SURINAME

MINISTRY OF NATURAL RESOURCES
with
FOOD AND AGRICULTURE ORGANIZATION

Project GCP/SUR/001/NET

Forestry Advisory Assistance
to the
Ministry of Natural Resources in Suriname

ECONOMIC DATA AND INFORMATION ABOUT THE FOREST SECTOR IN SURINAME

by

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July 1999

This report is one of a series of reports produced during the course of a two-month assignment (during October and November 1998) as International Consultant (Forest Economics) to the FAO project GCP/SUR/001/NET, funded by the Government of the Netherlands. The International Consultant wishes to acknowledge the help and co-operation given by staff of the State Forest Service (*LBB*) and others in the forestry sector in Suriname with the completion of this work. In particular, the consultant's counterparts: Mr Matai; Mr Asraf; and Mr Lemen, have provided very valuable support with this work. The conclusions and recommendations presented here are those of the author and do not represent the official policy of the Food and Agriculture Organization of the United Nations, the Government of Suriname or the Government of the Netherlands.

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1 INTRODUCTION

Forest levies or charges for the right to harvest timber from publicly owned forests in Suriname are currently set by the Minister for Natural Resources on behalf of the Government of Suriname. In the absence of competitive markets for such rights, it is necessary for the Government to calculate appropriate levels of forest levies that take into account the profitability and condition of the forestry sector. Forest levies are usually set by calculating the economic rent from forestry operations, or the surplus of timber revenues over operating and capital costs (including an allowance for normal profit). This, in turn, requires information to be collected about a range of factors, including: the biological condition and productivity of the forest; forest product output levels and productivity; and cost and price information.

Other components of the Project have or will make recommendations about the collection of forest inventory and production data necessary for the supervision and orderly development of the forestry sector (see, for example: Cox, 1998; Mitchell, 1998a; and Mitchell, 1998b). This report has been prepared to help staff of the State Forest Service in Suriname (*Lands Bosbeheer* or *LBB*) collect and evaluate economic information about the forestry sector in Suriname. As part of this task it also examines the collection of relevant data from international sources. Much of this report discusses the collection of economic data for the purpose of setting forest fees. However, it also discusses the collection of economic and other types of data for wider forestry policy and forest industry development, where this has not been covered in other reports of the Project.

The next section of this report briefly discusses the methods that can be used to collect economic data on the forestry sector and the sorts of data that are required. The processes followed during this study are described and used as examples of how data can be collected and assessed. Section three describes the data collected from local sources in Suriname to support the analyses presented in other reports. Section four describes the data collected from international sources. The final section of the report presents conclusions and recommendations about information and data collection and storage in the future. Two appendices to the report present other data sources which can be used for economic analysis or general forestry policy development. The first presents useful data sources that are freely available and the second presents a record of discussions that were held with various stakeholders in the forestry sector in Suriname. These were used to collect a lot of the information presented earlier in the paper and are given as an example of the sorts of results which can be obtained from such interviews. A third appendix also presents a classification system for the storage of information about forestry in Suriname.

2 METHODOLOGY

The major challenge for anyone attempting to collect economic information about the forestry sector is that, unlike other quantitative information such as standing volumes or productivity rates, the data collector often can not collect the data themselves, but has to rely on other people to supply the information required. This can be a problem if the respondent to an inquiry doesn't understand what sort of information is required or why it is required. Another problem is that they may not keep the data in the format required by the data collector and sometimes not keep such information at all. Perhaps the greatest challenge is that economic data is often quite sensitive and respondents may be reluctant to supply the information or have an incentive to give artificially low or high values.

Because of these challenges, economic data collection is often given a low priority within government forestry institutions. However, the importance of reliable economic data can not be stressed enough. Accurate and timely economic data is often essential for forestry policymakers to make sensible decisions regarding the setting of government charges and tariffs, the allocation of resources and the planned development of the forestry sector. Reliable information on the forestry sector also helps the forest administration (i.e. *LBB*) promote its policies and programmes within government and gain political support for its actions. In nearly all countries, forestry is seen as a relatively minor, low-value economic activity and reliable data to support policy decisions is an important tool to help forestry policymakers compete with other government departments for scarce public resources.

Accurate economic information about the forestry sector is also very important for the private sector. Good information is important to analyse potential investment in new infrastructure and machinery and to help develop markets. It is also important for the daily management of forest operations, in order to minimise costs of production and maximise the value of output. In a small developing economy such as Suriname, good information provided by a reliable and independent source is also crucial to attract foreign investment in the sector. A major concern to any domestic or foreign investor considering investing in the forestry sector is the risk associated with operating in the sector. To some extent, this can be reduced if reliable information about some key aspects of the forest economy is publicly available and trusted to be reasonably reliable.

Given the importance of economic information about the forestry sector and the difficulties associated with collecting it, this short report will attempt to identify the key aspects of successful data collection and recommend a strategy for collecting and improving the economic data currently held by *LBB* about the forestry sector in Suriname. The remainder of this section of the report will discuss the general principles behind successful data collection using, as examples, the methodology used during this study, before going on to present the data collected as part of this study in later sections.

2.1 Types of economic information

Before discussing the techniques for collecting information, it is useful to have a general description of the types of economic information that is often collected to assist project or policy analysis and development.

2.1.1 Quantitative and qualitative information

Economic data on the forestry sector can be broken down into broadly two types: quantitative information and qualitative information. Quantitative information includes data such as: costs; prices; rates of productivity; profit levels; production, capacity and trade statistics. This type of information can be collected using: censuses and surveys; interviews with local experts; field studies; and mandatory reporting.[1]

[1] Mandatory reporting can be defined as a situation where industries are legally required to provide the government with a certain type of information at regular periods. An example in Suriname, would be the information which will be collected about roundwood production and export by the Foundation for Forest Management and Production Control (*SBB*).

Qualitative information includes variables such as: market expectations; investment and marketing plans; and opinions about topics such as: current policy measures; development options; and barriers to trade. Such information is usually collected through interviews or round-table discussions with key experts or stakeholders in the sector. However, in some countries, surveys have also been developed to collect this type of data.

Quantitative data is often the easiest type of information to interpret, because it can be analysed using standard statistical techniques, so that the precision of the data can be examined and useful measures such as averages and trends can be constructed. However, although qualitative information is often more difficult to analyse, it is often very valuable because it can give a more complete picture of the condition of the sector than the statistics alone would give.

2.1.2 Level of detail

A second important distinction between different types of information or data is the level of detail present in the information and the scale or area covered by the information. At a broad scale, data can be collected for a whole industry or the whole of the country. This is usually called macroeconomic data. This type of data includes information such as: the total size of markets; total production; general price levels; inflation and interest rates, and is usually collected using censuses, large representative surveys or mandatory reporting. Such data is most useful for monitoring broad trends and developments in the economy, but is often difficult to interpret (i.e. it is often difficult to analyse what lies behind any trends identified). In the forestry sector, the most common use of macroeconomic data is for projecting or forecasting future forest product supply and demand.

Alternatively, information can be collected and analysed at the level of individual companies or communities. This is usually called microeconomic data. Typical examples would include: production levels of individual firms; cost and price structures; productivity rates; and sawnwood recovery rates. Such information is usually collected using: field studies; interviews; and small surveys. This type of information is often more useful to get a better idea of the variation within a sector, measure the impact of policy changes and examine policy and investment options (option appraisal). Of course, if such information is regularly collected from a large enough representative sample, it can also be used to monitor broad trends and developments (as above).

A final distinction it is important to make is whether information is collected is in an aggregate form or as unit figures. For example: total sawnwood consumption; total sales income; total production and total fuel cost for a company or industry are broad aggregates. Corresponding examples of unit figures for each of these variables might be: per capita sawnwood consumption; product prices; labour productivity; and fuel prices. If unit figures are available and a measure of physical input or output (e.g. wage rates and number of employees), the corresponding aggregate measure can still easily be constructed, but the analyst has more flexibility in how they analyse the data.

Generally, unit figures are more useful for the forestry policy analyst, because they enable the analyst to examine a wide range of factors that might have an effect on the sector. For example, labour costs could change due to a change in the wage rate, changes in productivity, or a combination of both factors. Unit figures also make it easier to construct pieces of information that it would not be easy to collect directly. For example, it would probably be difficult to collect information directly on forest harvesting costs in Suriname, because few companies seem to keep such information. Most of them do, however, have a slightly better knowledge of productivity rates, numbers of employees and harvesting volumes (i.e. m^3/ha). Such information can be used along with information collected elsewhere, to calculate the total production cost and examine the effects of changes in each of these variables on total harvesting cost (sensitivity analysis). It also generally makes it easier to update aggregated statistics in the future, because each of these components are likely to change at different rates over time (e.g. labour productivity may change only slowly

and need to be remeasured every three years, but wage rates might change rapidly and need updating every year).

2.2 Information collection methodologies

There is a range of techniques available to the forestry policy analyst to collect economic information about the forestry sector. This section briefly explains how each of them work and discusses how the right technique should be identified for different circumstances.

2.2.1 Objective, need and availability

A first priority before embarking on any data collection exercise is to be clear about what the objective of the exercise is. This will determine what sort of information is needed and start to clarify the tasks that must be performed. For example, the objective of the data collection exercise for this study was:

> **to collect cost, price and production data necessary to calculate the economic rent from roundwood production and broadly estimate the contribution of the forestry sector to the economy of Suriname.**

The objective of the data collection exercise was, therefore, to provide data for a fairly complicated and large-scale analysis. This suggested that quite a large amount of detail about a wide range of variables was likely to be needed. However, due to time constraints, it also suggested that it would only be possible to collect a relatively small amount of information about each variable.

Other data collection exercises are likely to require different levels of detail or information about a wider or narrower set of variables. For example, in the proposal to create the Foundation for Forest Management and Production Control (*Stichting voor Bosbeheer en Bostoezicht* or *SBB*), three separate data collection exercises (exploration inventory, annual stock survey and the forest production control system) are proposed to meet the following objective:

> **to identify the appropriate level of harvesting in each forest concession and ensure that these harvest volumes are not exceeded and that all roundwood levies are paid to the government.**

Each of these exercises require a large volume of data to be collected, but only require information to be collected about a relatively small number of variables (e.g. for the forest production control system, information is only required about: roundwood source; volume; species and type of product). Thus, with these needs in mind, a completely different system for collecting such data should be designed.

Another important consideration, which should be taken into account when designing any data collection system, is the availability of existing information. As noted above, the collection of economic information usually requires the co-operation of the private-sector to help to supply the information. There is likely to be considerable resistance to take part in any survey, if others have already asked respondents for similar information. Therefore, care should be taken to ensure that the required data has not already been collected elsewhere, either by other parts of *LBB*, other government departments, or the private-sector industrial associations (e.g. the Chamber of Commerce).[2] The best way to check this is to speak with these organisations directly or even involve them in the design and implementation of the data collection exercise (see below). Other published sources of information may also be available either in Suriname or from international agencies. These should also be examined in order to reduce the amount of information that might have to be collected during the survey.

[2] This is unlikely to be a major problem in Suriname at the moment, as it seems that most government agencies are currently collecting very little information about activities within their sectors. Also, the private-sector industrial associations do not seem to be producing much in the way of data and information about their industries. This may, however, become more of an issue as the economy of Suriname develops.

There is always a temptation when designing a data collection system, to try to collect more information than is actually needed. It is true that, if a staff member of *LBB* has to visit a sawmill to collect some information, then the cost of collecting more than is immediately required is quite small. However, any additional data requested should not be excessive. This is particularly the case if respondents are expected to complete questionnaires themselves. A short questionnaire has a reasonable chance of being completed, but a large questionnaire may simply be ignored (and thus provide *LBB* with no information at all). An excessively large questionnaire may also cause resentment and undermine any future attempts to collect information. Thus, any additional information requested should only be limited to information that may prove useful in the near future.

2.2.2 Censuses and samples

A key question, which must be asked when designing a data collection exercise, is whether a complete census of the sector is required or whether a sample of companies or individuals can be used. Broadly the main differences between a census and a sample are as follows:

> **A census** involves collecting information about the total population under investigation (e.g. all companies or individuals in the forestry sector or all trees in a forest). Because of the amount of information collected, a census is therefore, likely to cost more to implement than a sample. It should however, give results that are precise and representative of the whole sector (as long as the whole population is accurately measured).
>
> **A sample** involves collecting information from a proportion of the population (e.g. 10 companies or 15 x 1 ha plots in a forest). Less information is collected than in a census, so data collection and analysis is generally less expensive. However, the design of a sample survey is likely to be more complicated and, therefore, more expensive. Sample results are less precise than census results, in that there is always a risk that the sample may include a number of individuals that are untypical of the sector as a whole (sampling error). Precision increases with the size of the sample taken and the skill in designing a sample is to try to ensure that it is representative of the sector as a whole and that it collects sufficient information to give a reasonably precise estimate.

Generally, censuses are used to collect information that is simple and easy to collect, while samples are used to collect more detailed information. These and other factors that should be considered when choosing between using a census and a sample to collect information are shown in Table 1.

Table 1 Factors to be considered when choosing between using a census or a sample to collect information

Consider using a census if:	Consider using a sample if:
Information is required about the whole of the sector (i.e. macroeconomic information) for the purpose of measuring or monitoring broad trends in the sector.	Information is required for the detailed analysis of underlying factors influencing the performance or development of the sector.
The information required is expected to be very variable between different individuals.	The information required is not expected to vary by much between different individuals or, if the variation is well understood, it can be built into the design of the sample.
Information is required about a relatively small number of variables and is simple to collect.	Information is required about a large number of variables or will be difficult to collect.
The information is considered important enough that the cost of data collection and analysis is less of a concern than accuracy (e.g. roundwood production data required to calculate forest levies owed to the government).	Cost is a major consideration.

It is rarely necessary to collect information using a census, because a well designed sample survey can usually produce sufficiently precise information at a much lower cost. Censuses are usually only considered where the information that will be collected is relatively simple and considered to be important. For example,

LBB may wish to consider implementing a forest industry census in the future to monitor broad trends in the forest sector (see: *Section 5.2 Improving and updating the information*). However, for most purposes, a sample is likely to be the most efficient way of collecting economic information on the forestry sector in Suriname.

Given the time constraints for this assignment, it was not possible to consider undertaking a census to collect any of the information required for this study. Therefore, for the purposes of this study, information was collected from a small sample of companies in the logging, sawmilling and forest concession sectors, as well as local communities, industry associations and other key stakeholders in the sector.

2.2.3 Basic principles of sampling

As noted above, most of the economic information about the forestry sector which *LBB* is likely to need in the future, can probably be most efficiently collected using samples of individuals or stakeholders in the sector. This section therefore, briefly explains the basic principles of sample selection. It does not discuss the detailed statistical calculations necessary to optimise sample selection, which can be obtained from any basic textbook (see, for example, Philip (1994) or FAO (1981), for a good discussion of forest sampling methodologies or Wonnacot and Wonnacot (1985) for an introduction to collecting and analysing socio-economic statistics). It focuses more on the broad principles and practical considerations when designing samples.

The overall aim of any sample is to collect information that is representative of the whole population without having to incur the expense of taking a complete census of the population. With this in mind, three considerations are most important when designing the sampling strategy: precision; accuracy; and robustness. The different meanings of each of these terms are explained in Box 1. Accuracy is by far the most important consideration and the elimination of bias should be given the highest priority in the design of any sample.

Box 1 The difference between precision, accuracy and robustness

The three most important factors which should be considered in any survey are: precision; accuracy and reliability.

Precision is a measure of how close the sample estimate of a variable is likely to be to the true value of that variable in the population. The degree of precision or standard error of a sample estimate can be calculated using simple statistical formulae. Broadly speaking, a larger sample will give a more precise estimate than a smaller one and the precision of any sample estimate can be increased if the population is divided into different groups based on some other information which is thought likely to affect the variable. The importance of precision is that it helps the person designing the sample to compare the cost of collecting information from different sizes of sample with the precision of results. Precision is also an issue when deciding how a variable should be measured. Precise measurements are often more costly to collect. For example, in order to collect a precise estimate of product recovery rates in a sawmill, it might be necessary to measure a large number of logs going into the mill and pieces of sawnwwod coming out, over a long period of time. However, the sawmill manager might be able to provide a less precise estimate almost instantly.

Accuracy is the degree to which the sample is representative of the whole population. If a sample includes a large number of individuals (compared with the general population) with a particular characteristic which is likely to affect the variable being measured, then the sample cold be biased or inaccurate. This can be a major problem if part of the sample can not provide a particular piece of information. For example, some of the sawmillers interviewed during this assignment were unsure about what their product recovery rates were. This is a key piece of management information so, assuming that the sawmillers that could produce this information generally run more efficient operations than those that couldn't, the product recovery rates collected could be biased upwards. Accuracy or bias can also be a measurement problem if there is an incentive to understate or overstate results or the measurement process results in errors that are mostly on one side of the truth.

Robustness is similar to accuracy and is the degree to which the results of a sample can be applied to a range of different circumstances or over a long period of time. For example, a very precise and accurate estimate of sawmill recovery might not be robust if it is measured this year but recovery rates vary considerably from year to year. For this reason, variables which are likely to change a lot over time need to be regularly remeasured. Economic information which typically falls into this category is price and production statistics.

There are two general principles that are commonly followed to try to ensure that a sample is accurate. The first is to try to divide the population into groups or strata, based on existing information about key variables

which are thought to affect the information which the sample is trying to collect. This ensures that examples of different types of individual within the population are included in the sample. It can also be used to explain some of the variation recorded in the sample and thus increase the precision of the results. For example, in the sample surveyed for this study, information was deliberately collected from different locations (e.g. Paramaribo; two smaller towns; and in the forest), different scales of operation (e.g. small; medium-sized and large sawmillers) and different types of operator (e.g. sawmillers; independent loggers; and local villagers). The other way in which bias can be minimised is to collect information from a random group of individuals in the sample or each stratum and to try to ensure that each respondent gives all of the information requested.

Two concerns about accuracy were encountered with the sample selected for this study. Firstly, many of the individuals visited and interviewed tended to be people who already had a good relationship with *LBB* or the FAO Project (and who may not, therefore, be representative of the population as a whole). Secondly, some of those individuals could not or would not provide all of the information requested. There may, therefore be some bias in the information collected. A major concern about accuracy of measurement was that everybody interviewed assumed that the volume of an average log is 2 m^3. This may not be true.

Precision can only be calculated if several measurements of the same piece of information are taken from different individuals. Thus, it is only generally possible to calculate precision if a formal surveying technique such as a questionnaire is used with a large sample. The survey techniques used for this analysis were less formal and used interviews and discussions to collect information about costs and prices. It is not possible therefore, to estimate how precise they are in the statistical sense. Other checks can be made however, to examine the reliability of the data collected (see: *Section 2.3 Evaluating the information*).

Given the fact that economic data about the forestry sector is often difficult to collect and that all economic analysis is subject to a certain amount of imprecision anyway, acceptable standards of precision for the collection of economic data are generally lower than might be required in other areas of forestry.[3]

With respect to the robustness of the data collected from a sample, it is generally the case that many variables do not change rapidly over time. Thus, for example, industrial capacity, product recovery rates, labour and capital productivity rates and possibly even some cost data probably do not change by very much from year to year. The variables that probably do change a lot over short periods of time are: production levels; export levels; and product prices. Therefore, information about these variables may have to be collected fairly frequently.

