saw away all bark (at least on one side of the block) so that you get a 90° angle.

4.3.3 Making the third cut

1. Turn the log 90°.
2. Set the desired sawing height.
4. Fold the support leg down against the ground so that the log is securely supported.
5. Perform the safety check and make the cut.
6. Always engage the chain brake before removing the chainsaw from the guide rail.
7. Reset the sawing height and make the next saw cuts until you have the desired block width.

Place a sturdy plank under the log to obtain a firm position and a good sawing angle. Replace the support leg with a shorter board if the angle to the ground is not optimal.

Cut the ground end of the support leg at an angle to keep it from sliding along the ground.

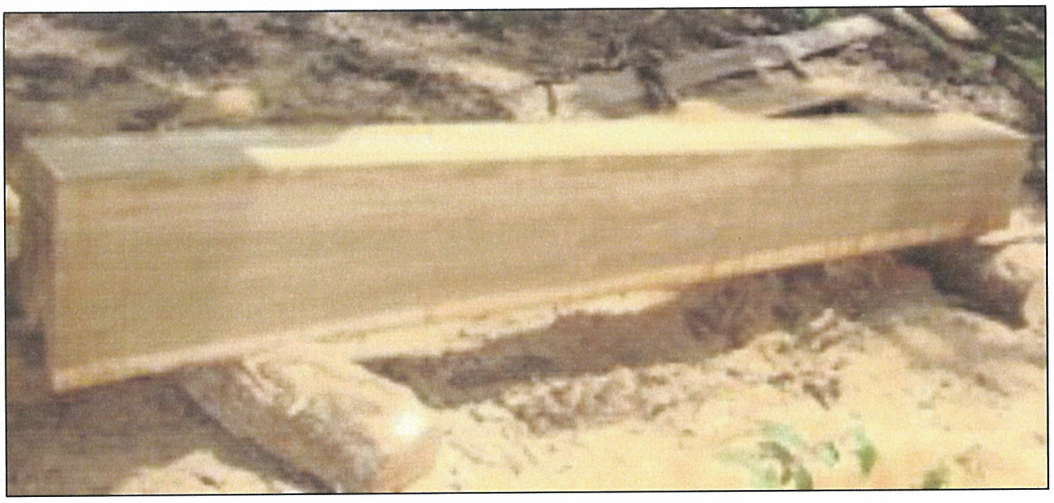


Figure 17: A plank after a 3rd cut of a log

4.3.4 Making the fourth cut

Once the block is ready, place it on end. Set the guide rail so the cut will be made exactly at bark level at the top end, then set the same height at the root end. The cut will then be parallel to the pith (medulla). When three sides are sawn there are two ways to continue sawing (see box 4.3):

Box 4.3: Making a fourth cut on a log

Method 1: Loosen the guide rail supports, fasten the block and use the Timberjig to cut the block into boards. Make sure that the corner the Timberjig will run on is a sharp right angle and not a rounded edge.

Method 2: Saw the boards by lowering the guide rail after each cut. Turn the block 180° when you cannot go any further. Calculate how big you want the centre piece to be, and where the saw cuts will be made. The smallest possible measurement on the center piece is 4 1/2 inches. Saw by lowering the guide rail after each cut. Loosen the guide rail supports, fasten the block and saw the remaining piece with the Timberjig. Remember to perform the safety check before sawing and to engage the chain brake when the chainsaw is not on the guide rail.

The scale on the T-bar can vary somewhat depending on the brand of chainsaw used.

Make note of any variance and remember to take that into account when sawing the log. Even the smallest possible block size can vary depending on the chainsaw used. The scales will agree when the guide bar cover is 8 mm thick.

4.3.5 Edging the boards

To obtain a better yield (Figs. 19), collect the rough edged boards until you have a larger number that are approximately the same width. Work on a smooth, level surface.