The export markets for Surinam's forest products are currently depressed and this appears to have resulted in a large increase in supply to the domestic market. International product prices have declined and this shift has also pushed down domestic product prices. Thus, assuming that markets will eventually return to more normal levels, the price information collected as part of this study may not be very robust.

2.2.4 Basic types of survey

Once the type of information that needs to be collected has been identified and the census or sample has been designed, the next stage in the data collection process is to decide how the information should actually be collected. There are four basic ways in which economic information can be collected and these are briefly described below.

> **Direct measurement** is probably the most time-consuming and expensive way of collecting economic information, but is likely to yield the best results. In the same way that a forest inventory crew can go to a forest and measure trees, it is possible for the forest economist or other suitably

[3] Generally, it is probably true to say that, all over the world, many forestry policies (and often other government policies) are implemented on the basis of quite imprecise information. All policy advice will be subject to a certain amount of political negotiation before it is implemented, so the government economist should not worry too much about the precision of the data used to formulate advice.

qualified data collector, to go to a forest or a sawmill and collect economic information directly. Accounts, invoices and receipts (if they are available) can be examined and used to produce valuable cost and price information in the format that is required for later analysis. Similarly, good estimates of productivity can be obtained if they are measured directly by the data collector (who knows what he or she is looking for) rather than having to rely on the estimate of the sawmill or forest manager.

The main advantage of direct measurement is the quality of the results usually obtained from such an approach. The main disadvantages of direct measurement are that it is generally slow and expensive and that it requires a tremendous amount of co-operation on the part of the sawmill or forest manager to agree to such an intrusion. However, this can sometimes be overcome if the data is not sensitive and the managers can see some use in having the information themselves.[4] Alternatively, a questionnaire can sometimes be left with a manager and they can be asked (or paid) to collect the information themselves.

Questionnaires are probably the most common way in which data is collected. Questionnaires can be sent by post to respondents (for them to complete and return), or they can be completed over the telephone or face-to-face by the data collector.

The main advantages of using questionnaires are: that they help to clarify the information being requested; they ensure that all respondents are asked the same set of questions; they get to the point and can, therefore, collect a lot of information over a short period of time (although they may require some time to organise and administer); and they don't need a skilled person to ask the questions (see Box 2 for a basic outline of good questionnaire design). Postal questionnaires also have the advantage that they are very cheap to administer. The main disadvantages of questionnaires are that they rely on the respondent to provide the information, they are rigid and often require the respondent to have the information available in a particular format, they don't offer much scope for exploring issues which may be of interest and they often suffer from a poor response rate[5] (which can lead to a lot of bias).

Interviews can be used to complete questionnaires (see above) or to collect information in a less formal way. Informal interviews may not be as rigid as questionnaire interviews, but they should still have an overall structure and the data collector should have in his or her mind a list of major subjects which should be examined or pieces of information which should be collected (see, for example, Appendix 2, for a list of the subjects covered in the interviews conducted as part of this assignment).

The main advantages of using informal interviews are that they allow the data collector to collect more detail in areas where the respondent has greater knowledge or has more enthusiasm to provide answers. They can also provide important information that the analyst might not have thought of and are particularly useful for collecting qualitative information. Perhaps the main advantage of this technique however, is that it is less threatening than direct measurement or a formal questionnaire and is, therefore, more likely to gain the co-operation of the respondent. The main disadvantages are that progress is generally slow with such an approach and that it usually

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4 For example, for many years universities in the United Kingdom collected private forestry cost information (from forest owners own records of income and expenditure) on behalf of the Forestry Commission (the government department responsible for forestry). This worked, in part, because the universities were trusted to keep secret the source of the information, they did not require much time or input from the forest owner and owners believed that the information would help the government to help them in the long-run.

5 Typically, experience of many surveys has shown that only about 30% of postal questionnaires are returned and around 70% - 80% of questionnaire interviews over the telephone or face-to-face are completed. These figures are based on the consultants experience with forest, forest industry and socio-economic surveys in developed countries. In Suriname, lower response rates might be expected.

requires a quite skilled interviewer (preferably the data analyst) to keep the discussion on the subjects that are important and collect the information required.

Box 2 Basic principles of good questionnaire design

In nearly all types of survey (including direct measurement, interviews and group discussions), a questionnaire of some sort will probably be used to collect and temporarily store information. When completion of a questionnaire is the main part of the survey, it is very important to design a questionnaire which is clear, concise and collects the right information. The following are the main points which should be considered in questionnaire design.

Overall design and layout - the questionnaire should be clear to read and follow and the space for each answer should be large enough to write in. Clear instructions should be given about whether the answer expected is a simple yes or a no, a figure, or some other type of information. The same layout for each question should be followed if possible (eg. all questions on the right-hand side of the questionnaire and space for the answers on the left-hand side). Where respondents are asked to complete tables, these should be clearly laid-out. If an answer to one question determines the next question to be asked, this should be clearly indicated. If a questionnaire requires more than one piece of paper, each piece shoudl be given a serial number so that they can be reunited if they become separated. A postal questionnaire will be greatly enhanced if all the information requested can be put onto one piece of paper (and preferably one side) and a pre-paid return envelope is provided. The designer of the questionnaire should also think about how the information will eventually be stored and try to make it easy to transfer the information from the questionnaire to the database or spreadsheet.

Structure - it is useful to group similar questions together. Thus, for example, questions about production could all be grouped together, then followed by a group of questions about prices. Questions which are easy to answer should generally be put before questions which are more difficult to answer. It is also often useful to have an introduction which explains the purpose of the questionnaire, who is collecting the information and what it will be used for. If the survey is being conducted by an independent agency on behalf of the government and anonymity can be guaranteed, this should be made clear.

Measurement units - the measurement units used in the questionnaire should be made clear for every answer. If it is likely that different respondents may use different measurement units (eg. US$ or Sf), then alternatives should be presented or the respondent should be asked to also record the units they are using. This should be clearly explained.

Testing and training - it is often a good idea to test any questionnaire before using it. Even asking somebody in the office to pretend to fill it in is useful. Postal questionnaires have to be much clearer and easier to complete than other types of questionnaire. Data collectors should be trained to complete the questionnaire, in particular it must be stressed that they are to write down exactly what is said and not try to interpret responses.

Group discussions are similar to interviews, but with groups of people rather than individuals. They can be either formal (such as consultations with industry representatives) or informal (such as meetings with groups of local villagers). The same general principles as were described for interviews above also apply to group discussions. The only additional disadvantage with group discussions is that there is a risk that a few members of the group may dominate the discussions.

Formal discussions are unlikely to be useful for the collection of quantitative economic information, because members of the group may be competitors and unwilling to divulge such information to other members of the group.[6] They are often, however, very useful sources of qualitative information and can be used to examine broad economic issues which are affecting the industry as a whole.

Group discussions can also be useful to collect information in situations where respondents may not be familiar with all the information being requested or are not used to answering such questions. For this reason, group discussions are a popular way of trying to collect socio-economic information about communities living in and around forests (see Box 3 for a brief explanation of the types of information which are often collected in such ways by socio-economists working in the forestry sector). The socio-economic impact of forestry development in Suriname is currently unknown and much of the discussion of its potential impacts is based either on experience in other countries or on very little information at all. Given the scale of expansion in the forestry sector in Suriname, this may become more of an issue in the future and skills in using group discussions to collect such information may have to be developed.

[6] They may, however, provide useful leads or contacts for further discussions on a one-to-one basis.

Box 3 Participatory rural appraisal - a technique to collect socio-economic information at the village level

In order to identify the impacts of forestry development on local communities, it is often useful to collect socio-economic information from villages within and around the affected forest areas. Useful information might include variables such as: the economic activities undertaken in each village; the main times of the year when each activity is carried-out; the current use of the forest and other local resources; and information about whether any of the activities generate cash income.

Experience has shown that formal questionnaire-type interviews can be very time consuming in such settings and may produce unreliable results. Individual villagers often find such surveys intrusive and may be unwilling to participate. Also, as individuals they may not have all of the information required or may attempt to answer questions about subjects they really know little about in order to try to please the data collector. However, in a group, villagers are often more confident about answering such questions. Generally, therefore, such information is usually collected in group meetings with local villagers, where the purpose of the survey can be clearly explained and they have the opportunity to discuss amongst themselves what a representative answer to each question might be. Such an approach is often called Participatory Rural Appraisal or PRA.

There are many ways to carry-out a PRA. However, all PRAs tend to have the following similar characteristics. Firstly, considerable time is usually devoted during the meeting to explain the purpose of the survey and to try to address any fears the villagers might have about supplying information. Secondly, simple visual aids such as sketch maps, calendars of activities and charts showing income are often drawn-up to help the respondents (who are generally unfamiliar with record-keeping) to visualise and recall their activities. Thirdly, constant checking and re-checking often takes place as the information is collected and the respondents start to see how it all fits together and can correct any earlier statements they might have made. (A fourth characteristic is that women, who may not feel comfortable speaking-out in a mixed group, are often interviewed in a separate group from the men).

Participatory Rural Appraisal has been used all over the world to try to estimate local uses of the forest and evaluate the impacts of forest development on local economies. It has also been used to identify existing management structures which local communities may have developed, discuss and resolve boundary disputes and identify potential sources of conflict with forest managers. Most importantly however, it can be considered as a first step to consulting local communities about issues which may have a very large effect on them.

Because of the wide range of data required for this study and the lack of existing information about what information might or might not be available in Suriname, it was decided to use an interview approach to collect economic information on the forestry sector. A complete record of discussions held with stakeholders is presented in Appendix 2.

2.2.5 Who collects the data?

The last point that should be considered in any data collection exercise is the question of who should collect the data. Two issues are of major importance: the level of skill required to collect the information and the need for confidentiality.

Generally, it requires a high level of skills to collect information using informal interviews or group discussion techniques. Firstly, the data collector should be technically competent in the subject. If they are, they can ask the right questions and follow-up interesting answers with other questions. They may also have to explain some of the questions to the respondent and should be able to spot inconsistencies in answers and help the respondent clarify what they mean (but not, of course, try to answer the question for them). The second skill required, is an ability to keep the respondent on the subject and supplying information that is of interest. This is generally the most difficult skill to acquire and can only be acquired with practice.

Collecting information with questionnaires or direct measurement generally requires less skill. The skill required for such work can usually be obtained with a little training and some testing with a supervisor present or checking the results later.

The issue of confidentiality can be a major obstacle to collecting sensitive information such as cost and price data. Respondents may understandably be reluctant to supply such information, particularly to government officials or consultants (who they may see as future potential competitors). The only way around this is to use data collectors to collect sensitive information who can present a credible guarantee that the data collected will be passed on anonymously to the government. Many countries use universities or independent research organisations to fulfil this role and this may be an option for Suriname. Another way in which such fears may

be addressed is by involving the industry's associations in the process. For example, in many countries the private-sector forest manager's and processor's organisations are used to collect sensitive information and pass this on to the government. The scope for doing this may, however, be limited in Suriname, because none of the main forest industry associations have an independent secretariat.

2.3 Evaluating the information

The last section discussed the various techniques for collecting economic information about the forestry sector. Once this information has been collected, it can be analysed to examine the various policy issues described in the objectives of the data collection exercise. However, any analysis of such information is only as good as the information collected. Therefore, as part of this analysis, it is also useful to test or evaluate the quality of the data collected. If the data collected is poor or unreliable, this would suggest that a certain amount of caution should be used when making policy recommendations. It may even be necessary to collect more information, in order to produce better advice.

As has already been noted, there is a range of statistical techniques that can be used to evaluate the quality of data collected in any sample or census survey. Indicators commonly used include: the standard errors of each estimate; the response rate to the survey; or just simply the sample size achieved in the survey. However, surveys of economic information often score poorly in terms of these measures (see earlier comments on precision), such that it is often very difficult to calculate whether the information collected is comparatively good or bad. Due to such problems, a number of other measures have been designed to evaluate the quality of economic data and these are briefly discussed below.

2.3.1 Internal consistency

The simplest way to evaluate the quality of a response to an economic survey is to check for internal consistency in the answers given. Extra zeroes or decimal points in the wrong place can often be spotted fairly easily, but other types of mistakes may be more difficult to explain (see Table 2, for examples of inconsistencies which might be encountered and possible explanations - all of these examples were encountered during this study). Internally inconsistent answers can often be overcome by contacting the respondent again and checking the answers with them. If this is not possible it may be necessary to discard the inconsistent answers or sometimes even the whole set of responses from that person.

2.3.2 Convergent validity

After any inconsistencies in the data have been corrected or eliminated, a slightly more rigorous test of the quality of the data collected is to examine whether each respondent has given answers to questions which are either similar to the answers from other respondents in the sample (or any major differences can be explained) or similar to data collected in other studies. If all the answers to a particular question in the survey are about the same, then they pass the test of convergent validity. This test only works, of course, if it would be expected that all the answers should be roughly the same. Thus, for example, wage rates paid for a particular type of forest worker might all be expected to be roughly similar, but product recovery rates might be expected to vary considerably (in which case theoretical validity is a better test - see below).

In the interviews carried-out as part of this study, one piece of information, which showed strong convergent validity, was the amount paid to village captains for permission to cut timber on *HKV*s. All respondents quoted figures of around Sf 3,000/m^3 and this figure is similar to one collected in a separate study (Flaming, 1996). On the other hand, the sawmill export prices quoted by companies for 1997 varied considerably. Some of this variation may be due to differences in markets but, with the incentive to understate export values to avoid paying export levies, the validity of some of this information is questionable.

Table 2 Examples of inconsistencies that may be encountered in economic data and possible explanations

Inconsistency	Possible explanation
A sawmiller states that production is significantly above capacity or that product output is higher than log input volume.	Different measurement units are being used or the sawmiller is obtaining logs from a source not identified in the survey.
A sawmiller reports product prices far below the cost of their log inputs.	The products are priced in US$ and the inputs in Sf.
A sawmiller gives one figure for daily log input and another for yearly input that seems far too low.	The mill is only working for a few days per week.
A forest manager states that they are harvesting several species in their concession but then goes on to give a much more limited range of species that they are using in their sawmill.	Some of the roundwood is being sold or traded with other forest managers and sawmillers.

2.3.3 Theoretical validity

Theoretical validity is a test to examine the quality of answers to questions about variables that might be expected to differ. Thus, for example, transport cost information collected in a survey might be expected to differ, depending on the distance each respondent has to transport their roundwood from the forest to the sawmill. Similarly, expenditure on repairs and maintenance might be expected to be higher for a company with old machinery compared to one with relatively new machinery.

To test for theoretical validity, the answers given in a survey can be compared to variables which might explain differences (also collected in the survey or from elsewhere), to see if any trends or patterns emerge. This can be done either simply by plotting them on a chart, or by using more complicated tools such as regression analysis. Thus, for example, machinery repair and maintenance costs collected in a survey might be plotted against age of machinery, or transport costs might be plotted against distance from forest to mill. Any responses that appear to be well outside the trend (i.e. outliers) should be queried to see if there is any other explanation for why they should be so different.

Given the time available and the amount of information collected locally, not enough data was collected in Suriname to perform such a test on the responses given during the interviews with local sawmillers and loggers. However, a greater amount of information was collected from international sources for some variables and regression analysis was used to refine this information and identify underlying trends that were useful for the analysis (e.g. the calculation of depreciation rates from second-hand machinery prices collected from international sources).

2.4 Recording and storing the information

Given the time and effort involved in collecting economic (and other) types of information on the forestry sector, it is important that this information is recorded and stored in an orderly way, so that it can be passed to others, re-analysed in different ways and used to compare with later surveys. Indeed, one of the major requirements for sustainable forest management is sustained data collection and record storage.

With modern microcomputers is should be possible to store, for an indefinite period, all the information needed to carry-out economic and policy analyses of the forestry sector in Suriname. It is recommended therefore, that some of the information, which is currently held on paper files, should be put into simple spreadsheet databases and updated at regular intervals. In addition to putting all this information onto computer files, it is also important to be able to retrieve it again easily and at short notice. For this reason, it is useful to have some sort of classification or filing system that records or catalogues the location of different types of information. It is equally important to store and catalogue all of *LBB's* other information, such as

books, reports and journals. More detailed recommendations on data storage will be given in: *Section 5.3.1 Information storage and dissemination.*

2.5 Checklist for surveys of economic information

The checklist shown in Box 4 summarises the main components of survey design. Some of the points raised are questions that should be considered as part of the survey planning and design process. Others are activities that will be required to complete the survey. By following the stages shown in Box 4 it should be possible to plan, design and implement reasonably good surveys of economic information under most circumstances.

Box 4 Checklist for surveys of economic information

Stage 1 - Survey planning

1.1 **Identify the objective of the information collection exercise.** What is the policy issue being examined?

1.2 **Identify information needs and availability.** What type of information will be required to meet the objective? What level of detail is necessary? What level of precision will be required? Is any of this information already available from other sources?

1.3 **Select survey methodology.** What resources are available? Will a census be required or will a sample be sufficient? What will be the best way to collect and record this information? Is confidentiality an issue? Who should collect the information? Would it be useful to involve the private-sector industry associations and what role could they play? Draw-up a timetable and budget for the whole exercise. Identify who will be responsible for the various activities (eg. survey manager, fieldwork manager, data entry and analysis).

Stage 2 - Survey design

2.1 **Identify companies or individuals who will be surveyed.** Compile a list of all companies or individuals and stratify this list (if possible). Select the sample (if sampling is being used).

2.2 **Prepare survey materials.** Design questionnaires or data collection sheets, or draw-up a list of questions which will be asked. Are the materials clear and easy to use? Do they cover all the possible responses to each question? Are different measurement units likely to cause a problem? Test the survey materials on colleagues or a small pilot sample to see how well they work. Start to prepare databases or spreadsheets to store all the information which will be collected.

2.3 **Training.** Train data collectors to collect the information using the survey materials. If the data collectors are used to test the materials on a small pilot sample, involve them in improving the materials.

Stage 3 - Survey implementation

3.1 **Scheduling.** Print all survey materials required and provide data collectors with these plus any other necessary equipment. Draw-up a schedule for data collection (eg. give each data collector a list of the people they will be visiting and an outline itinerary for their visits).

3.2 **Fieldwork.** Collect the information required from the sample or list of companies or individuals, using the survey materials already prepared. Report any problems to the fieldwork and survey managers.

3.3 **Data storage.** Finalise the databases or spreadsheets for storing the data. Enter records as they are collected and modify the design of any databases or spreadsheets as necessary. Provide regular reports to the survey manager.

3.4 **Monitoring.** Monitor progress of the survey against budget and timetable. As the data is being compiled, check for accuracy, sampling or measurement bias and validity of responses. Clarify any unexpected or irregular responses with data collectors or with respondents (if possible).

3 INFORMATION COLLECTED LOCALLY IN SURINAME

This section of the report describes the information collected locally in Suriname by the International Consultant (Forest Economist) and counterparts from *LBB*. Very little information about costs and prices in the forestry sector is currently collected on a regular basis in Suriname. Some information is collected on export prices, but in view of the incentive for timber exporters to understate prices to avoid paying *ad valorem* export levies, this information must be treated with caution. All cost and price information is presented for the year 1998 (unless otherwise stated) and prices quoted in US$ have been converted to Suriname Guilders (Sf) at a rate of Sf 650 = US$ 1.

In addition to cost and price data, other types of quantitative information and some qualitative information about the general state of the forest industry in Suriname was also collected during the study. This information is presented at the end of this section.

3.1 Forestry cost information

Local cost information for this study was collected by the *LBB* counterparts before the International Consultant (Forest Economist) arrived in Suriname. Additional cost information was collected during the assignment and as part of the discussions with sawmillers, independent loggers, local communities, forest concessionaires, industry representatives, and local agents of machinery manufacturers (see Appendix 2 for a complete record of these discussions). Cost information collected has been broken down into the following six categories: labour costs; consumable costs; capital costs; contracting costs; levies, taxes and fees; and other miscellaneous costs.

3.1.1 Labour costs in Suriname

The labour cost information shown in Table 3 was collected from one of the large foreign-controlled forest companies operating in Suriname. The only other labour cost information collected was gathered during a discussion with the exploitation manager for *Bruynzeel*, who stated that his harvesting workers were generally paid about Sf 100,000/month (considerably less than the figures presented in Table 3). It is known that *Bruynzeel* probably pay below average salaries (and consequently, probably have low labour productivity rates). However, it is also possible that the foreign-controlled company may have been overstating salaries to avoid criticism.

It was not possible to validate this information against any other sources; therefore the figures presented in Table 3 may be a little on the high side. However, in the absence of any better data, this information was used in the production cost analysis.

Table 3 The level of forest employee salaries reported by one sawmiller

Operation and job title	Salary	Operation and job title	Salary
Management		**Felling**	
Exploitation manager	Sf 200,000/month	Operator	Sf 450/m3
Administrator	Sf 125,000/month	Assistant	Sf 300/m3
Forest inventory		**Skidding/bulldozing**	
Team leader	Sf 120,000/month	Operator	Sf 400,000/month
Tree spotter	Sf 100,000/month	Assistant	Sf 200,000/month
Compassman	Sf 100,000/month	**Loading**	
Tree measurer	Sf 70,000/month	Operator	Sf 400,000/month
Assistant	Sf 50,000/month	Assistant	Sf 200,000/month
Miscellaneous		**Road haulage**	
Cook	Sf 50,000/month	Operator	Sf 250,000/month
Driver	Sf 60,000/month	Assistant	Sf 150,000/month

Source: *LBB*

3.1.2 The cost of consumable items purchased in Suriname

For the purposes of this study, consumables were defined as all raw materials, regularly replaced spare parts and minor pieces of equipment used in forest management and harvesting, including: fuel; oils and greases; filters; undercarriage and tyres; winch cables and chokers; batteries; files; tools; clothing; paints; measuring tapes; machetes; camping equipment and other miscellaneous inventory equipment. Information about the cost of such items was collected from local and international equipment suppliers (presented later) and during discussions with various logging operators.

Table 4 shows the current (1998) prices of fuel, oil and greases used by forest machinery. The government fixes the price of fuel in Suriname, so this cost item is known with certainty. The costs of oil and greases were the same for all local suppliers in Paramaribo. These figures were checked during the interviews with forest managers, who confirmed that they were about right.

Table 4 The cost of fuel, oils and greases

Item	Manufacturer and type	Price and measurement unit	Standardised price (Sf/litre)
Petroleum	Shell - unleaded	Sf 200/litre	200
Diesel	Shell - diesel	Sf 180/litre	180
Oil for petrol engine	Shell - Helix 40	Sf 20,300/pail	812
Oil for diesel engine	Shell - Rotella 40	Sf 17,500/pail	700
Grease	Shell - Alvania	Sf 37,200/pail	1,488
Hydraulic fluid	Shell - Telus 37	Sf 18,100/pail	724
Transmission fluid	Shell - Donax TG	Sf 26,700/pail	1,068
Gear oil	Shell - Spirax HD40	Sf 21,200/pail	848

Source: Various suppliers in Suriname

Information about spare parts was slightly more difficult to collect. Unfortunately, the local supplier of spare parts for most of the forest machinery operating in Suriname could not (or would not) supply replacement part price information without a machine serial number. However, some of the logging managers interviewed were able to provide this information for the current year or for last year. Data taken from their records is shown in Table 5.

Table 5 The cost of filters, tyres, undercarriage and cables

Item	Type of machine	Quoted unit price	Unit price in Sf
1998 prices			
Oil filter	All types	Sf 3,000 - Sf 5,000	3,000 - 5,000
Fuel filter	All types	Sf 6,000 - Sf 8,000	6,000 - 8,000
Air filter	All types	Sf 6,000 - Sf 8,000	6,000 - 8,000
Tyre + inner tube	Skidder	US$ 3,200	2,080,000
1997 prices			
Tyre	Skidder	US$ 2,200	1,430,000
Inner tube	Skidder	Sf 120,000	120,000
Tyre	Loader	US$ 2,500	1,625,000
Inner tube	Loader	Sf 150,000	150,000
Tyre	Log truck + trailer	US$ 565	367,250
Inner tube	Log truck + trailer	Sf 21,000	21,000
Tyre + inner tube	Dump truck	Sf 290,000	290,000
Tyre + inner tube	Crew bus	Sf 290,000	290,000
Tyre	Grader	US$ 380	247,000
Inner tube	Grader	Sf 21,000	21,000
Complete undercarriage	Small bulldozer (D6)	US$ 14,000	9,100,000
Complete undercarriage	Large bulldozer (D8)	US$ 23,000	14,950,000
Blade	Grader	Sf 88,000	88,000
Winch cable (250m)	Skidder	Sf 1,125,000	1,125,000
Choker	Skidder	Sf 7,500	7,500
Battery (150 amp)	Bulldozer	Sf 58,000	58,000
Battery (120 amp)	Skidder/loader/grader/truck	Sf 58,000	58,000

Source: Discussions with forest managers

Table 6 shows the current (1998) list prices of various minor items used in forest inventory and harvesting, such as: replacement parts for chainsaws; small tools; and safety equipment. This information was collected from a number of local equipment suppliers.

In addition to the items listed in Table 6 the forest inventory consultant also collected more information about forest inventory and camping equipment prices (see: Cox, 1998). This was also used to calculate consumable costs, but has not been presented here in order to save space.

It is interesting to note that many pieces of forest inventory and safety equipment are not generally available in Suriname and have to be imported. The list prices of such items from international suppliers were also collected as part of this study and are presented later.

Table 6 List prices of various minor items used in forest inventory and harvesting

Item	Supplier A	Supplier B	Supplier C	Supplier D
Forest inventory equipment				
Machete				7,475
Compass				12,970
Measuring tape - 30m		7,960		
Measuring tape - 10m	4,370			
Diameter tape - 3m	1,970	2,060		
Clipboard				3,000
Fluorescent paint (1 gallon)		8,795		
Paintbrush		305		
Felling equipment				
Triangular file			2,000	
Round file			548	
Flat file			3,500	
Chainsaw chain			12,400	
Chainsaw bar			56,100	
Chainsaw spark plug			1,200	
General forest camp equipment				
Axe		7,435		
Hand axe	4,850			
Equipment sledge		5,255		
Rope (4mm x 50m)				13,000
Hammer	5,100			
Nails (1 kg)		500		
Hammock				17,500
Jerrycan (5 litre)	1,950			
Jerrycan (10 litre)		3,000		
Jerrycan (20 litre)		4,300		
Oil lamp	33,250	20,600		
Clothing and safety equipment				
Boots				35,750
Safety helmet	4,000			
Gloves		3,150		
Raincoat			6,800	

Source: Various equipment suppliers in Suriname

3.1.3 The cost of capital equipment purchased in Suriname

The cost of major pieces of capital equipment is shown in Table 7. These figures were obtained from *Surmac* (the local Caterpillar dealer) and other machinery dealers. *LBB* also collected this information in 1994, and these figures are given in Table 7 for comparison. Three points are worth noting. Firstly, the costs presented here are quotations for new pieces of equipment. Most forestry equipment in Suriname is very old, so the depreciated value of equipment currently being used in Suriname is probably much less than this. Secondly, the cost of new machinery in Suriname appears to be roughly twice the cost of the same sort of equipment in the USA (the main source of logging equipment used in Suriname). Finally, it should be noted that the cost of a logging truck collected for this analysis is the cost of a flatbed truck, rather than a proper truck designed to carry logs. Most forestry operators in Suriname use a variety of old converted flatbed and light freight trucks

to transport their roundwood. The price of these vehicles is only slightly less than the price of a proper logging truck, but they have a much lower carrying capacity (10 m^3 - 20 m^3, rather than 30 m^3 - 40 m^3).

Table 7 Recent estimates of machinery costs

Item	Manufacturer and model	Price in 1994 (in US$)	Price in 1998 (in US$)
Bulldozer	Caterpillar D8	325,000	490,000
Bulldozer	Caterpillar D7	250,000	n.a.
Bulldozer	Caterpillar D6	n.a.	280,000
Bulldozer	Caterpillar D4	n.a.	120,000
Wheeled skidder	Caterpillar 528B	200,000	210,000
Wheeled loader	Caterpillar 950F	300,000	245,000
Grader	Caterpillar 140H	200,000	240,000
Logging truck + trailer	n.a.	200,000	n.a.
Dump truck	n.a.	175,000	n.a.
Chainsaw	Stihl 070	n.a.	c. 1,000
4WD Pick-up truck	various	n.a.	c. 25,000

Source: *Surmac* machinery distributor and other suppliers

The only other major capital cost to be considered is the cost of building a logging camp. Currently, only four forest operations in Suriname have permanent camps in the forest and information about the cost of building such camps was not available. As forest exploitation in Suriname moves into more remote areas, it may be necessary for companies to start to build permanent camps to house employees, carry-out repairs to machinery and perform some administrative and planning functions. Therefore, estimates of these costs should be included in any appraisal of forestry development in the interior of the country.

3.1.4 The average age of machinery in Suriname

The age of the machinery currently working in the forest sector in Suriname is an important variable, because it determines the capital value of equipment being used[7] and it can have a major impact on machine availability and repair costs. This is particularly true in the case of Suriname, where much of the machinery currently being used in the forest is very old.

With the exception of chainsaws and pick-up trucks, all of the small and medium-scale loggers and sawmillers said that their equipment was at least 10 years old and several said it was 20 years old. Only *Bruynzeel* appeared to have some equipment purchased within the last five years. Even the large foreign-controlled logging operations, which have imported a lot of their equipment, have imported mostly second-hand equipment.

Based on a general impression of the forest sites visited and interviews with sawmillers and forest managers, the average ages of machinery presented in Table 8 are the author's best estimates of the ages of various pieces of forest machinery currently working in the forestry sector in Suriname.

[7] It was decided to use a depreciated replacement value method to estimate the current value of capital equipment being used in the forest, so the age of the equipment being used was crucial for this calculation.

Table 8 Approximate estimated age of forest machinery currently working in Suriname

Machine	Scale of forest operation		
	Large logging operation	Medium-sized sawmill or concession	Small-scale logging operation
Bulldozer for road building	10 years old	20 years old	n.a.
Bulldozer for skidding	8 years old	15 years old	n.a.
Wheeled skidder	7 years old	12 years old	15 years old
Wheeled loader	11 years old	15 years old	n.a.
Logging truck + trailer	5 years old	10 years old	n.a.
Chainsaw	2 years old	2 years old	2 years old
4WD Pick-up truck	2 years old	2 years old	5 years old

Source: Author's own estimates based on *Bruynzeel's* records and discussions with other forest managers

3.1.5 Contracting costs in Suriname

As an alternative to owning their own machinery, many forest managers use contractors to perform some of their roundwood production operations. During discussions with forest managers, it was discovered that contractors are frequently used to transport roundwood by road and by barge. Smaller forest logging operations also use contractors to extract and load timber. Table 9 shows the range of contracting costs mentioned during discussions with forest managers.

Table 9 Current costs of contracting-out various forest operations

Operation	Contract costs per m^3	
	Roundwood for the domestic market	Roundwood for the export market
Felling (with own chainsaw)	Sf 2,000	n.a.
Felling (labour cost only)	Sf 700 - Sf750	Sf 700 - Sf750
Skidding	Sf 8,000	n.a.
Loading	Sf 1,500 - Sf 3,250	US$ 5.00
Unloading	Sf 2,000 - Sf 4,000	US$ 10.00
Road transport	Sf 50/m^3/km - Sf 180/m^3/km	n.a.
Water transport	Sf 30/m^3/km - Sf 100/m^3/km	US$ 0.20/m^3/km

Source: Discussions with forest managers

The felling cost of Sf 700/m^3 - Sf 750/m^3 (labour only) and Sf 2,000/m^3 (tree feller with their own chainsaw) was mentioned by several managers and matched figures collected elsewhere by *LBB*. Two small logging operations quoted a contract skidding cost of Sf 8,000/m^3. However, these operations were fairly close to each other, so they may have been using the same contractor. It is not known whether this is representative of contract skidding costs throughout Suriname, but discussions with *LBB* and others in the industry suggested that it was probably about right.

Loading and transport costs varied widely, depending on location, the distance transported and the type of timber being loaded and transported. Near Paramaribo, road transport and loading costs appeared to be cheaper, possibly because there is more competition to provide these services. Figures quoted were around Sf 1,500/m^3 for loading and Sf 50/m^3/km - Sf 100/m^3/km for road transport. However, the highest unloading cost mentioned in discussions was for unloading at the quayside in Paramaribo (Sf 4,000/m^3). Loading and transport costs in areas distant to Paramaribo were about twice the cost of the same operations in areas close to Paramaribo. In-forest loading costs were also slightly more than the cost of unloading, because of the additional cost of transporting the loader to the forest. Water transport costs varied widely, for no apparent reason.

The other interesting point raised in discussions was that contractors charge higher rates and want paying in US$ if they sense that the timber they are handling is for the export market (e.g. export-grade logs and hewn squares). Thus, for example, a crane owner in Paramaribo will charge Sf 4,000/m^3 for unloading at a sawmill in Paramaribo, but charge US$ 10/m^3 for unloading at the harbour. This is a good example of rent seeking on the part of the crane owner and suggests that competition to provide such services must be very limited such that they can act in this way.

3.1.6 Levies, taxes and other fees paid in Suriname

There are currently two sets of specific taxes and levies charged on the production and export of forest products in Suriname. The first is a complex array of concession fees, roundwood and minor forest product royalties and miscellaneous charges levied on production, transportation and grading of roundwood and forest products. These are shown in Table 10. The second is a rather simpler set of *ad valorem* (i.e. percentage-based) export levies charged on the value of roundwood and forest products exported from Suriname. To avoid under-reporting of export values, minimum values for each product are also specified and these, along with the export tariffs, are shown in Table 11.

Table 10 Current forest levies and other charges in Suriname

Type of fee	Level of fee	Remarks
Concession fee	Sf 0.02/ha/year	
Royalty (Retribution) - Class A species	Sf 7.00/log	
Royalty (Retribution) - Class B species	Sf 2.00/log	
Extra royalty in exploration licence areas	Sf 0.10/m^3	Reduced from Sf 0.15/m^3 in December 1996
Road use fee	Sf 1.50/m^3	Production: less than 500 m^3/year
Road use fee	Sf 1.25/m^3	Production: 500 m^3/year- 1,000 m^3/year
Road use fee	Sf 1.00/m^3	Production: 1,000 m^3/year- 1,500 m^3/year
Road use fee	Sf 0.75/m^3	Production: 1,500 m^3/year- 2,000 m^3/year
Road use fee	Sf 0.50/m^3	Production: more than 2,000 m^3/year
Bridge fee	Sf 25.00/m^3	Saron bridge
Bridge fee	Sf 25.00/m^3	Carolina bridge
Grading fee (within Paramaribo)	Sf 200/m^3	Increased from Sf 1.50/m^3 in December 1996
Grading fee (outside Paramaribo)	Sf 300/m^3	Increased from Sf 2.50/m^3 in December 1996
Hewn squares	Sf 0.30/m^3	
Bean poles	Sf 0.01/piece	
Fence posts	Sf 0.25/piece	Fence posts longer than 2.4 m
Fence posts	Sf 0.15/piece	Fence posts shorter than 2.4 m
Scaffolding poles	Sf 0.10/piece	
Sleepers	Sf 0.50/piece	
Firewood	Sf 0.25/m^3	Levy charged on the basis of stacked m^3
Charcoal	Sf 0.10/sack	
Sawnwood	Sf 5.00/m^3 (product)	

Source: *LBB*

The Minister of Natural Resources and Minister of Finance have joint responsibility for setting these levies. All levies are paid to *LBB* and transferred directly to the Ministry of Finance.

There is a provision in the 1992 Forest Management Act (Government of Suriname, 1992, or see Cullinan (1996) for an annotated English translation of the Act), that the forest levies should be revised at least every five years. However, many of these levies have not changed by much for many years. Indeed, during the last set of revisions in 1996, the export levy (and the schedule of minimum export prices) was reduced twice and the Exploration Licence Royalty was reduced. Only the grading fee was increased. There is currently

(November 1998) a proposal to significantly increase these levies, but this has not yet been entered into the official gazette. Past attempts to raise the levies have failed to materialise (see, for example, Ministry of Natural Resources, 1998) and, given the recent history with setting forest levies, it remains to be seen whether these increases will be materialise.

Table 11 Current minimum export values and *ad valorem* export levies in Suriname

Product	**Export levy**	**Minimum export value**			
Roundwood - Class A species	5% of export value	US$ 90/m^3			
Roundwood - Class B species	5% of export value	US$ 75/m^3			
Hewn squares (5 species)	5% of export value	US$ 175/m^3			
Hewn squares (3 species)	5% of export value	US$ 130/m^3			
Sleepers	5% of export value	US$ 130/m^3			
Hewn round poles	5% of export value	US$ 125/m^3			
Pressure-treated poles	5% of export value	US$ 125/m^3			
Letterhout (snakewood) - A quality	5% of export value	US$ 2.50/kg			
Letterhout (snakewood) - B quality	5% of export value	US$ 1.75/kg			
Sawnwood		**1st quality**	**2nd quality**	**3rd quality**	**4th quality**
Class 1 species	no tariff	US$ 350/m^3	US$ 300/m^3	US$ 200/m^3	US$100/$m^3$
Class 2 species	no tariff	US$ 270/m^3	US$ 250/m^3	US$ 175/m^3	US$125/$m^3$
Class 3 species	no tariff	US$ 175/m^3	US$ 150/m^3	US$ 125/m^3	US$90/$m^3$
Other sawn products		**Flooring and mouldings**	**Prefabricated houses**	**Doors and furniture**	**Souvenirs**
Class 1 species	no tariff	US$ 420/m^3	US$ 525/m^3	US$ 700/m^3	US$ 1,400/m^3
Class 2 species	no tariff	US$ 324/m^3	US$ 405/m^3	US$ 540/m^3	US$ 1,080/m^3
Class 3 species	no tariff	US$ 210/m^3	US$ 263/m^3	US$350/$m^3$	US$ 700/m^3
Plywood and veneer sheets		**1st quality**	**2nd quality**	**3rd quality**	**4th quality**
Veneer sheets **[check]**	no tariff	US$ 275/m^3	US$ 250/m^3	US$ 225/m^3	n.a.
Core plywood (9mm and over)	no tariff	US$ 275/m^3	US$ 250/m^3	US$ 225/m^3	n.a.
Core plywood (under 9mm)	no tariff	US$ 325/m^3	US$ 300/m^3	US$ 275/m^3	n.a.
Face plywood **[check]**	no tariff	US$ 325/m^3	US$ 300/m^3	US$ 275/m^3	n.a.
Cellular board	no tariff	US$ 325/m^3	US$ 300/m^3	US$ 275/m^3	n.a.