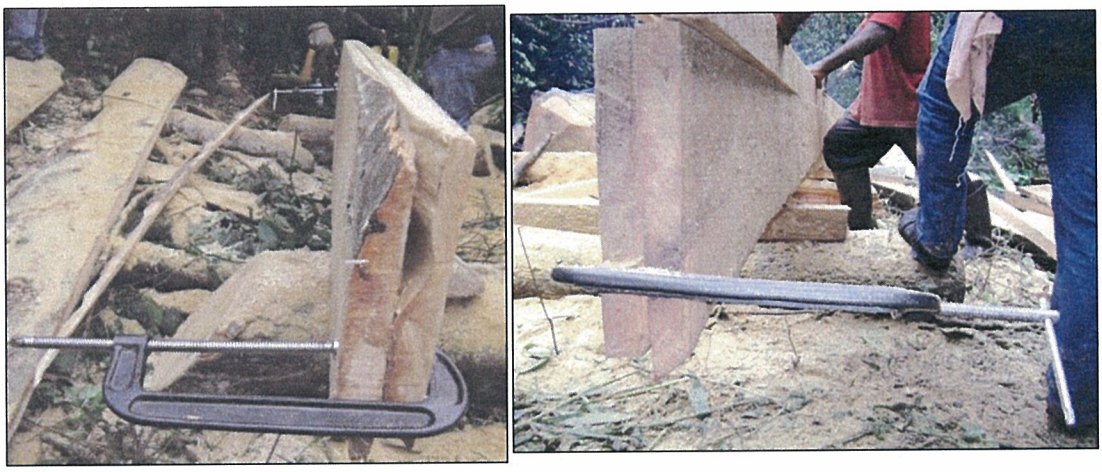
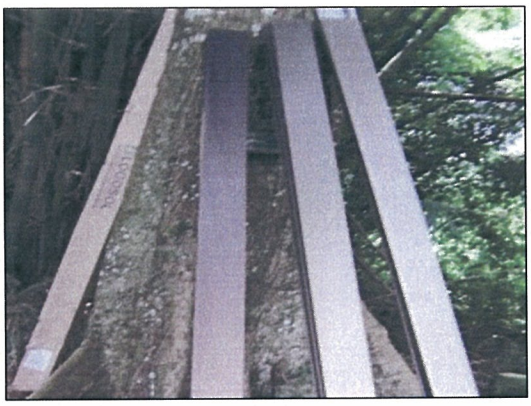


Figure 18: Edging of boards using C-clamps

If you want to make six inch wide boards from rough edged boards, use the guide rail to prepare a 5 to 6 inch high rectangular block. Place the rough edged boards on the work surface and clamp them together with C-clamps. Set the height so that all bark will be removed when you sawn. After you have taken the cut, turn the boards over and fasten them to the block with C-clamps again. Set the height again and start sawing. Cross stack and dry the rough edged boards. When you have gathered a large amount, you can remove the bark on all of the boards at the same time. This method is much more efficient than performing the operation on only a few boards at a time. In addition, you can decide on the definitive width of the boards at a later stage.

4.3.6 Sawing of long logs

In sawing longer logs, the 2.75m guide rail (Fig. 20-left) is easily extended by adding additional guide rail sections. This is possible by using a specially designed joint coupler which expands inside the guide rail, allows the joint to become as strong as the rest of the guide rail. In this case the jointed portion (middle of the two guide rails) is supported to keep them straight. Therefore a guide rail prop with spike accessory is used and at the ends where the T-bars are. For a length more than 3.5m, the accessory (Fig. 20-right) is used at a meter interval along the sawing length. Logs can then be milled with the same methods above.



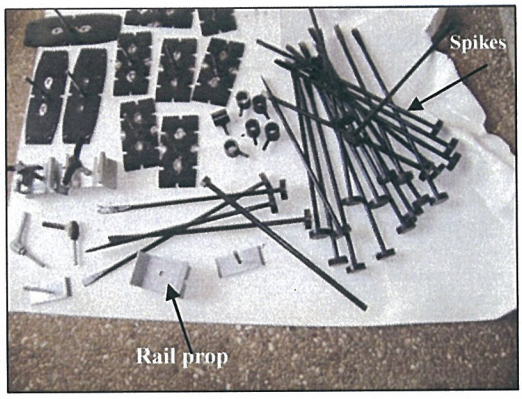


Figure 19: Some components of logosol machines

Figure 20: Display of logosol milling skills by operators

4.3.7 Sawing with double guide rails (Big mill PRO)

The use of double guide rails becomes necessary when oversized logs, as seen from Fig. 20, are to be sawn. Such logs are to be thoroughly fastened with large wooden wedges. The advantages are that it is possible to easily mill large logs and increases sawing precision. Measurement deviations are limited to less than 2 mm if everything is set-up correctly and the log lacks extensive tensions in the wood. The working procedure is basically the same as when sawing with one guide rail.