Source: *LBB*

The most significant point about the export tariff and minimum export values set for the export of roundwood and forest products, is that exporters are required to pay these levies in US$ and surrender the value of the exports in US$ to the Central Bank of Suriname. The Central Bank then converts this money into Suriname Guilders at the official exchange rate.[8] This has not been much of a problem until recently, when the market exchange rate has diverged considerably from the official exchange rate. This has, in effect, imposed a massive tax on the export of roundwood and forest products.

For example, Table 12 shows the divergence between official and market exchange rates experienced since the beginning of 1998. Currently the official exchange rate is more than 40% below the market exchange rate, so exporters effectively lose over 40% of their export revenues when they are converted back into Suriname Guilders at the official exchange rate. There is a provision in the import and export regulations that should enable exporters to also obtain foreign currency at the official exchange rate to import the raw materials and capital goods they need to produce their goods. If this worked effectively, then all the analysis in this study could be carried-out using the official exchange rate. However, a common complaint within the

[8] Until recently, exporters were even required to submit these amounts before they could obtain an export licence (the Foreign Exchange Surrender Requirement). This significant non-tariff barrier to trade was revoked in 1998 (Mhango, 1998) and now exporters can pay the foreign exchange after thay actually receive it.

forestry sector was that most of the foreign exchange collected is given to traders (and, consequently, subsidises domestic consumption) rather than the productive sectors of the economy. All companies in the forestry sector reported that they had to obtain their foreign currency at the market exchange rate to purchase imported items such as spare parts, tools and machinery. Thus, they effectively pay for any imports they need at a rate of Sf 710 to the US$, but can only get back Sf 396 to the US$ if they export their products. This is a major barrier to trade and has discouraged many of them from exporting their products.

Table 12 The divergence between official and market exchange rates in Suriname in 1998 and the additional "taxation effect" this divergence has on exports of roundwood and forest products.

Exchange rate and effect	January	April	July	October
Official exchange rate (Sf to the US$)	396	396	396	396
Market exchange rate (Sf to the US$)	440	460	550	710
"Taxation effect" (% of export revenue lost)	10	14	35	44

Source: Larsen (1998)

In addition to the specific export levies charged on the value of roundwood and forest products exported from Suriname, there are also the following two general export levies which must also be paid to the Ministry of Finance:

the statistical levy (*statistiekrecht*) = 2.00% of FOB value in US$; and

the export consent levy (*consentrecht*) = 0.01% of FOB value in US$.

These levies are charged in US$ and there are also similar levies on imports.

The only other major tax relevant to this study is the corporate tax rate. The corporate tax rate in Suriname is currently 45% of annual profits. However, discussions with many individuals in the sector suggested that corporate tax collection was not very well developed in Suriname. Procedures for estimating allowable expenses such as depreciation do not seem to be well developed and it was reported that probably many other actions to evade taxes, such as transfer pricing and false invoicing, are common in the country. Generally, it seems that payment of corporate taxes is largely a matter of negotiation between individual companies and tax inspectors. Thus, while the calculations within this study have assumed that corporate taxes are collected effectively, the real level of corporate tax collection may in reality be much lower.

3.1.7 Estimates of other miscellaneous forestry costs in Suriname

There are a range of other miscellaneous costs which some producers in the forest sector have to pay, including: port charges; interest on loans; social costs; insurance premiums; repair costs; and additional processing costs for semi-processed products such as hewn squares. In important consideration is also the level of profit which companies in the forestry sector should be allowed to retain after they have paid all forestry levies (i.e. the "normal" level of profit). A brief description of each of these items is given below.

Port charges are paid by all producers exporting roundwood and forest products. The charge for loading and unloading at the port in Paramaribo is: US$ 4.42/m^3 and the charge for using the port is US$ 1.50/m^3 (source: *LBB*). These charges are paid to the port authority. It is not known whether the other major ports in Suriname charge different fees, but it is thought that this is unlikely. Anyway, nearly all roundwood and forest products exported from Suriname go through the port at Paramaribo.

Interest charges vary widely depending upon whether the loan is in US$ or Sf and the financial record of the borrower. Loans in US$ are available from overseas banks (and some local banks) at interest rates of around 15% - 20% per annum. However, these are unattractive because of the exchange rate differential (i.e. they obviously have to be repaid in US$ and, with the exchange rate differential, the cost of servicing such a loan is about 80% higher than if exporters did not have to

convert all of their US$ earnings in Sf at the official exchange rate). The interest rates for loans in local currency are between 35% and 50% and most local banks expect a very rapid payback period. Consequently, very few companies in the forestry sector currently have any outstanding loans and local banks mostly lend to traders, where quick profits and early repayment can be realised.

Social costs include the cost of medical care, sickness benefit and, sometimes, housing and other benefits, paid to employees. Often, some of these benefits (e.g. medical care) cover the employee's whole family. Discussions with forest managers suggested that these costs are roughly an additional 40% on top of direct labour costs. However, it is not known exactly how many employers actually provide these benefits. Certainly, it seems unlikely that they are paid to members of local communities working for logging operations. But, some of the larger operations said that they pay for visits by medical workers to their forest areas and some (e.g. *Bruynzeel*) even have clinics at their forest camps.

Insurance costs include the cost of insuring buildings and equipment. *LBB* estimates that annual buildings insurance premiums are roughly 7.5% of the building's replacement value and annual equipment insurance premiums are equal to 10% of the replacement value of the equipment. These costs seem rather high, for example the annual insurance cost of the FAO Project's 4WD pick-up trucks is only 3.5% of their value. This figure is probably a better indication of the cost of equipment insurance. As with social costs, it is not known how many forest operations actually insure their buildings and equipment, but it is suspected that probably very few do.

Repair costs include the cost of all major repairs, but exclude the regular replacement of items such as filters, undercarriage, tyres, and winch cables (which have been included elsewhere as consumable items). Ideally, repair costs should be split into parts and labour costs, because the former are likely to be mostly items paid for in US$, while the latter will be paid in local currency. Only one forest operator had this information readily available and provided the information shown in Table 13. It is not known whether these costs are typical for the whole of the forest sector in Suriname but, given the current condition of much of the machinery seen, it is suspected that many operators probably spend a similar amount on maintenance and repairs.

Table 13 Repair cost budget for 1998 for one forest logging operation in Suriname

Machine	Annual repair cost (in Sf per machine)		
	Parts	Labour	Total
Bulldozer for road building	1,200,000	900,000	2,100,000
Bulldozer for skidding	1,200,000	900,000	2,100,000
Wheeled skidder	1,200,000	900,000	2,100,000
Wheeled loader	1,200,000	900,000	2,100,000
Logging truck + trailer	1,000,000	900,000	1,900,000
Light truck/crew bus	750,000	50,000	800,000
4WD Pick-up truck	500,000	50,000	550,000

Source: Interview with one local logging company

Additional processing costs include items such as the cost of debarking poles sold as telegraph poles, cutting hewn squares and treating poles with preservative (sawnwood production costs are discussed separately below). Most of these costs are thought to be negligible, except for the cost of cutting hewn squares and treatment with preservative. Discussions with one forest manager producing hewn squares, suggested that the additional cost of cutting hewn squares is about Sf 10,000/m^3. Treatment costs are unknown, but are thought to be about roughly the same as this.

Normal profit is the level of profit that is just sufficient to make investing in the forestry sector attractive to entrepreneurs. The level of normal profit will depend upon a range of factors such as the

level of profits generally earned in other sectors of the economy and the risk associated with operating in the forestry sector. Identifying the level of normal profit is important for the calculation of forest levies because this variable has a major effect on deciding how much of the economic rent from forestry activities should be taken by the government (as owners of the resource) and how much should be left for the companies working in the sector. If it is decided that the normal profit level should be quite high, then this would suggest that forestry levies should be set at lower rates than if a lower level of normal profit was thought to be acceptable. Discussions with a range of stakeholders in the sector suggested that a rate of 20% was probably an acceptable level of normal profit for the forestry sector in Suriname.

3.2 Rates of materials consumption and productivity in Suriname

The previous section gave a very detailed description of the cost of all the various inputs used in forest management and harvesting activities. Two other important pieces of information are required to calculate the total production cost per m^3 of roundwood or product and these are: the rates of consumption of some of these items (e.g. consumables and capital costs); and the rates of productivity for each activity.

Very little information is available about the current rates of materials consumption and productivity in the forestry sector in Suriname. The information which was collected was thought to be quite unreliable because there currently appears to be overcapacity and overmanning in much of the sector (i.e. the rates suggested by managers are probably all rather low and would be much higher if there was a greater demand for the sectors products and the sector was managed more efficiently). Another concern was that very few managers really seemed to have much of an idea about what their productivity rates and materials consumption rates actually were. However, the information collected locally is presented below as an indication of raw materials consumption and productivity based on current practices. Indications of what could be achieved are presented in: *Section 4.2 Manufacturer's estimates of rates of materials consumption*.

3.2.1 Labour and machine productivity in Suriname

The rate of productivity achieved in forest operations is a combination of four factors: the number of hours worked each year; the availability of machinery (i.e. the time it is working and not broken-down), the utilisation rate (i.e. the time it has work to do and is not waiting for some other part of the production process to be completed) and the rate at which it can do the job (e.g. the speed and capacity of trucks used to haul timber). All of these factors can be influenced by different variables. For example, machine availability will be affected by the age of machinery, how well it is maintained and the length of time it takes to complete repairs. Utilisation will depend on how well the operation is managed and whether there are any "bottlenecks" in the production process. The rate at which each piece of machinery can actually perform its function will also depend on the age of the machinery and other factors such as the skill of the operator, the difficulty of the job, and the capacity of the machine.

Table 14 gives some estimates of current productivity in the forestry sector in Suriname, based on discussions with forest managers and site visits. The table assumes an 8-hour working day and presents overall productivity per crew or machine, per hour. The large forest operations appear to have the highest overall rates of productivity because, due to the scale of their operations, they are able to schedule production more efficiently and avoid "bottlenecks" in the production process. Medium-sized operations are not far behind and are only generally less productive because their rate of production tends to be limited by the availability of skidders. Small-scale operators are the least productive because they often do not work a full 8-hour day.

Table 14 Estimates of hourly productivity in the forestry sector in Suriname

Activity	Scale of forest operation		
	Large logging operation	Medium-sized sawmill or concession	Small-scale logging operation
Forest inventory	3 ha/hour/team	n.a.	n.a.
Felling	3.5 m^3/hour/crew	2.0 m^3/hour/crew	0.5 m^3/hour
Skidding	5.0 m^3/hour/machine	4.0 m^3/hour/machine	n.a.
Loading	10.0 m^3/hour/machine	4.0 m^3/hour/machine	n.a.
Road transport (proper logging truck)	35.0 m^3 @ 13 km/h	n.a.	n.a.
Road transport (typical truck used in Suriname)	10.0 m^3 @ 13 km/h	10.0 m^3 @ 13 km/h	10.0 m^3 @ 13 km/h
Water transport	250.0 m^3 @ 6 km/h	250.0 m^3 @ 6 km/h	250.0 m^3 @ 6 km/h

Source: Author's own estimates based on site visits and discussions with forest managers

With the exception of the transport figures, all the figures presented in Table 14 are all generally well below what might be expected at a larger scale of operations. With respect to road transport productivity, the current use of small light freight and flatbed type trucks to haul timber also dramatically reduces the productivity of road transport compared with what it could be if proper logging trucks (with a higher capacity) were used.

3.2.2 Consumption of consumable items

Only one logging operation had detailed information about the consumption of fuel, oil and other lubricants, and spare parts (such as filters, tyres and winch cables). The rates of consumption of these items was roughly half the rate specified by the manufacturer, but the manager also suggested that his machines were probably only utilised for half of the time that they could be. Thus, in terms of actual working hours, rates of consumption in Suriname are probably the same as specified by the machinery manufacturers (see: *Section 4.2 Manufacturer's estimates of rates of materials consumption and productivity*).

With respect to other materials, such as: protective clothing; small tools; and inventory equipment, it was suggested that most of these items would be either lost or broken on a fairly regular basis and would have to be replaced every year.

3.3 Sawmill production cost information

In order to calculate the economic rent from forest operations, it is also useful to have information about the cost of producing value-added products such as sawnwood and plywood. This is because, if mills are buying roundwood at very low prices, there may not appear to be very much economic rent in the roundwood production sector. But, at such prices, the economic rent from harvesting the roundwood may actually be being captured in the processing sector. Therefore, in order to properly calculate the economic rent in the sector, it is necessary to calculate back from the product selling price (i.e. by subtracting its production costs), the processing sector's ability to pay for the roundwood it consumes (which may be more than they are currently paying).

Ideally, the level of detail of information collected about processing costs should be as great (if not greater) than that already shown above. However, due to time constraints, it was only possible to collect very limited information about these costs. (Part of the problem was also that many sawmillers seemed unwilling or, more likely, unable to provide this information). The information presented below is based on a few observations from interviews with sawmillers and some information that *LBB* already had collected. This can be

considered as only a rough approximation of the current level of processing costs, but is probably good enough for a first attempt at estimating the sawmill sector's ability to pay for roundwood.[9]

3.3.1 Sawmill labour and consumable costs in Suriname

Information on sawmill labour and consumable costs in Suriname were available from three sources. Firstly, two sawmillers interviewed had some idea of what their total variable production costs (i.e. labour and consumable costs) were. Secondly, LBB had a financial proposal for a sawmill which had recently been presented to them by a potential investor (as now required under the 1992 Forest Management Act). This is, of course, only a proposal and there is no guarantee that the costs contained within it are realistic. Indeed, some parts of the proposal looked unreliable. However, the variable costs looked "reasonable". The third source of information was employment figures given by most of the sawmillers interviewed. Discussions with sawmill managers and *LBB* staff indicated what the likely wage rates are in sawmills in Suriname (Sf 300,000/month for the manager and sawdoctor and Sf 100,000/month for general labourers). These, along with the employment and production figures collected during the interviews, were used to estimate the labour component of sawmill production costs.

A summary of all this information is given in Table 15 (the sawmill numbers refer to the order in which they were visited - see: *Appendix 2*). Assuming that some workers are "fixed" (i.e. their employment doesn't vary with the level of production in the sawmill - e.g. the manager, the sawdoctor and the account clerk), the variation in unit labour costs can be partly explained by differences in capacity utilisation. For example, sawmill number 1 (with the highest unit labour cost) is working at 50% capacity, but sawmill number 4 (with the lowest cost) is working at 80% capacity. Product quality may also account for some of the difference (sawmill number 1 is concentrating on producing export quality material while sawmill number 4 sells only to the domestic market).

Table 15 Estimates of sawmill labour and consumable costs (per m^3 of sawnwood production)

Sawmill	Number of employees	Approximate total annual labour cost	Annual production of sawnwood	Unit labour cost	Total unit production cost
Number 1	50 FT	Sf 64,800,000	1,600 m^3	Sf 40,500/m^3	n.a.
Number 2	10 FT + 10 PT	Sf 19,680,000	750 m^3	Sf 26,000/m^3	n.a.
Number 4	18 FT	Sf 26,400,000	2,400 m^3	Sf 11,000/m^3	n.a.
Number 5	30 FT	Sf 40,800,000	1,275 m^3	Sf 32,000/m^3	n.a.
Number 6	n.a.	n.a.	275 m^3	n.a.	US$ 45/m^3 - US$ 70/m^3
Number 7	31 FT	Sf 44,400,000	2,500 m^3	Sf 17,760/m^3	n.a.
Number 8	16 FT	Sf 24,000,000	1,010 m^3	Sf 23,750/m^3	n.a.
Number 9	n.a.	n.a.	1,740 m^3	n.a.	Sf 25,000/m^3 - Sf 30,000/m^3
Proposal	n.a.	n.a.	n.a.	US$ 41/m^3	US$ 62/m^3
Average	n.a.	n.a.	n.a.	Sf 25,000/m^3	Sf 35,000/m^3

Source: Interviews with sawmillers and a project proposal submitted to *LBB*

In the absence of any better information, the average presented at the bottom of this table could be used as a rough indication of unit labour and consumable costs in the sawmilling industry. This would indicate that labour costs might be around Sf 25,000/m^3 and consumable costs a further Sf 10,000/m^3 to give a total cost of Sf 35,000/m^3. Costs would be higher than average if a sawmill is producing well below capacity or

[9] The information given here is limited to sawmill production costs. Ideally, the cost of plywood production should also be collected and analysed to investigate the amount which plymills could afford to pay for their logs. However, there is currently only one plymill in Suriname and it accounts for a relatively small share of roundwood production. Thus, given the time constraints for this assignment, this part of the analysis was not pursued.

producing a higher value product (e.g. export sawnwood, mouldings or flooring) and less than average if the opposite were true.

3.3.2 Sawmill capital costs in Suriname

Sawmill capital can be roughly divided into three types of assets: the cost of buildings (including site preparation, engineering and connection to utilities); the cost of stationary equipment in the mill (e.g. gangsaws, planers, edgers, cranes and log carriages); and the cost of mobile equipment (e.g. loaders, fork-lift trucks, freight trucks and 4WD pick-up trucks). In addition to these major items, a sawmill will also usually carry a stock of spare parts, logs and unsold products, which can be considered as another capital asset (working capital).

The cost of mobile equipment has already been discussed above (most of these items are similar to those used in the forest and would thus, be expected to cost roughly the same). A little information about the cost of stationary equipment was collected during discussions with sawmill managers, but many had little information to offer because it has been a long time since most sawmills in Suriname last purchased any major pieces of equipment. The only indication of building costs was contained in the proposal to build a new sawmill submitted to *LBB*.

Based on the proposal submitted to *LBB*, the cost of building a fairly large sawmill in Suriname (say, around 30,000 m^3 annual roundwood intake) would appear to be around US$ 45/m^3 of roundwood input capacity. However, most sawmills in Suriname are generally smaller than this, so they may have cost more to construct (in terms of cost per m^3 input capacity) when they were first built.

Four pieces of information were collected about the costs of stationary equipment. The first sawmiller visited said that he had just installed a sawdoctoring unit in his mill at a cost of around US$ 300,000. This included all the equipment necessary to maintain a wide range of bandsaws, gangsaws and edgers. He also said that he had just bought a one-year old vertical bandsaw at a cost of US$ 50,000 and expected to spend about the same amount again, installing it in his mill. The latter figure was confirmed in discussions with the last sawmiller visited, who stated that all of his major pieces of equipment would today cost between DM 60,000 and DM 100,000 (equal to around US$ 35,000 - US$ 55,000) to replace, depending on the type of equipment (e.g. less for planers and edgers but more for gangsaws and bandsaws). He also stated that it generally cost about as much to install the equipment as it did to purchase it. The last piece of information was taken from the proposal to build a new sawmill submitted to *LBB*, where it was stated that the complete installation of all stationary equipment for the whole mill, would cost around US$ 520,000.

As with all the capital equipment used in forest operations, the average age of sawmilling machinery in Suriname is very old. Thus, the depreciated replacement value of equipment should be used in any calculation of sawmill profitability. However, sawmilling equipment is likely to depreciate at a much slower rate than forest machinery, so a different depreciation rate should be used. These issues will be considered further in the calculation of the average sawmill's ability to pay for its roundwood input.

3.3.3 Sawmill product recovery rates in Suriname

The last major factor, which should be considered in estimating a sawmill's ability to pay for its roundwood input, is the product recovery rate in the sawmill. Obviously, if a sawmill can produce 1 m^3 of product from 2 m^3 of roundwood, it can afford to pay more for its roundwood than if it needs 3 m^3 of roundwood.

A full description of the current state of the sawmilling industry in Suriname is given in: *Section 3.5.2 Sawmills and traders in forest products in Suriname*. The information collected about sawmills in Suriname suggested that the current average product recovery rate is about 43%. However, there is considerable variation within the sector and this estimate is far from certain. Indeed, many observers felt that it was probably too high and that a recovery rate of 33% might be closer to what is achieved in reality.

3.4 Price information

Price information was collected during the study, for a range of product types. Domestic roundwood price information was collected entirely from interviews with sawmillers, loggers and forest managers. Suriname does not currently have any public auctions of roundwood, *LBB* do not sell any roundwood, nor are there any mandatory requirements for companies in the forest industry to provide price information (except for exported roundwood and wood products). Thus, this was the only way to collect this information. Domestic wood product prices were collected from published list prices and advertisements produced by one medium-sized sawmill, one large sawmill and a timber trader operating in Paramaribo. Export roundwood and wood product prices were collected from *LBB* statistics.

3.4.1 The value of different timber species

Most of the people interviewed stated that the prices obtained for roundwood and wood products varied considerably with species, quality[10] and local market conditions. So, before presenting the price data collected as part of this study, it is useful to present a short description of the relative value of the different timber species present in Suriname.

The last major forest inventory of Suriname (FAO, 1975) lists 52 commercial species, 48 potentially commercial species, 24 possibly commercial species and 68 other species. Of these, at least six of the potentially commercial species and one of the possibly commercial species are now harvested in significant volumes. By using local or trade names[11], the number of commercial species groups(including the newly commercial species) can be reduced to around 40. Some of these species are quite rare and most loggers reported taking around 20-25 species, which they considered to be commercial.

Table 16 shows four different measures of the relative value of the various currently commercial species in Suriname. The first two columns show the classes *LBB* use to assess export levies. The third shows the consultants own estimate of relative value in the domestic market, based on current domestic market product prices (presented later) of similar products (e.g. sawnwood of the same dimensions and quality). The species ranked second in this list currently sell at around 90% of the price of the most valued species and those ranked third sell at around 80% of this price. The third column is incomplete because some commercial species are uncommon and others (e.g. *Groenhart*) are so highly valued that they are rarely used for the domestic market. The last column indicates whether the species is currently exported (either as roundwood or wood product) in significant volumes. Unfortunately, *LBB* do not currently collect production or export information by species, so this information was obtained during interviews with sawmillers and *LBB* staff.

[10] When respondents referred to quality in the interviews, it was suspected that what they actually meant was species. Some species are certainly more highly valued than others in Suriname, but *Bruynzeel* seemed to be the only sawmilling company with fairly stringent and well specified quality requirements (one of the loggers interviewed showed us the specifications he had to meet in order to sell his logs to *Bruynzeel*). Most of the others appeared to have generally fairly poor quality control. Log quality does not currently appear to be a major problem in Suriname because the forest can generally supply far more logs than are required each year and it is suspected that most production is of high quality logs (ie. the forest is continuously being high-graded). However, scarcity of high quality logs may become an issue in the future.

[11] Local or trade names often group together several different species on the basis of similar appearance and timber quality. Thus, for example, the local name *"pisi"* groups together 13 species from the *Lauraceae* family.

Table 16 The relative value of different timber species in Suriname

Species	LBB royalty group		Domestic product price	Currently exported in significant volumes?
	Roundwood	Sawnwood		
Wana	A	1	1	
Bruinhart	A	1	1	
Ceder	A	1	1	maybe
Rode Lokus	A	1	1	yes
Zwarte Kabbes	A	1	1	
Baboen	A	3	2	
Ingi Pipa	A	2	1	
Bolletrie	B	3	2	
Walaba	A	3	2	
Pisie	A	3	2	
Basralocus	A	1	2	yes
Kopie	A	1	2	yes
Slangenhout	A	1	3	
Meri	A	3	3	
Riemhout	A	3	3	
Soemaroeba	A	3	3	
Wanakwarie	B	3	3	
Moksie	B	3	3	
Gronfolo	A	2	3	
Krappa	A	3	3	yes
Bostamarinde	A	1	?	
Pritijari	A	3	?	
Purperhart	A	2	?	maybe
Rozenhout	A	3	?	
Groenhart	A	2	?	maybe
Goebaja	A	3	?	
Kwari kwari	A	3	?	
Manbarklak	A	3	?	
Sali	A	3	?	
Tingimoni	A	3	?	
Okerhout	A	3	?	
Agrobigi	A	3	?	
Rode Kabbes	A	3	?	
Pakuli	A	3	?	
Mora	B	3	?	
Kaneelhart	B	3	?	
Koenatepi	B	3	?	
Manletter	B	3	?	
Letterhout	n.a.	n.a.	n.a.	n.a.
Satijnhout	B	1	?	
Softwoods	B	2	3	

Source: *LBB* and author's own analysis of domestic product prices

In broad terms, nearly all of the currently commercial species are in the first category for assessing roundwood export levies. However, some species appear to be missing from the first category (e.g. *Bolletrie*). There are also a few discrepancies between the export levy classes for sawnwood and roundwood (e.g. *Krappa* is in the A category for logs, but the 3rd category for sawnwood exports and *Satijnhout* is in the 1st category for sawnwood, but the B category for log exports). In very general terms, the relative value of the most well known commercial species might be ranked as follows:

1st - species that are mostly exported or account for a large proportion of exports: *Groenhart; Purperhart; Letterhout*[12]*; Basralocus; Rode Lokus; Krappa;* and *Kopie. Cedar* and *Wana* are also both highly valued in the export and domestic markets.

[12] Letterhout or snakewood is an extremely rare species. However, it is included in this list because it is a very highly valued decorative species (for example, export levies for this species are charged per kg of wood exported). The species is well-known because it is probably the most highly valued of all species in Suriname.

2nd - species that are highly valued in the domestic market: *Bruinhart; Zwarte Kabbes;* and *Ingi Pipa*

3rd - species of medium value in the domestic market: *Baboen*[13]*; Bolletrie; Walaba;* and *Pisie*.

4th - other species sold in the domestic market: *Slangenhout; Meri; Riemhout; Soemaroeba; Wanakwari; Moksie;* and *Gronfolo*.

The species not ranked above are not commonly encountered in the forest, so it is difficult to say what their relative value might really be.

3.4.2 Domestic roundwood prices

Domestic roundwood prices obtained during interviews with stakeholders were mostly quoted in Sf/m^3, although some also quoted figures in US$/$m^3$ for roundwood which they had exported or sold to a trader (for export). The following prices were quoted for standing, felled at stump, roadside and delivered roundwood.

Standing value. Currently, the purchase of standing roundwood mostly occurs in *HKV's*, where village leaders (*captains*) sell the rights to harvest timber from their *HKV's* in return for a fee. The price quoted by all respondents was in the range Sf 2,500/m^3 - Sf 3,000/m^3.

Felled at stump value. Some village captains and small concession holders fell their own timber and sell it to independent loggers and sawmillers, felled at stump. The price paid for roundwood felled at stump is around Sf 5,000/m^3.

Felled at roadside. A little information was collected about roadside sale prices, which seem to be around Sf 13,000/m^3.

Delivered roundwood prices. Traders are currently paying about US$ 45/m3 - US$ 60m3 for export quality roundwood delivered to Paramaribo (of course, loggers can get much higher prices if they can export them themselves). Species that are highly valued in the domestic market sell for around Sf 22,000/m^3 - Sf 25,000/m^3, medium value logs sell for Sf 18,000/m^3 - Sf 22,000/m^3 and low value logs sell for Sf 15,000/m^3 - Sf 18,000/m^3.

There was a reasonable degree of consistency between the price figures collected and the contract cost information collected (which indicates the difference that would be expected between values of timber standing, at stump, at roadside and delivered).

3.4.3 Domestic product prices

Detailed domestic product price information was collected from two sawmillers and a timber trader in Paramaribo and two sawmillers in another town. This information is presented in Table 17 to Table 38. This information provides a useful indication of the prices charged for different species and grades of timber. Because some of the information is for 1997 and some for 1998, it also gives an indication of the decline in domestic product prices which has been experienced over the last year.

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13 *Baboen* (or *Virola*) is the major species used to produce plywood in Suriname (it should not be confused with White Virola sold by Brazil, which is a different species altogether). Usually, plywood species attract high prices, but in Suriname this does not appear to be the case. This may, however, be due the fact that there is only one plywood manufacturer in Suriname (*Bruynzeel*) and thus, no competition for this species. If there were more competition for *baboen*, its value might actually be higher than is indicated here.

Table 17 List prices (August 1997) of various dimensions of 1st grade sawnwood made from: *Bruinhart; Zwarte Kabbes; Wana; Rode Lokus; and Ceder*

Dimension (in inches)	Price per m length (in Sf)		Price per m^3 (in Sf)	
	planed	unplaned	planed	unplaned
¾ x ¾	84	221	231,467	608,979
¾ x 1¼	119	235	196,747	388,534
¾ x 1½	140	246	192,889	338,934
¾ x 2	185	259	191,167	267,634
¾ x 3	278	390	191,511	268,667
¾ x 4	368	514	190,134	265,567
¾ x 5	459	640	189,720	264,534
¾ x 6	554	784	190,823	270,045
¾ x 8	733	1,026	189,359	265,051
¾ x 10	916	1,277	189,307	263,914
¾ x 12	1,098	1,530	189,100	263,501
1 x 2	256	322	198,400	249,550
1 x 3	385	481	198,917	248,517
1 x 4	511	640	198,013	248,000
1 x 5	638	797	197,780	247,070
1 x 6	765	964	197,625	249,034
1 x 8	1,014	1,284	196,463	248,775
1 x 10	1,271	1,595	197,005	247,225
1 x 12	1,528	1,916	197,367	247,484
1¼ x 1¼	201	283	199,392	280,737
1¼ x 1½	243	311	200,880	257,094
1¼ x 2	321	414	199,020	256,681
1¼ x 3	479	619	197,987	255,854
1¼ x 4	638	824	197,780	255,441
1¼ x 5	795	1,028	197,160	254,945
1¼ x 6	956	1,363	197,574	281,687
1¼ x 8	1,273	1,645	197,315	254,976
1¼ x 10	1,589	2,056	197,036	254,945
1¼ x 12	1,913	2,473	197,677	255,544
1½ x 1½	288	403	198,400	277,623
1½ x 2	385	494	198,917	255,234
1½ x 3	575	743	198,056	255,923
1½ x 4	765	990	197,625	255,751
1½ x 5	954	1,025	197,160	211,834
1½ x 6	1,148	1,481	197,712	255,062
1½ x 8	1,524	1,974	196,850	254,976
1½ x 10	1,920	2,588	198,400	267,427
1½ x 12	2,290	3,084	197,195	265,567
2 x 2	533	688	206,538	266,601
2 x 3	831	1,033	214,675	266,859
2 x 4	1,069	1,369	207,119	265,244
2 x 5	1,328	1,714	205,840	265,671
2 x 6	1,596	2,056	206,150	265,567
2 x 8	2,125	2,763	205,860	267,666
2 x 10	2,643	3,408	204,833	264,121
2 x 12	3,160	4,098	204,084	264,663
3 x 3	1,251	1,543	215,450	265,739
3 x 4	1,661	2,056	214,546	265,567
3 x 5	2,078	2,576	214,727	266,187
3 x 6	2,495	3,084	214,848	265,567
3 x 8	3,290	4,080	212,480	263,501
3 x 10	4,119	5,100	212,815	263,501
3 x 12	4,971	6,168	214,030	265,567
4 x 4	2,211	2,763	214,191	267,666
4 x 6	3,290	4,080	212,480	263,501
4 x 8	4,456	5,525	215,838	267,618

Source: A large sawmill in Paramaribo

Table 18 List prices (August 1997) of various dimensions of 1st grade sawnwood made from: *Basralocus; Kopie; Pisie; Bolletrie; Walaba; and Ingi Pipa*

Dimension (in inches)	Price per m length (in Sf)		Price per m^3 (in Sf)	
	planed	unplaned	planed	unplaned
¾ x ¾	67	184	184,623	507,023
¾ x 1¼	95	197	157,067	325,707
¾ x 1½	110	205	151,556	282,445
¾ x 2	148	215	152,934	222,167
¾ x 3	221	324	152,245	223,200
¾ x 4	194	427	100,234	220,617
¾ x 5	366	532	151,280	219,894
¾ x 6	440	640	151,556	220,445
¾ x 8	586	854	151,384	220,617
¾ x 10	732	1,063	151,280	219,687
¾ x 12	877	1,274	151,039	219,412
1 x 2	205	269	158,875	208,475
1 x 3	307	400	158,617	206,667
1 x 4	408	532	158,100	206,150
1 x 5	510	662	158,100	205,220
1 x 6	612	804	158,100	207,700
1 x 8	812	1,070	157,325	207,313
1 x 10	1,018	1,330	157,790	206,150
1 x 12	1,220	1,597	157,584	206,280
1¼ x 1¼	162	235	160,704	233,120
1¼ x 1½	192	260	158,720	214,934
1¼ x 2	256	346	158,720	214,520
1¼ x 3	383	515	158,307	212,867
1¼ x 4	510	686	158,100	212,660
1¼ x 5	635	856	157,480	212,288
1¼ x 6	766	1,032	158,307	213,280
1¼ x 8	1,019	1,370	157,945	212,350
1¼ x 10	1,271	1,711	157,604	212,164
1¼ x 12	1,530	2,060	158,100	212,867
1½ x 1½	232	336	159,823	231,467
1½ x 2	307	412	158,617	212,867
1½ x 3	460	619	158,445	213,212
1½ x 4	612	824	158,100	212,867
1½ x 5	762	853	157,480	176,287
1½ x 6	917	1,235	157,928	212,695
1½ x 8	1,220	1,645	157,584	212,480
1½ x 10	1,600	2,156	165,334	222,787
1½ x 12	1,909	2,571	164,386	221,392
2 x 2	444	573	172,050	222,038
2 x 3	694	859	179,284	221,909
2 x 4	890	1,140	172,438	220,875
2 x 5	1,106	1,428	171,430	221,340
2 x 6	1,330	1,714	171,792	221,392
2 x 8	1,771	2,279	171,566	220,779
2 x 10	2,203	2,840	170,733	220,100
2 x 12	2,634	3,415	170,113	220,553
3 x 3	1,043	1,286	179,628	221,478
3 x 4	1,385	1,714	178,896	221,392
3 x 5	1,731	2,146	178,870	221,754
3 x 6	2,076	2,571	178,767	221,392
3 x 8	2,743	3,399	177,152	219,519
3 x 10	3,434	4,249	177,424	219,532
3 x 12	4,144	5,140	178,423	221,306
4 x 4	1,844	2,279	178,638	220,779
4 x 6	2,743	3,399	177,152	219,519
4 x 8	3,714	4,604	179,897	223,007

Source: A large sawmill in Paramaribo

Table 19 List prices (August 1997) of various dimensions of 1st grade sawnwood made from: *Gronfolo; Moksie; Riemhout; Soemaroeba; Wanakwarie; and Meri*

Dimension (in inches)	Price per m length (in Sf)		Price per m^3 (in Sf)	
	planed	unplaned	planed	unplaned
¾ x ¾	51	144	140,534	396,801
¾ x 1¼	74	163	122,347	269,494
¾ x 1½	89	170	122,622	234,223
¾ x 2	118	180	121,934	186,000
¾ x 3	176	270	121,245	186,000
¾ x 4	235	358	121,417	184,967
¾ x 5	291	569	120,280	235,187
¾ x 6	350	536	120,556	184,623
¾ x 8	466	716	120,384	184,967
¾ x 10	582	895	120,280	184,967
¾ x 12	699	1,070	120,384	184,278
1 x 2	163	226	126,325	175,150
1 x 3	244	331	126,067	171,017
1 x 4	324	442	125,550	171,275
1 x 5	407	551	126,170	170,810
1 x 6	488	666	126,067	172,050
1 x 8	647	881	125,357	170,694
1 x 10	810	1,104	125,550	171,120
1 x 12	972	1,322	125,550	170,759
1¼ x 1¼	129	197	127,968	195,424
1¼ x 1½	153	217	126,480	179,387
1¼ x 2	205	287	127,100	177,940
1¼ x 3	305	428	126,067	176,907
1¼ x 4	407	570	126,170	176,700
1¼ x 5	507	712	125,736	176,576
1¼ x 6	608	856	125,654	176,907
1¼ x 8	807	1,138	125,085	176,390
1¼ x 10	1,011	1,421	125,364	176,204
1¼ x 12	1,216	1,710	125,654	176,700
1½ x 1½	183	281	126,067	193,578
1½ x 2	244	343	126,067	177,217
1½ x 3	365	514	125,722	177,045
1½ x 4	488	684	126,067	176,700
1½ x 5	606	852	125,240	176,080
1½ x 6	730	1,026	125,722	176,700
1½ x 8	972	1,349	125,550	174,246
1½ x 10	1,321	1,710	136,504	176,700
1½ x 12	1,585	2,054	136,486	176,873
2 x 2	370	456	143,375	176,700
2 x 3	559	684	144,409	176,700
2 x 4	738	910	142,988	176,313
2 x 5	983	1,164	152,365	180,420
2 x 6	1,106	1,366	142,859	176,442
2 x 8	1,466	1,816	142,019	175,925
2 x 10	1,826	2,261	141,515	175,228
2 x 12	2,184	2,710	141,050	175,021
3 x 3	863	1,026	148,628	176,700
3 x 4	1,150	1,349	148,542	174,246
3 x 5	1,438	1,710	148,594	176,700
3 x 6	1,725	2,048	148,542	176,356
3 x 8	2,284	2,710	147,509	175,021
3 x 10	2,850	3,385	147,250	174,892
3 x 12	3,443	4,096	148,241	176,356
4 x 4	1,539	1,816	149,091	175,925
4 x 6	2,276	2,710	146,992	175,021
4 x 8	3,083	3,668	149,333	177,669

Source: A large sawmill in Paramaribo

Table 20 List prices (August 1997) of various dimensions of 2nd grade sawnwood made from: *Bruinhart; Zwarte Kabbes; Wana; Rode Lokus; and Ceder*