Figure 21: Sawing logs with Bigmill PRO

4.3.8 Sawing without guide rails (Big mill LSG)

This is the device used in milling logs without guide rails. The plane surface of the log steers the next cut. Two Timberjigs are assembled together to create a Big Mill LSG. LSG comes from the German *Längsschnittgerät,* meaning "a unit for sawing along the log".

Fasten a flat and straight plank on the log. This plank will serve as a guide for your first cut with the LSG. For the remaining cuts, you just let the equipment be steered by the sawn surface.

4.4 Stacking of lumber on site

Squared sticks of cross-sectional area between 12.5 and 25mm (of the same species as the lumber) are used to stack the lumber at the milling site before they are cart and re-stack under shed. This will minimize defects as the lumber dries. In the raining season materials like polythenes are used to prevent water from getting to the lumber (Fig. 21).

Figure 22: Lumber stacked at the field after milling before carting to drying shed

4.5 Lumber records keeping

After processing of logs of each tree into lumber, the quantity of each dimension obtained and the type of species are recorded against the name of the beneficiary farmer whose farm the tree is felled. This will enable the marketing committee estimate the proportion for the farmer in monetary or lumber terms.

4.6 Carting of lumber to drying shed

The generated lumber at stump site should be conveyed to a constructed shed for stacking and air drying. The terms for carting lumber from farms to the shed for air drying/ sale should be discussed by the farmer(s) and marketing committee in order to avoid any possible conflict.

5.0 MARKETING

5.1 Marketing of Processed Lumber

Summarize data on the processed lumber (see box 5.1) in the form that would allow for the sharing of the revenue accruing from the sale of the lumber. The community members should meet and agree on the formula by which the percentage share of the farmers whose trees have been processed should be distributed among them.

Box 5.1: community lumber production (Duration.....)

Species	Name of farmer	Unit price	Total lumber
Tree number (e.g. Wawa T1) Dimension of lumber 1. 2.			
Subtotal			
Tree number (e.g. Ofram T2) Dimension of lumber 1. 2.			
Subtotal			

5.1.1 Price negotiations

The marketing committee members constituted by community members are to look for prospective buyers of the processed lumber, negotiate the prices and sell the lumber to these buyers. The lumber prices at the domestic markets should guide these committee members in the sale of the lumber to the buyers.

5.1.2 Documentation and Transportation

The marketing committee members are to assist prospective buyers of the lumber to acquire the necessary transit document from the local district forest office. It is the

duty of the marketing committee members and the prospective buyer to provide the forestry officer with the relevant data on the processed lumber for the conveyance certification to allow for safe transportation of the lumber to the buyer's destination. See box 5.2 for a sample conveyance certificate which is slightly different from the official Forestry Commission's log measurement and conveyance certificate.

Box 5.2: CONVEYANCE CERTIFICATE FOR ..... PROJECT FOR LUMBER PRODUCTION ON FARMLANDS WITH LOGOSOL MACHINE AT .....FOREST DISTRICT

PLACE OF CONVEYANCE .....

DESTINATION.....

Species	Dimension	Quantity
1.	W x T x H	X
2.		
Total		

Vehicle No..... Driver's Name.....

Date of Permit..... Date of Expiry..... Time.....

Receipt No.....

Signature
DISTRICT MANAGER
FOREST SERVICES DIVISION
FOREST DISTRICT NAME.....

5.1.3 Withdrawal of money and distribution to beneficiaries

Using the percentage shares of each stakeholder as indicated in box 1, withdraw the money deposited in the bank and share among these stakeholders as and when monies realized from the sale of lumber are deposited in the bank. However the share of the community's should only be given out after definite project has been jointly identified and agreed upon by all parties concerned.