Dimension (in inches)	Price per m length (in Sf)		Price per m^3 (in Sf)	
	planed	unplaned	planed	unplaned
¾ x 3	107	120	73,711	82,667
¾ x 4	140	163	72,333	84,217
¾ x 6	211	239	72,678	82,322
¾ x 10	352	397	72,747	82,047
¾ x 12	421	476	72,506	81,978
1 x 2	100	109	77,500	84,475
1 x 3	140	158	72,333	81,633
1 x 4	187	212	72,463	82,150
1 x 6	280	318	72,333	82,150
1 x 8	371	424	71,881	82,150
1 x 10	468	530	72,540	82,150
1 x 12	559	635	72,204	82,021
1¼ x 1¼	77	84	76,384	83,328
1¼ x 2	118	134	73,160	83,080
1¼ x 3	176	199	72,747	82,253
1¼ x 4	235	268	72,850	83,080
1¼ x 5	292	332	72,416	82,336
1¼ x 6	348	401	71,920	82,873
1¼ x 8	476	530	73,780	82,150
1¼ x 10	580	662	71,920	82,088
1¼ x 12	700	798	72,333	82,460
1½ x 2	140	158	72,333	81,633
1½ x 3	211	239	72,678	82,322
1½ x 4	280	318	72,333	82,150
1½ x 5	350	402	72,333	83,080
1½ x 6	421	476	72,506	81,978
1½ x 8	586	635	75,692	82,021
1½ x 10	700	798	72,333	82,460
1½ x 12	838	953	72,161	82,064
2 x 2	190	212	73,625	82,150
2 x 3	383	318	98,942	82,150
2 x 4	373	424	72,269	82,150
2 x 5	470	530	72,850	82,150
2 x 6	562	665	72,592	85,896
2 x 8	744	846	72,075	81,956
2 x 10	928	1,051	71,920	81,453
2 x 12	1,110	1,260	71,688	81,375
3 x 3	422	476	72,678	81,978
3 x 4	562	665	72,592	85,896
3 x 5	698	798	72,127	82,460
3 x 6	844	953	72,678	82,064
3 x 8	1,110	1,260	71,688	81,375
3 x 10	1,388	1,576	71,713	81,427
3 x 12	1,668	1,904	71,817	81,978
4 x 4	744	846	72,075	81,956

Source: A large sawmill in Paramaribo

Table 21 List prices (August 1997) of various dimensions of 2nd grade sawnwood made from: *Basralocus; Kopie; Pisie; Bolletrie; and Walaba*

Dimension (in inches)	Price per m length (in Sf)		Price per m^3 (in Sf)	
	planed	unplaned	planed	unplaned
¾ x 3	85	120	58,556	82,667
¾ x 4	112	163	57,867	84,217
¾ x 6	168	239	57,867	82,322
¾ x 10	280	397	57,867	82,047
¾ x 12	334	476	57,522	81,978
1 x 2	76	109	58,900	84,475
1 x 3	112	158	57,867	81,633
1 x 4	150	212	58,125	82,150
1 x 6	222	318	57,350	82,150
1 x 8	295	424	57,156	82,150
1 x 10	370	530	57,350	82,150
1 x 12	443	635	57,221	82,021
1¼ x 1¼	61	84	60,512	83,328
1¼ x 2	94	134	58,280	83,080
1¼ x 3	140	199	57,867	82,253
1¼ x 4	186	268	57,660	83,080
1¼ x 5	230	332	57,040	82,336
1¼ x 6	276	401	57,040	82,873
1¼ x 8	378	530	58,590	82,150
1¼ x 10	458	662	56,792	82,088
1¼ x 12	554	798	57,247	82,460
1½ x 2	112	158	57,867	81,633
1½ x 3	168	239	57,867	82,322
1½ x 4	221	318	57,092	82,150
1½ x 5	277	402	57,247	83,080
1½ x 6	332	476	57,178	81,978
1½ x 8	443	635	57,221	82,021
1½ x 10	554	798	57,247	82,460
1½ x 12	665	953	57,264	82,064
2 x 2	150	212	58,125	82,150
2 x 3	222	318	57,350	82,150
2 x 4	295	424	57,156	82,150
2 x 5	370	530	57,350	82,150
2 x 6	443	665	57,221	85,896
2 x 8	588	846	56,963	81,956
2 x 10	732	1,051	56,730	81,453
2 x 12	876	1,260	56,575	81,375
3 x 3	334	476	57,522	81,978
3 x 4	443	665	57,221	85,896
3 x 5	554	798	57,247	82,460
3 x 6	664	953	57,178	82,064
3 x 8	876	1,260	56,575	81,375
3 x 10	1,093	1,576	56,472	81,427
3 x 12	1,319	1,904	56,790	81,978
4 x 4	588	846	56,963	81,956

Source: A large sawmill in Paramaribo

Table 22 List prices (August 1997) of various dimensions of 2nd grade sawnwood made from: *Gronfolo; Moksie; Riemhout; Soemaroeba; Wanakwarie; and Meri*

Dimension (in inches)	Price per m length (in Sf)		Price per m^3 (in Sf)	
	planed	unplaned	planed	unplaned
¾ x 3	74	120	50,978	82,667
¾ x 4	98	163	50,633	84,217
¾ x 6	144	239	49,600	82,322
¾ x 10	238	397	49,187	82,047
¾ x 12	288	476	49,600	81,978
1 x 2	65	109	50,375	84,475
1 x 3	97	158	50,117	81,633
1 x 4	127	212	49,213	82,150
1 x 6	192	318	49,600	82,150
1 x 8	251	424	48,631	82,150
1 x 10	316	530	48,980	82,150
1 x 12	378	635	48,825	82,021
1¼ x 1¼	52	84	51,584	83,328
1¼ x 2	82	134	50,840	83,080
1¼ x 3	120	199	49,600	82,253
1¼ x 4	160	268	49,600	83,080
1¼ x 5	196	332	48,608	82,336
1¼ x 6	238	401	49,187	82,873
1¼ x 8	316	530	48,980	82,150
1¼ x 10	392	662	48,608	82,088
1¼ x 12	512	798	52,907	82,460
1½ x 2	98	158	50,633	81,633
1½ x 3	144	239	49,600	82,322
1½ x 4	192	318	49,600	82,150
1½ x 5	238	402	49,187	83,080
1½ x 6	284	476	48,911	81,978
1½ x 8	378	635	48,825	82,021
1½ x 10	473	798	48,877	82,460
1½ x 12	564	953	48,567	82,064
2 x 2	127	212	49,213	82,150
2 x 3	192	318	49,600	82,150
2 x 4	251	424	48,631	82,150
2 x 5	316	530	48,980	82,150
2 x 6	378	665	48,825	85,896
2 x 8	505	846	48,922	81,956
2 x 10	628	1,051	48,670	81,453
2 x 12	749	1,260	48,373	81,375
3 x 3	284	476	48,911	81,978
3 x 4	378	665	48,825	85,896
3 x 5	473	798	48,877	82,460
3 x 6	564	953	48,567	82,064
3 x 8	749	1,260	48,373	81,375
3 x 10	935	1,576	48,308	81,427
3 x 12	1,130	1,904	48,653	81,978
4 x 4	503	846	48,728	81,956

Source: A large sawmill in Paramaribo

Table 23 List prices (August 1997) of various dimensions of kiln-dried sawnwood for furniture manufacturing, made from: *Bruinhart; Zwarte Kabbes; Ingi Pipa; Rode Lokus; and Ceder*

Dimension (in inches)	Price per m length (in Sf)		Price per m^3 (in Sf)	
	planed	unplaned	planed	unplaned
1 x 3	450	581	232,500	300,184
1 x 4	600	776	232,500	300,701
1 x 6	899	1,163	232,242	300,442
1 x 8	1,194	1,546	231,338	299,538
1 x 10	1,493	2,016	231,415	312,481
1 x 12	1,790	2,323	231,209	300,055
1¼ x 6	1,121	1,455	231,674	300,701
1¼ x 8	1,493	1,934	231,415	299,771
1¼ x 10	1,865	2,415	231,260	299,461
1¼ x 12	2,243	2,909	231,777	300,597
1½ x 6	1,345	1,743	231,639	300,184
1½ x 8	1,790	2,323	231,209	300,055
1½ x 10	2,243	2,909	231,777	300,597
1½ x 12	2,689	2,390	231,553	205,806
2 x 6	1,859	2,323	240,121	300,055
2 x 8	2,470	3,089	239,282	299,247
2 x 10	3,073	3,839	238,158	297,523
2 x 12	3,685	4,605	237,990	297,407
3 x 3	1,489	1,743	256,439	300,184

Source: A large sawmill in Paramaribo

Table 24 List prices (August 1997) of various dimensions of sawnwood for flooring

Dimension (in inches)	Species	Price per m^2 (in Sf)		Price per m^3 (in Sf)	
		1st quality (kiln dried)	2nd quality	1st quality (kiln dried)	2nd quality
1 x 3	*Rode Lokus*	10,284	4,500	404,882	177,165
1 x 3	*Bruinhart*	10,284	4,500	404,882	177,165
1 x 3	*Zwarte Kabbes*	10,284	4,500	404,882	177,165
1 x 3	*Basralocus*	8,220	3,450	323,622	135,827
1 x 4	*Basralocus*	7,776	3,312	306,142	130,394
1 x 3	*Kopie*	8,220	3,450	323,622	135,827
1 x 4	*Kopie*	7,776	3,312	306,142	130,394
1 x 3	*Gronfolo*	7,704	3,450	303,307	135,827
1 x 4	*Gronfolo*	7,452	3,312	293,386	130,394
1 x 3	*Moksie*	7,704	3,450	303,307	135,827
1 x 4	*Moksie*	7,452	3,312	293,386	130,394

Source: A large sawmill in Paramaribo

Table 25 List prices (August 1997) of various dimensions of 1st quality kiln dried mouldings

Dimension (in mm)	Species	Price per m (in Sf)	Price per m^3 (in Sf)
8 x 34	*Basralocus*	226	830,882
12½ x 59	*Basralocus*	317	429,831
12½ x 90	*Basralocus*	427	379,556
16 x 36	*Basralocus*	288	500,000
16 x 57	*Basralocus*	467	512,061
16 x 63½	*Basralocus*	432	425,197
16 x 83	*Basralocus*	631	475,151
16 x 83	*Basralocus*	578	435,241
16 x 94½	*Basralocus*	666	440,943
16 x 127	*Basralocus*	854	420,276
22 x 70	*Basralocus*	594	385,714
16 x 83	*Bruinhart*	757	570.030
16 x 83	*Ceder*	757	570.030
16 x 94½	*Ceder*	800	529,661
12½ x 59	*Gronfolo*	263	356,610
16 x 57	*Gronfolo*	372	407,895
16 x 63½	*Gronfolo*	364	358,268
16 x 83	*Gronfolo*	536	403,614
16 x 83	*Gronfolo*	475	357,681
16 x 127	*Gronfolo*	812	399,606
22 x 70	*Gronfolo*	475	308,442
16 x 83	*Ingi Pipa*	631	475.151
16 x 63½	*Kopie*	432	425.197
16 x 83	*Kopie*	578	435,241
16 x 94½	*Kopie*	666	440,943
16 x 127	*Kopie*	854	420,276
16 x 94½	*Krappa*	580	384.004
12½ x 59	*Moksie*	263	356.610
16 x 36	*Moksie*	239	414,931
16 x 63½	*Moksie*	364	358,268
16 x 83	*Moksie*	536	403,614
16 x 83	*Moksie*	475	357,681
16 x 94½	*Moksie*	580	384,004
16 x 127	*Moksie*	812	399,606
27 x 48	*Moksie*	614	473,765
12½ x 59	*Pisie*	317	429.831
16 x 33	*Pisie*	307	581,439
16 x 63½	*Pisie*	432	425,197
16 x 83	*Pisie*	631	475,151
16 x 83	*Pisie*	578	435,241
16 x 127	*Pisie*	854	420,276
16 x 83	*Riemhout*	536	403.614
16 x 83	*Slangenhout*	631	475.151
8 x 34	*Wana*	270	992.647
19 x 19	*Wana*	276	764,543
22 x 41	*Wana*	469	519,956
29 x 29	*Wana*	586	696,790
16 x 83	*Zwarte Kabbes*	757	570,030

Source: A large sawmill in Paramaribo

Table 26 List prices (August 1997) of various dimensions of 2nd quality mouldings

Dimension (in mm)	Species	Price per m (in Sf)	Price per m^3 (in Sf)
8 x 34	*Basralocus*	70	257,353
12½ x 90	*Basralocus*	155	137,778
16 x 39	*Basralocus*	221	354,167
16 x 57	*Basralocus*	166	182,018
16 x 63½	*Basralocus*	166	163,386
16 x 83	*Basralocus*	241	181,476
16 x 94½	*Basralocus*	276	182,733
16 x 127	*Basralocus*	331	162,894
22 x 70	*Basralocus*	162	105,195
16 x 83	*Bruinhart*	290	218,373
16 x 83	*Ceder*	290	218,373
16 x 94½	*Ceder*	332	219,809
16 x 39	*Gronfolo*	184	294.872
16 x 57	*Gronfolo*	134	146,930
16 x 63½	*Gronfolo*	138	135,827
16 x 83	*Gronfolo*	205	154,367
16 x 94½	*Gronfolo*	221	146,319
16 x 127	*Gronfolo*	275	135,335
22 x 70	*Gronfolo*	162	105,195
16 x 57	*Ingi Pipa*	166	182.018
16 x 83	*Ingi Pipa*	241	181,476
16 x 127	*Ingi Pipa*	331	162,894
16 x 39	*Kopie*	221	354.167
16 x 57	*Kopie*	166	182,018
16 x 63½	*Kopie*	166	163,386
16 x 83	*Kopie*	241	181,476
16 x 94½	*Kopie*	276	182,733
16 x 127	*Kopie*	331	162,894
16 x 39	*Moksie*	184	294.872
16 x 57	*Moksie*	134	146,930
16 x 63½	*Moksie*	138	135,827
16 x 83	*Moksie*	205	154,367
16 x 94½	*Moksie*	221	146,319
16 x 127	*Moksie*	275	135,335
16 x 33	*Pisie*	95	179,924
16 x 39	*Pisie*	221	354,167
16 x 63½	*Pisie*	166	163,386
8 x 34	*Wana*	83	305.147
16 x 33	*Wana*	114	215,909
19 x 19	*Wana*	88	243,767
22 x 41	*Wana*	162	179,601
27 x 48	*Wana*	187	144,290
29 x 29	*Wana*	180	214,031
16 x 83	*Zwarte Kabbes*	290	218,373

Source: A large sawmill in Paramaribo

Table 27 Prices (1997/98) of plywood made from *Baboen*

Thickness (in mm)	Price per 8'x 4' piece (in Sf)			Price per m^3 (in Sf)		
	1st quality	2nd quality	3rd quality	1st quality	2nd quality	3rd quality
4	5,310	4,545	3,765	446,534	382,203	316,610
5	5,600	4,675	4,150	376,737	314,508	279,189
6	6,540	5,465	4,950	366,646	306,379	277,507
9	8,390	6,845	5,530	313,574	255,830	206,682
12	9,240	8,020	7,190	259,007	224,809	201,543
15	10,910	9,770	8,500	244,655	219,090	190,611
18	12,330	10,895	9,230	230,415	203,599	172,484

Source: *Bruynzeel*

Table 28 Prices (1997/98) of plywood for furniture manufacturing made from *Baboen*

Thickness (in mm)	Price per 8'x 4' piece (in Sf)			Price per m^3 (in Sf)		
	1st quality	2nd quality	3rd quality	1st quality	2nd quality	3rd quality
18	13,675	12,220	10,425	255,549	228,359	194,816

Source: *Bruynzeel*

Table 29 Prices (1997/98) of plywood door panels made from *Baboen*

Thickness (in mm)	Price per 8'x 4' piece (in Sf)			Price per m^3 (in Sf)		
	1st quality	2nd quality	3rd quality	1st quality	2nd quality	3rd quality
4	4,275	3,595	2,945	359,498	302,315	247,654
5	4,530	3,755	3,340	304,753	252,616	224,697
6	5,215	4,410	4,010	292,364	247,234	224,809
9	6,245	5,530	4,460	233,405	206,682	166,691
12	7,495	6,495	5,770	210,092	182,061	161,739
15	8,750	7,795	6,845	196,217	174,801	153,498
18	9,840	8,750	7,550	183,883	163,514	141,089

Source: *Bruynzeel*

Table 30 Prices (1997/98) of plywood made from *Baboen* with a *Cedar* face

Thickness (in mm)	Price per 8'x 4' piece (in Sf)			Price per m^3 (in Sf)		
	1st quality	2nd quality	3rd quality	1st quality	2nd quality	3rd quality
4	5,841	5,000	4,142	491,188	420,423	348,271
5	6,160	5,143	4,565	414,411	345,959	307,108
6	7,194	6,012	5,445	403,310	337,017	305,258
9	9,229	7,530	6,083	344,931	281,413	227,350
12	10,164	8,822	7,909	284,907	247,290	221,697
15	12,001	10,747	9,350	269,120	240,999	209,672
18	13,563	11,985	10,153	253,456	223,958	189,733

Source: *Bruynzeel*

Table 31 Prices (1997/98) of plywood for furniture manufacturing made from *Baboen* with a *Cedar* face

Thickness (in mm)	Price per 8'x 4' piece (in Sf)			Price per m^3 (in Sf)		
	1st quality	2nd quality	3rd quality	1st quality	2nd quality	3rd quality
18	15,043	13,442	11,468	281,104	251,195	214,297

Source: *Bruynzeel*

Table 32 Prices (1997/98) of plywood door panels made from *Baboen* with a *Cedar* face

Thickness (in mm)	Price per 8'x 4' piece (in Sf)			Price per m^3 (in Sf)		
	1st quality	2nd quality	3rd quality	1st quality	2nd quality	3rd quality
4	4,703	3,955	3,240	395,448	332,546	272,419
5	4,983	4,131	3,674	335,229	277,877	247,166
6	5,737	4,851	4,411	321,600	271,957	247,290
9	6,870	6,083	4,906	256,745	227,350	183,360
12	8,245	7,145	6,347	231,102	200,268	177,913
15	9,625	8,575	7,530	215,839	192,282	168,848
18	10,824	9,625	8,305	202,272	179,866	155,198

Source: *Bruynzeel*

Table 33 List prices (September 1998) of various dimensions of rough sawnwood made from: *Basralocus and Kopie*

Dimension (in inches)	Price per m length (in Sf)		Price per m^3 (in Sf)	
	1st quality	2nd quality	1st quality	2nd quality
1 x 2	125	63	96,875	48,438
1 x 3	200	100	103,334	51,667
1 x 4	300	150	116,250	58,125
1 x 5	350	175	108,500	54,250
1 x 6	400	200	103,334	51,667
1 x 8	500	250	96,875	48,438
1 x 10	700	350	108,500	54,250
1 x 12	800	400	103,334	51,667
1¼ x 8	700	350	108,500	54,250
1¼ x 10	900	450	111,600	55,800
1¼ x 12	1,000	500	103,334	51,667
1½ x 3	300	150	103,334	51,667
1½ x 6	700	350	120,556	60,278
1½ x 8	800	400	103,334	51,667
1½ x 10	1,000	500	103,334	51,667
1½ x 12	1,200	600	103,334	51,667
2 x 3	400	200	103,334	51,667
2 x 4	500	250	96,875	48,438
2 x 5	613	307	95,015	47,508
2 x 6	800	400	103,334	51,667
2 x 8	1,000	500	96,875	48,438
2 x 10	1,400	700	108,500	54,250
2 x 12	1,600	800	103,334	51,667
3 x 3	700	350	120,556	60,278
3 x 8	1,500	750	96,875	48,438

Source: A medium-sized sawmill in Paramaribo

Table 34 List prices (September 1998) of various dimensions of rough sawnwood made from: *Gronfolo*

Dimension (in inches)	Price per m length (in Sf)		Price per m^3 (in Sf)	
	1st quality	2nd quality	1st quality	2nd quality
1 x 2	100	50	77,500	38,750
1 x 3	175	88	90,417	45,208
1 x 4	225	113	87,188	43,594
1 x 5	300	150	93,000	46,500
1 x 6	350	175	90,417	45,208
1 x 8	450	225	87,188	43,594
1 x 10	600	300	93,000	46,500
1 x 12	700	350	90,417	45,208
1¼ x 8	600	300	93,000	46,500
1¼ x 10	800	400	99,200	49,600
1¼ x 12	900	450	93,000	46,500
1½ x 3	225	113	77,500	38,750
1½ x 6	600	300	103,334	51,667
1½ x 8	700	350	90,417	45,208
1½ x 10	900	450	93,000	46,500
1½ x 12	1,050	525	90,417	45,208
2 x 3	350	175	90,417	45,208
2 x 4	450	225	87,188	43,594
2 x 5	526	263	81,530	40,765
2 x 6	700	350	90,417	45,208
2 x 8	900	450	87,188	43,594
2 x 10	1,200	600	93,000	46,500
2 x 12	1,400	700	90,417	45,208
3 x 3	600	300	103,334	51,667
3 x 8	1,350	675	87,188	43,594

Source: A medium-sized sawmill in Paramaribo

Table 35 List prices (September 1998) of various dimensions of rough sawnwood made from other mixed hardwoods

Dimension (in inches)	Price per m length (in Sf)		Price per m^3 (in Sf)	
	1st quality	2nd quality	1st quality	2nd quality
1 x 2	80	40	62,000	31,000
1 x 3	135	68	69,750	34,875
1 x 4	200	100	77,500	38,750
1 x 5	250	125	77,500	38,750
1 x 6	300	150	77,500	38,750
1 x 8	400	200	77,500	38,750
1 x 10	500	250	77,500	38,750
1 x 12	600	300	77,500	38,750
1½ x 3	200	100	68,889	34,445
1½ x 6	500	250	86,111	43,056
1½ x 8	600	300	77,500	38,750
2 x 3	300	150	77,500	38,750
2 x 4	400	200	77,500	38,750
2 x 5	438	219	67,890	33,945
2 x 6	600	300	77,500	38,750
2 x 8	800	400	77,500	38,750

Source: A medium-sized sawmill in Paramaribo

Table 36 List prices (September 1998) of various dimensions of rough sawnwood made from various species

Dimension (in inches)	Price per m length (in Sf)			Price per m^3 (in Sf)		
	Wana	Other hardwoods	Softwoods	*Wana*	Other hardwoods	Softwoods
1 x 2	116	105	84	89,900	81,375	65,100
1 x 3	193	175	140	99,717	90,417	72,333
1 x 4	220	200	160	85,250	77,500	62,000
1 x 6	415	377	302	107,209	97,392	78,017
1 x 8	580	527	422	112,375	102,106	81,763
1 x 10	756	687	550	117,180	106,485	85,250
1 x 12	990	900	720	127,875	116,250	93,000
1¼ x 10	902	820	656	111,848	101,680	81,344
1½ x 3	253	230	184	87,145	79,222	63,378
1½ x 8	902	820	656	116,509	105,917	84,734
1½ x 10	1,086	987	790	112,220	101,990	81,633

Source: A timber trader in Paramaribo

Table 37 List prices (November 1998) of rough sawnwood made from various species[14]

Species and dimension	Price per m length (in Sf)			Price per m^3 (in Sf)		
	1st grade	2nd grade	3rd grade	1st grade	2nd grade	3rd grade
Rode Kabbes 1" x 1"	88	70	53	136,400	109,120	81,840
Kopie 1" x 1"	88	70	53	136,400	109,120	81,840
Mora 1" x 1"	77	62	46	119,350	95,480	71,610
Gronfolo 1" x 1"	55	44	33	85,250	68,200	51,150
Soemaroeba 1" x 1"	55	44	33	85,250	68,200	51,150
Other hardwoods 1" x 1"	50	40	30	77,500	62,000	46,500

Source: Sawmills outside Paramaribo

[14] These sawmills all make a range of different dimensions of sawnwood, but base their charges on multiples of a standard size of 1" x 1" x 1 m.

Table 38 List prices (November 1998) of air dried mouldings and flooring made from various species

Species and dimension	Price per m length (in Sf)	Price per m^3 (in Sf)
Kopie mouldings 1" x 1"	385	596,751
Soemaroeba mouldings 1" x 1"	286	443,301
Mixed mouldings 1" x 1"	275	426,251
Mixed flooring 1" x 1"	350	542,501

Source: Sawmills outside Paramaribo

3.4.4 Export roundwood and product prices

Export roundwood and product prices for 1997 were obtained from *LBB* records of export volume and value (FOB). Table 39 shows the prices declared for all the main wood products exported from Suriname in 1997. The table also shows the minimum price for each product set by *LBB* for the purpose of assessing export levies. As was expected, the declared export prices are nearly all at or around the levels set by *LBB*. They should therefore, all be treated with a certain amount of suspicion.

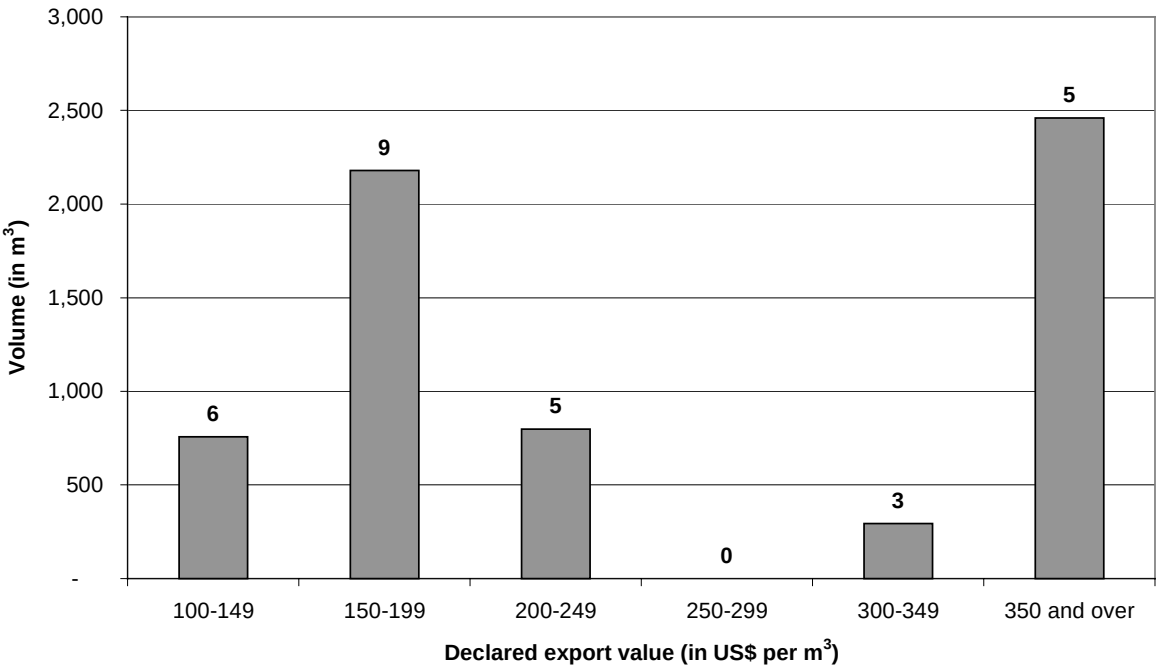
Table 39 Declared prices (FOB) of roundwood and forest products exported from Suriname in 1997

Product	Total volume exported (in m^3)	Total value of exports (in million Sf)	Unit export value		Minimum export price set by *LBB* (in US$)
			(in Sf/m^3)	(in US$/$m^3$)	
Roundwood	28,670	1,018	35,522	87	75 - 90 per m^3
Hewn squares	2,006	143	71,094	175	175 per m^3
Flooring	<1	<1	50,750	125	210 - 420 per m^3
Mouldings	18	4	203,147	500	210 - 420 per m^3
Sawnwood	6,490	681	104,887	258	90 - 350 per m^3
Furniture	25	16	633,847	1,561	350 - 700 per m^3
Plywood	4,823	776	160,924	396	275 - 325 per m^3
Letterhout (snakewood)	22	25	1,105,920	2,724	1.75 - 2.50 per kg
Total	42,054	2,662			

Source: *LBB*

Every company exporting roundwood declared export prices within the range of minimum export prices set by *LBB*. The three exporters of hewn squares were even more exact (i.e. they all declared export prices of US$ 175/m^3). Only one company (*Bruynzeel*) exported flooring in 1997 and somehow managed to declare an export price of less than the *LBB* minimum. It is unclear whether they had to repatriate an amount of US$ and pay the export levy based on the minimum set by *LBB* or their declared export value. *Bruynzeel* was also the only company exporting mouldings and plywood in 1997. Because *Bruynzeel* is a state owned company, they have less incentive to underdeclare their export values and it is interesting to note that their declared export values for these products were both well above the minimum values set by *LBB*. The same is true of their export sawnwood values. Figure 1 shows the range of export sawnwood values declared by the 28 companies exporting sawnwood in 1997. Bruynzeel accounts for a significant proportion of the large volume exported at a declared value of over US$ 350/m3. In contrast, *MUSA* accounted for a significant share of the large volume in the US$ 150/m^3 - US$ 199/m^3 declared export value range.

Figure 1 Volume of sawnwood exported at different declared export values



Note: numbers above each bar indicate the number of companies declaring values in each range

Source: *LBB*

3.5 Other quantitative information on the forest economy of Suriname

In addition to all the cost and price information described above, it is also useful to have some other basic quantitative information about the forestry sector in Suriname. For example, the biological productivity of the forest will affect the economics of forest harvesting and the number and location of sawmills will affect important variables such as local supply and demand conditions and transport costs. Macroeconomic information such as total production and trade in the sector is also necessary to calculate the total value of the sector to the economy and its potential contribution to government revenues. This section of the report presents other important quantitative information that is likely to affect the economics of the sector and, consequently, the calculation of economic rent.

3.5.1 Timber yields and cutting cycle

Three sources of information about timber yields and the appropriate length of the cutting cycle are available in Suriname: the results of the last (1974) national forest inventory (FAO, 1975); research into the CELOS silvicultural and harvesting system carried-out by a range of institutions over the last two decades (see, for example, von Bodegom, undated); and the results of discussions with forest managers during the course of this study.

The 1974 National Forest Inventory (1974 NFI) presents a little information about the potential harvest of commercial species that might be obtained in Suriname. It suggests that between 15 m^3/ha and 20 m^3/ha of commercial timber species may be obtained on average from the forests of Suriname, given the number of species that were considered as commercial at the time. It also notes however, that if all the species that were considered as potentially commercial were to be included in this calculation, the harvest volume would rise to around 50 m^3/ha. The inventory doesn't say anything about management of the subsequent crop

other than to note that regeneration of commercial species seems quite poor and that future silviculture should take this into account.

Research into the CELOS silvicultural and harvesting systems provides information about yield, harvesting intensity and presents a recommendation about the appropriate length of the cutting cycle. The research suggests that, without silvicultural treatment, growth of commercial species in the forests of Suriname may be as low as 0.2 m^3/ha/year. With a series of refinements[15], it suggests that this yield can be increased to 2.0 m^3/ha/year. The research also suggests that an appropriate level of harvesting intensity in Suriname might be 5 sph - 10 sph (which it equates to about 20 m^3/ha - 30 m^3/ha) on a cutting cycle of 25 years.

Discussions with forest managers during this study highlighted two problems with trying to estimate yield in the forests of Suriname. Firstly, many loggers are currently harvesting in areas that have been logged many times before (one logger quoted five previous companies, which had already worked in the area he was currently working in). This is partly due to the fact that, because of the uncertainty of tenure, very few logging operations are willing to invest in road building to open up new areas of forest, which might then be given to somebody else. The effect of this continuous re-logging is that the maximum volume many operators could probably cut in the areas they are currently working in is probably much lower than the volumes suggested by the 1974 NFI and CELOS research.

The second problem highlighted is that many loggers are currently actually choosing not to take all commercial species, but rather the small number of species that they currently market or have orders for (this partly explains why they are then able to go in and re-log previously cut areas again and again). It is therefore, somewhat difficult to estimate what a reasonable total commercial harvesting intensity in Suriname might actually be.

Only one logging operation visited (number 5) was fairly certain that they were working in an area which had not been logged before and appeared to be taking a wide range of commercial species (about 20). This operation reported that they were taking about 8 sph - 10 sph (roughly 16 m^3/ha - 20 m^3/ha) of commercial species greater than about 50 cm dbh.

Given the current uncertainty about growth and yield in the forests of Suriname, it would seem wise to take a conservative view about the appropriate harvesting intensity and length of cutting cycle which should be used in Suriname. It was agreed that, due to past logging activities, harvesting intensity might vary between 12 m^3/ha and 20 m^3/ha depending on how much the forest has been disturbed in the past. With respect to yield and the length of the cutting cycle however, it was much more difficult to reach a consensus. In terms of yield, it was felt that somewhere between the two figures quoted by CELOS research was probably about right and a figure of 0.8 m^3/ha has been used in this study. Assuming that the harvesting intensity in undisturbed forest should be around 20 m^3/ha, this would suggest a cutting cycle of 25 years (as recommended by the CELOS researchers). This seems a little short, but has also been used in this analysis. A summary of these assumptions made in order to estimate forestry production costs is given in Table 40.

[15] The refinements suggested are the systematic poisoning of non-commercial trees and poor or damanged commercial trees in several stages after felling. While this may serve to increase the growth of commercial species, the economic viability and environmental acceptability of such actions must be in doubt. It is highly likely that the increased growth from such refinements would not justify their cost and that such actions would be considered as environmentally unacceptable. Thus, a somewhat lower rate of growth should be assumed for forests in Suriname.

Table 40 Assumptions about harvesting intensity, yield and cutting cycle used in the calculation of forestry production costs in Suriname

Variable	Quality of forest		
	Low	Medium	High
Harvesting intensity	12 m^3/ha	16 m^3/ha	20 m^3/ha
Yield	0.8 m^3/ha/year	0.8 m^3/ha	0.8 m^3/ha
Cutting cycle	25 years	25 years	25 years

Source: Assumptions made after discussions with forest managers and *LBB* staff

3.5.2 Sawmills and traders in forest products in Suriname

The last major survey of sawmills in Suriname was carried-out by *LBB* in 1990. Some of the information collected has been lost and the number and scale of mills operating in the sector had changed somewhat since then. In addition to the sawmills, a number of traders have also recently begun to operate in the forestry sector (mostly buying roundwood and forest products for export). An effort was made during this study therefore, to try to update the databases of sawmills and traders currently working in the forestry sector in Suriname. A revised estimate of the sawmilling and sawnwood trading sectors in Suriname is given in Table 41.

Table 41 Sawmill location, capacity, production and trade in Suriname (1990, partially updated to 1998)

Location	Number of mills and traders	Capacity and utilisation (m^3 roundwood intake)			Product output and recovery rate		Approximate sales distribution			
							Domestic		Export	
		Total	Utilised	%	Total	%	m^3	%	m^3	%
Paramaribo	32	263,650+	110,900+	50	38,100+	40	35,250+	93	2,850	7
Nickerie	7	57,500	12,360+	24	6,300+	51	6,300	100	0	0
In forest	7	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	13	n.a.
Wanica	6	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0	0
Moengo	6	10,000+	8,000+	80	2,400+	30	2,400+	100	0	0
Para	3	50,000+	40,000+	80	20,000+	50	18,406+	92	1,594	8
Saramacca	2	56,000	31,500	56	8,750+	42	8,711+	>99	39	<1
Patamakka	2	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0	0
Commewijne	2	8,750+	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0	0
Coppername	1	8,000	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	31	n.a.
All sawmills	68	453,900+	202,760+	52	72,900+	43	68,373+	94	4,527	6
Traders (1997)	24+	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	1,963	n.a.
Total	92+	453,900+	202,760+	52	72,900+	43	66,410+	91	6,490	9

Note: the above percentage utilisation, recovery and sales figures are based on only partial information. Thus, for example, the utilisation rates for Moengo, Para and Saramacca are based on the figures for one mill only in each location. Also capacity rates have only been calculated for mills where both total and utilised capacity is known. So, for example, the capacity of all seven mills in Nickerie is known, but production is only known for six of the mills, so these six mills were used to calculate percentage capacity utilisation. Therefore, 12,360 divided by 57,500 does not equal 24%. The same is true of product recovery rates and the distribution of sales.

Source: 1990 sawmill survey (*LBB*), partially updated to 1998 by the author

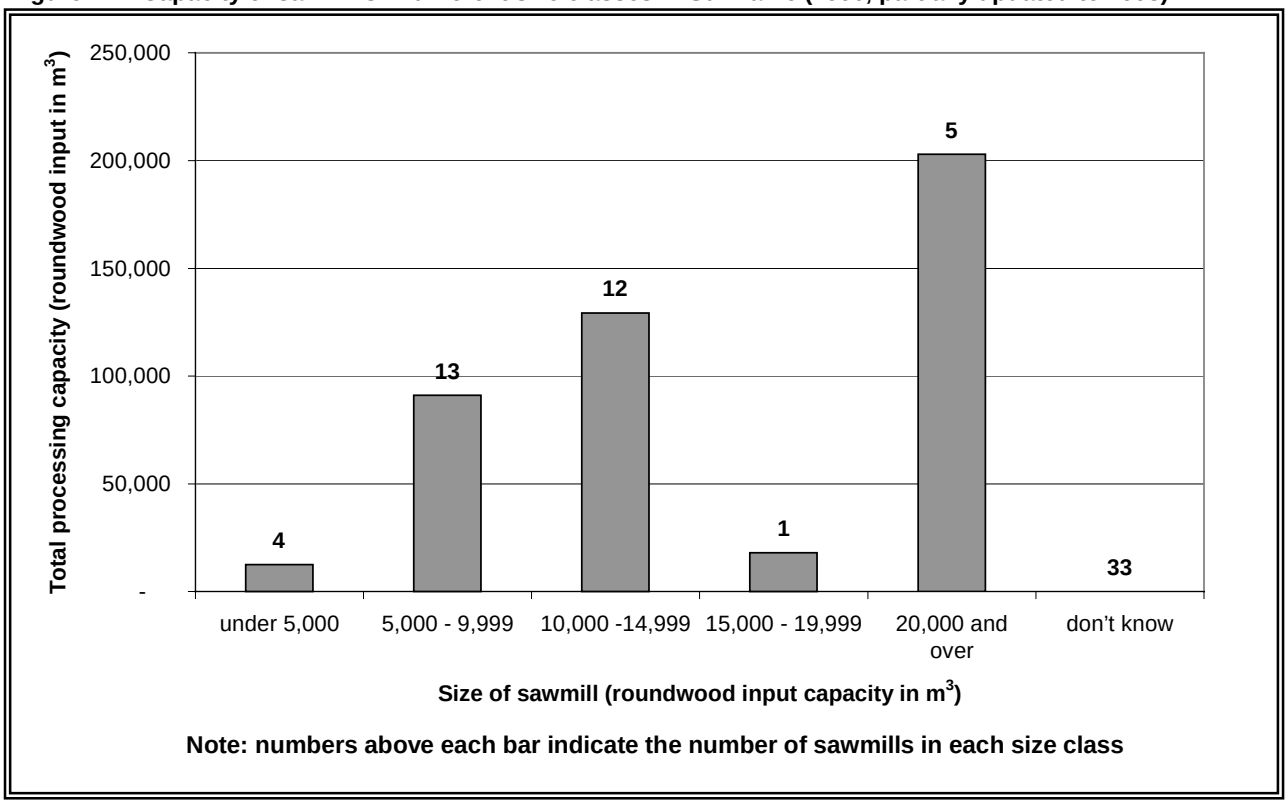
The current status of sawmilling and sawnwood trading activities in Suriname is briefly described below.