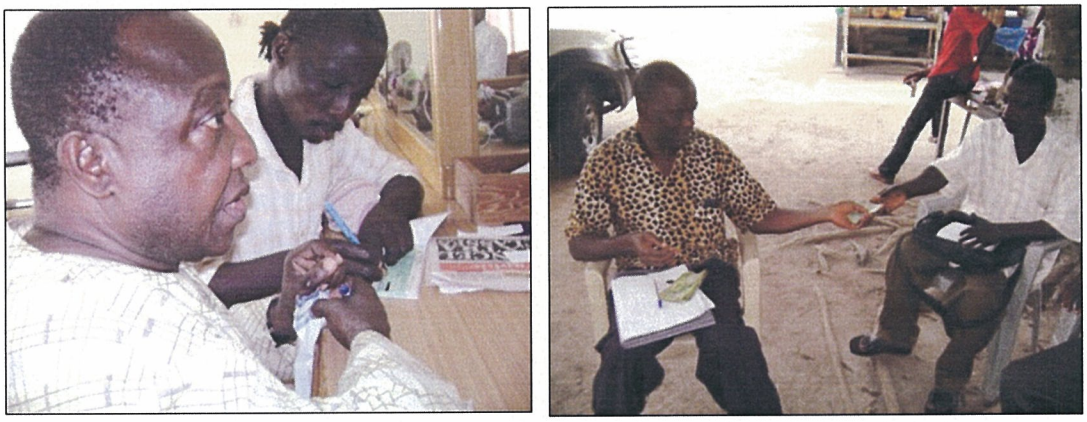


Figure 23: Cashing money from the bank and distributing it to community representatives

5.1.4 Benefit sharing

In box 5.3 the method for the sharing of the revenue accruing from the sale of the lumber to the beneficiary farmers is suggested.

Box 5.3: Computing farmer's share of 40% value of processed lumber

- Assume that there are X1, X2.....Xn farmers whose trees on their farmlands are processed into lumber in a given community, where X is the individual farmer and 1 is the first farmer and n is the nth farmer.
- Assume that total pieces of lumber of different tree species obtained from each of these individual farmer's land is Aj1, Aj2.....Ajn, where Aj1 is total lumber from jth tree species of first individual farmer, Aj2 is total lumber from the j tree species of second individual farmer and Ajn is total lumber from the jth tree species of nth individual farmer.
- To weight the different species based on their market value, assume a weighting scale of 1: 1.5, where 1 is for whitewood (wawa, ofram etc) and 1.5 is Redwood (Sapale, edinam, odum etc).
- Obtain the overall total number of lumber processed from each of two group of wood type (i.e. GTW =grand total of white wood and GTR =grant total of redwood).
- Assume the total lumber sold for a given community in a given period is GHM (i.e. M Ghana cedis). Therefore the farmer's 40% share is (40/100)*GHM=GHZ.
- Obtain the total value of the whitewood as GHTW= (1/2.5)*GHZ and total value of the redwood as GHRW= (1.5/2.5)*GHZ.
- To compute the 40% share for farmer X1, given that both whitewood and redwood are processed from his/her farmland. From box 5.1 obtain his/her total number of white wood processed as Aw1; and total his/her total number of redwood as Ar1.
- From these the total monetary value of his/her whitewood is (Aw1/GTW)*GHTW=TWX1; and that of the Redwood is (Ar1/GTR)*GHRW=TRX1.
- Total amount of money to be collected by individual farmer X1 from the 40% share meant for all the farmers whose trees have been processed is TRX1 +TWX1.

5.1.5 Community share of the benefits

The community decides on what to use their benefits for in the interest of the general public after which it is communicated to the project team for approval. The cheque is then countersigned to enable them access the community fund for the agreed developmental project. A community used their share of the benefits to purchase plastic chairs (Fig. 23) to be used for community general meetings and to generate funds through hiring by its citizens during family gatherings, for instance during funerals.

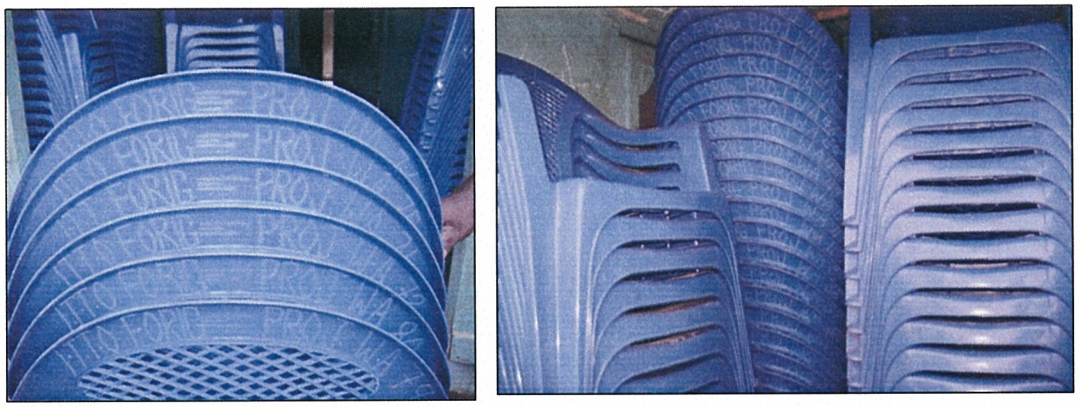


Figure 24: Acquired plastic chairs by a community

5.1.6 Award of certificates

Members of the project field operators and committees, for instance, Marketing officers and Trustees that will be set up for the efficient execution of the project should be awarded with certificates. Templates of such certificates are shown in Fig 24.

Figure 25: Templates of certificates for project field staff

6.0 PROTOTYPE PRODUCT

Wooden products, using logging residues, to be manufactured for the general community should be discussed and agreed upon before action is taken. Products to be considered include furniture for school pupils and teachers, community centre and the chief's palace. Fig. 25 indicates carpenters producing school furniture for a community while Fig. 26 shows some of the furniture that could be produced for local community school pupils.

Figure 26: Carpenters producing school furniture for a community

Figure 27: Proposed school furniture type for production

7.0 MONITORING OF ACTIVITIES

There should be regular monitoring to ensure that the MOU and rules & regulations governing the felling, processing and marketing are strictly adhered to including the welfare of the machine operators and marketing committee.

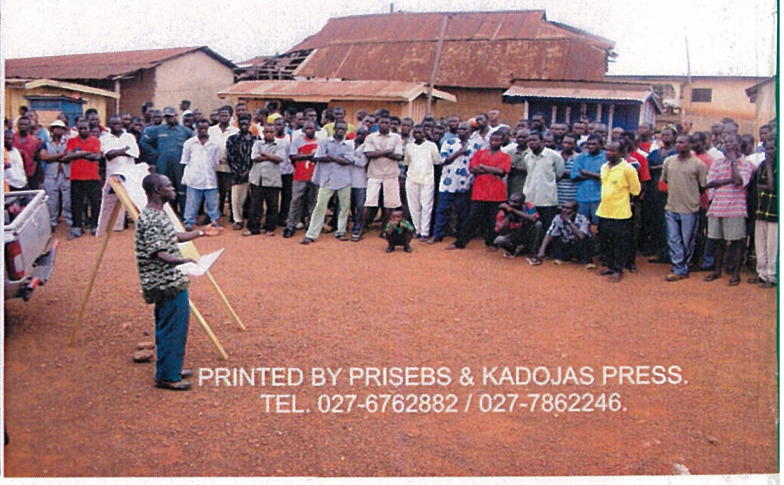
Strategy: Use monitoring to facilitate adaptive management of improved chainsaw milling and marketing

Actions: The monitoring should be done by a team agreed upon by all stakeholders
The monitoring periods (time and date) should be known by all stakeholders
All observations (right or wrong) should be reported on by the monitoring team
The right activities should be reinforced and wrong activities or decisions should be corrected immediately by the stakeholders.

8.0 PRECAUTIONS

In the area of lumber marketing, forestry officials and the community members should monitor the prospective buyers to ensure that they do not add illegal lumber from different sources to transport to their respective destinations.

In the lumber production at the stump site, operators to be engaged, should be properly monitored to ensure that they are not engage in illegal activities like diversion of fuel and lubricant meant for the work for their own illegal wood processing; and that they do not use the tools and machinery of the project for their own illegal wood processing to sell to these prospective buyers.



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