Number of sawmills. It is estimated that there are currently 68 sawmills in Suriname. Five sawmills are small portable bandsaw mills (one in Paramaribo (*Bosmij*) and four in the forest) and the remainder are larger mills using stationary sawmilling equipment. At least five sawmills are not

operating at the moment (possibly more). About half of the sawmills in Suriname are located in or near Paramaribo. Most of the others are also located close to the coast.

Sawmilling capacity. Information about sawmilling capacity is available for 35 sawmills (the 33 other sawmills are believed to be relatively small). Based on this information, the total sawmilling capacity in Suriname (assuming one shift working) is at least 455,000 m^3 roundwood intake per year. By making a conservative estimate of the capacity of the 33 other sawmills, total capacity might be closer to 600,000 m^3 roundwood intake per year. Over half of the known sawmilling capacity in Suriname is in Paramaribo. Other large mills or groups of mills are located in Nickerie, Moengo, Para and Saramacca. There is considerable variation in the size of sawmills operating in Suriname. The largest five mills account for about 45% of known sawmilling capacity, but the majority of sawmills in Suriname are in the range of 5,000 m^3/year to 15,000 m^3/year roundwood input. The distribution of sawmilling capacity by size of mill is shown in Figure 2 below.

Figure 2 Capacity of sawmills in different size classes in Suriname (1990, partially updated to 1998)



Source: 1990 sawmill survey (*LBB*), partially updated to 1998 by the author

Capacity utilisation. Estimates of capacity utilisation are available for 27 sawmills (including the five known not to be currently operating). Thirteen of these estimates were obtained from interviews with sawmillers and staff of *LBB* and can considered as being recent, the remainder were taken from the results of the 1990 sawmill survey. Based on these estimates, total roundwood intake would appear to be at least 200,000 m^3/year, giving a capacity utilisation figure of 52% for the mills where this information is known. It is suspected however, that capacity utilisation is actually much lower than this for two reasons. Firstly, the new *MUSA* sawmill has significantly increased processing capacity, but is currently not able to export much of its product because of poor market conditions in Southeast Asia. Consequently, it has been selling large volumes of sawnwood on the domestic market (which has probably not grown significantly since 1990) which has caused other sawmillers to reduce their output. Secondly, the average capacity utilisation rate of the sawmills visited during this assignment was much lower than 50%. Taking into account these observations, it would seem that current capacity utilisation across the sawmilling sector in Suriname might be as low as 35% -

40%. This would be equal to an annual roundwood intake of 160,000 m^3/year to 180,000 m^3/year, which is roughly the same as estimated roundwood production in Suriname (see: *Section 3.5.3 Information about forest product production and trade in Suriname*, below).

Product recovery. Estimates of product recovery, or the proportion of roundwood which is manufactured into finished forest products, are available for 19 sawmills in Suriname. On average, these mills claimed to achieve a 43% recovery rate. However, the discussions with sawmillers and *LBB* staff suggested that there was considerable uncertainty about this number. Many were really quite unsure about what their recovery rates were and gave answers such as: "about 50%". It was also pointed out that, in many cases, sawmillers still think in terms of mean length and quarter girth rather than cubic metres in Suriname and, consequently, measure their log input in terms of the roughly squared log entering the gangsaw after it has been through the first cut. It was felt, therefore, that a figure of 33% might actually be closer to the truth. This is quite low, particularly considering the quality of sawnwood generally produced in Suriname (i.e. there are few losses from planing and drying because very few high quality products are produced).

Number of traders. Twenty-four traders exported sawnwood during 1997. In addition to these, there may be a few other traders who buy and sell sawnwood on the domestic market. Traders accounted for just under 2,000 m^3 of sawnwood exports in 1997 or 30% of total exports. All of these traders are believed to be located in Paramaribo.

Domestic and export sales. Sawmillers exported six percent of their estimated output in 1997 and two sawmills (*Bruynzeel* and *MUSA*) accounted for the majority of exports. Some domestic sales were, however, exported by traders, bringing the total export level up to nine percent of estimated production. It is believed that export sales have declined in 1998.

Stihl mills. In addition to all of the above, there are also a number of individuals producing sawnwood using chainsaws in Suriname. These "Stihl mills" produce rough sawnwood for the domestic market and are thought to mainly serve the population of the interior of the country (around 10,000 to 20,000 people). The number of such operators is not known, nor was it possible to collect any information about them. The size and impact of this part of the sawmilling sector in Suriname might be a useful topic for further investigation.

In summary, the sawmilling sector in Suriname is currently characterised by overcapacity and low recovery rates. The level of overcapacity is even worse than indicated above, when it is considered that all these figures have been calculated on a single 8-hour shift basis and in many countries sawmills operate for nearly 24 hours per day.

The size of the domestic market is very small and many sawmills are currently finding it difficult to develop export markets for their products. There are a number of reasons for this (see: *Section 3.6 Qualitative information on the forest economy of Suriname*). The presence of traders in the export market is an interesting development. The fact that they have now captured 30% of the export market would suggest that they either have some advantage or provide a service which sawmillers do not.

3.5.3 Information about forest product production and trade in Suriname

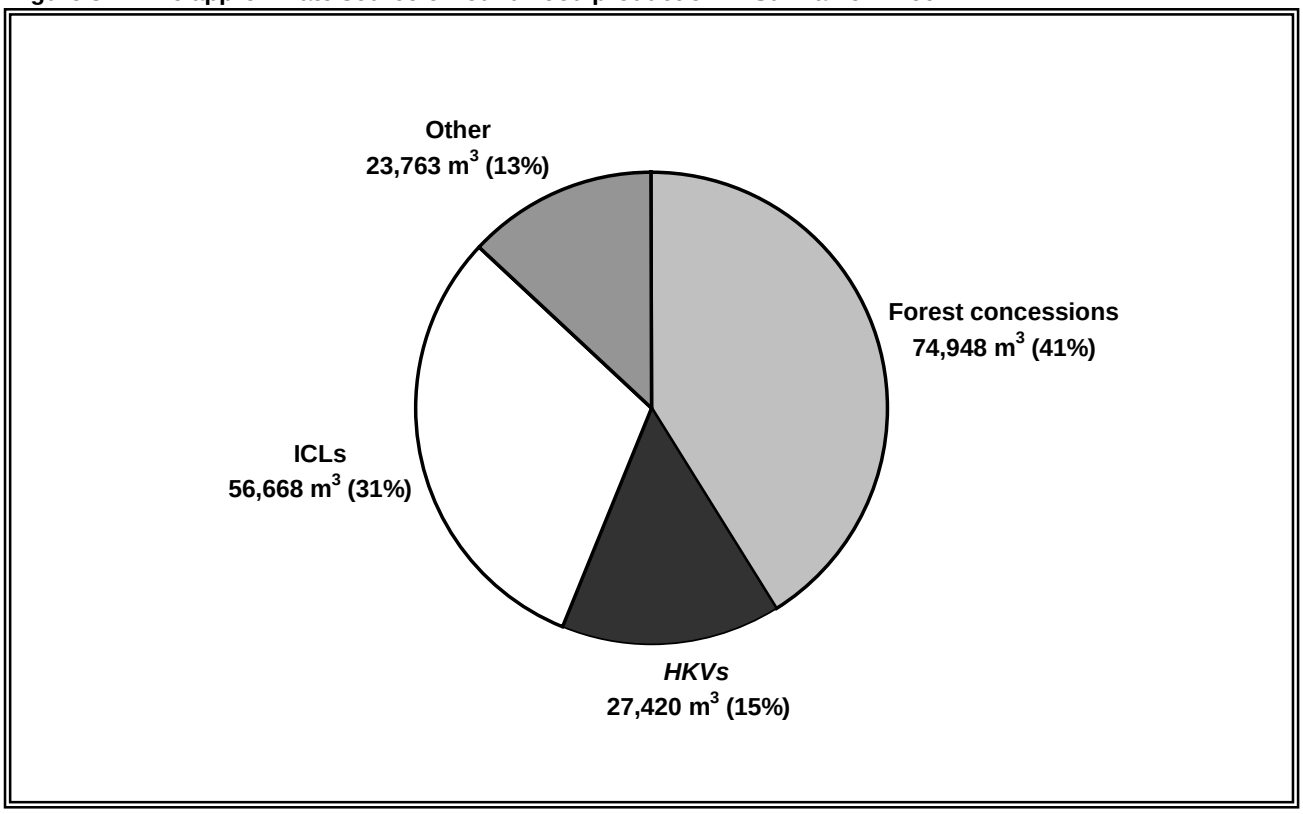
Information about forest product production and trade in Suriname was collected from the records of *LBB*. Table 42 shows recorded roundwood production over the last 11 years. Roundwood production has increased over the period to around 180,000 m^3/year. Much of this increase has occurred in the last few years and can be attributed to: the ending of the civil war; growth in log exports; the opening of the large new *MUSA* sawmill; and general improvements in data collection. However, despite recent improvements in data collection, it is still quite possible that a large volume of roundwood production goes unrecorded each year.

Table 42 Recorded annual roundwood production in Suriname 1987 - 1997

Product	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Industrial Rwd											
Sawlogs	111,032	182,992	119,349	114,784	105,177	118,765	93,122	96,213	104,668	202,703	179,228
Hewn squares	4,703	16,120	6,380	597	877	1,734	4,112	4,014	3,213	9,345	1,687
Subtotal	115,735	199,112	125,729	115,381	106,054	120,499	97,234	100,227	107,881	212,048	180,915
Minor Products											
Fence posts	2,125	3,581	1,277	468	452	1,291	821	362	880	803	655
Firewood	581	2,107	605	424	388	423	119	132	20	35	218
Sleepers				30			14				
Shingles	14	7	73	19		11	8	4	2		
Charcoal		70			104						
Others	124									771	1,006
Subtotal	2,844	5,765	1,955	941	944	1,725	962	498	902	1,609	1,879
Total	118,579	204,877	127,684	116,322	106,998	122,224	98,196	100,725	108,783	213,657	182,799

Source: *LBB*

Figure 3 The approximate source of roundwood production in Suriname in 1997



Source: *LBB*

The estimated source of all this roundwood production is shown in Figure 3. Forest concessions account for the majority of roundwood production followed by ICLs[16] and *HKVs*[17]. Most forest concessions have expired, however, so the production from these areas is, technically, illegal under the 1992 Forest Management Act.

16 ICLs or Incidental Cutting Licences, are short-term permits to fell roundwood from small areas of natural forest, issued by the Head of the Forest Service. ICLs were originally intended as a stop-gap measure to allow forest concessionaires to meet special orders or deal with other short-term and temporary problems in their concessions. However, ICLs have now become a major source of roundwood supply. This may be partly due to the slow rate at which new forest concessions have been issued.

Total production of forest products in Suriname is currently unknown. The only information available is for sawnwood production, which could be around 70,000 m^3/year (see Table 41 above), but this estimate is probably too high.

Just over 42,000 m^3 of forest products were exported from Suriname in 1997 (see Table 39 above). Two-thirds of this volume was accounted for by roundwood exports. Other products exported in significant volumes were: sawnwood (15% of the total); plywood (11%); and hewn squares (5%). The total value of exports was Sf 2,662 million (equal to about US$ 4 million at current exchange rates). Roundwood accounted for just under 40% of the value of exports, followed by: plywood (30%); sawnwood (25%); and hewn squares (5%).

Table 43 shows estimated exports of forest products over the last seven years, converted into the amount of roundwood required to produce these exports (m^3 EQ). As the table shows, around 40% of recorded roundwood production is exported in the form of roundwood and forest products. In addition to this, it is suspected that there are some illegal exports of roundwood and forest products to Guyana and French Guyana that are not recorded.

Table 43 Roundwood equivalent of exports of wood and wood products from Suriname 1991 - 1997[18]

Product	Assumed product recovery rate (%)	Derived roundwood volume by year (m^3 EQ)						
		1991	1992	1993	1994	1995	1996	1997
Sawlogs	100		1,741	1,216	6,898	12,693	24,005	28,670
Hewn squares	75		2,560	2,213	1,427	1,661	2,291	2,675
Sawnwood	33	891	1,524	2,682	4,422	9,393	4,650	19,470
Plywood	30	3,493	5,973	7,720	12,802	12,793	n.a.	16,077
Others	25	40	532	100	331	572	652	264
Total		4,424	14,322	15,924	27,874	39,107	33,594	69,153
Exports as a percentage of production		3%	12%	15%	27%	36%	>16%	38%

Source: Author's own estimates based on *LBB* data

The source of exports in 1997 is shown in Table 44 and Table 45. In terms of the volume of exports, forest concessions accounted for 86% of roundwood exports and around 61% of total exports. In contrast, sawmills (with forest concessions) exported very little roundwood, but accounted for around three-quarters of sawnwood exports. Also, sawmills accounted for only a quarter of total exports by volume. Traders accounted for just over a quarter of sawnwood exports, 12% of roundwood exports and 14% of total exports.

17 *HKVs* or *Houtkapvergunning,* are areas of forest granted to tribal communities. The original purpose of *HKVs* was to demarcate areas for local community subsistence-use, but they have also become major sources of industrial roundwood supply.

18 The figures presented here differ to those presented in a similar table in Mitchell (1998a), because of revised export figures for 1997 now available and the use of different conversion factors to get from export volumes to exports in terms of roundwood equivalent.

Table 44 Volume of roundwood and wood products exported from Suriname in 1997 by product and industry sector

Product	Forest concessions		Sawmills with forest concessions		Traders		Total
	(in m^3)	(%)	(in m^3)	(%)	(in m^3)	(%)	(in m^3)
Roundwood	24,752	86	390	1	3,528	12	28,670
Hewn squares	999	50	441	22	566	28	2,006
Flooring	0	0	<1	100	0	0	<1
Mouldings	0	0	18	100	0	0	18
Sawnwood	0	0	4,829	74	1,661	26	6,490
Furniture	0	0	25	100	0	0	25
Plywood	0	0	4,823	100	0	0	4,823
Letterhout (snakewood)	9	40	6	26	8	34	23

Source: *LBB*

In terms of the value of trade, the relative shares of trade held by each of these sectors of the industry are roughly the same within each product category. However, due to the higher value of processed products, the sawmilling sector accounted for a greater share of total exports by value (52%). Forest concessions accounted for 37% of the value of total exports and traders accounted for the remaining 11%.

Table 45 Value of roundwood and wood products exported from Suriname in 1997 by product and industry sector

Product	Forest concessions		Sawmills with forest concessions		Traders		Total
	(in million Sf)	(%)	(in million Sf)	(%)	(in million Sf)	(%)	(in million Sf)
Roundwood	889	87	13	1	116	11	1,018
Hewn squares	71	50	31	22	40	28	142
Flooring	0	0	<1	100	0	0	<1
Mouldings	0	0	4	100	0	0	4
Sawnwood	0	0	553	81	127	19	680
Furniture	0	0	16	100	0	0	16
Plywood	0	0	776	100	0	0	776
Letterhout (snakewood)	11	46	6	26	7	29	24
Total	971	37	1,400	52	290	11	2,661

Source: *LBB*

Table 46 and Table 47 show the destination of exports in 1997. Asia was the main market for roundwood exports (around 20,000 m^3 of roundwood went to Thailand and most of the rest of the roundwood destined for Asia went to People's Republic of China). All hewn squares exports went to Europe (Spain) and all plywood exports went to the Caribbean. Sawnwood was exported mostly to European countries, the Caribbean and, to a lesser extent, North and Central America[19]. In terms of value, the Caribbean is the largest export market, accounting for about 40% of the value of exports. Asia accounts for 33% and Europe accounts for 20%.

[19] Most of this sawnwood was identified as going to Panama. It is quite likely that some of this was then re-exported to Asia.

Table 46 Volume of roundwood and wood products exported from Suriname in 1997 by product and destination

Product	Caribbean		Europe		South America		North & Central America		Asia	
	(in m^3)	(%)	(in m^3)	(%)	(in m^3)	(%)	(in m^3)	(%)	(in m^3)	(%)
Roundwood	637	2	2,285	8	0	0	996	3	24,751	86
Hewn squares	0	0	2,006	100	0	0	0	0	0	0
Flooring	<1	100	0	0	0	0	0	0	0	0
Mouldings	18	100	0	0	0	0	0	0	0	0
Sawnwood	2,466	37	3,236	48	13	0	978	15	30	0
Furniture	25	100	0	0	0	0	0	0	0	0
Plywood	4,344	90	0	0	479	10	0	0	0	0
Letterhout (snakewood)	0	0	20	93	0	0	1	6	<1	1
Total	7,491	18	7,548	18	493	1	1,975	5	24,781	59

Source: *LBB*

Table 47 Value of roundwood and wood products exported from Suriname in 1997 by product and destination

Product	Caribbean		Europe		South America		North & Central America		Asia	
	(in mill Sf)	(%)	(in mill Sf)	(%)	(in mill Sf)	(%)	(in mill Sf)	(%)	(in mill Sf)	(%)
Roundwood	22	2	75	7	0	0	33	3	889	87
Hewn squares	0	0	143	100	0	0	0	0	0	0
Flooring	<1	100	0	0	0	0	0	0	0	0
Mouldings	4	100	0	0	0	0	0	0	0	0
Sawnwood	328	47	298	42	4	1	71	10	2	0
Furniture	16	100	0	0	0	0	0	0	0	0
Plywood	692	89	0	0	84	11	0	0	0	0
Letterhout (snakewood)	0	0	23	91	0	0	2	8	<1	1
Total	1,062	40	538	20	88	3	106	4	891	33

Source: *LBB*

In summary, official roundwood production statistics for Suriname indicate that roundwood production might currently be around 180,000 m^3. The survey of sawmillers estimates that their annual roundwood intake may be around 160,000 m^3 - 180,000 m^3. Added to this, exports of roundwood and hewn squares are a further 30,000 m^3 EQ and the amount of roundwood needed to produce the volume of plywood exported from Suriname comes to a further 15,000 m^3 EQ. In total therefore, it would appear that log production might easily be up to 225,000 m^3 EQ or 25% higher than officially estimated. However, much depends upon the current rates of capacity utilisation and product recovery in Surinam's sawmills, the extent of unrecorded trade with neighbouring countries and the unrecorded production of small operators such as "Stihl mills".

Exports account for 40% of the volume of officially recorded roundwood production (probably somewhat less if unrecorded production is taken into account). In terms of value, exports probably account for more than 40% of the value of roundwood and forest products produced in Suriname.

3.5.4 The location of roundwood production and transportation distances in Suriname

The location of forest concessions in Suriname is important for the calculation of economic rent (and, consequently, forest levies), because this affects the cost of transporting roundwood from the forest to the sawmill (most of which are located in or around Paramaribo or on the coast).

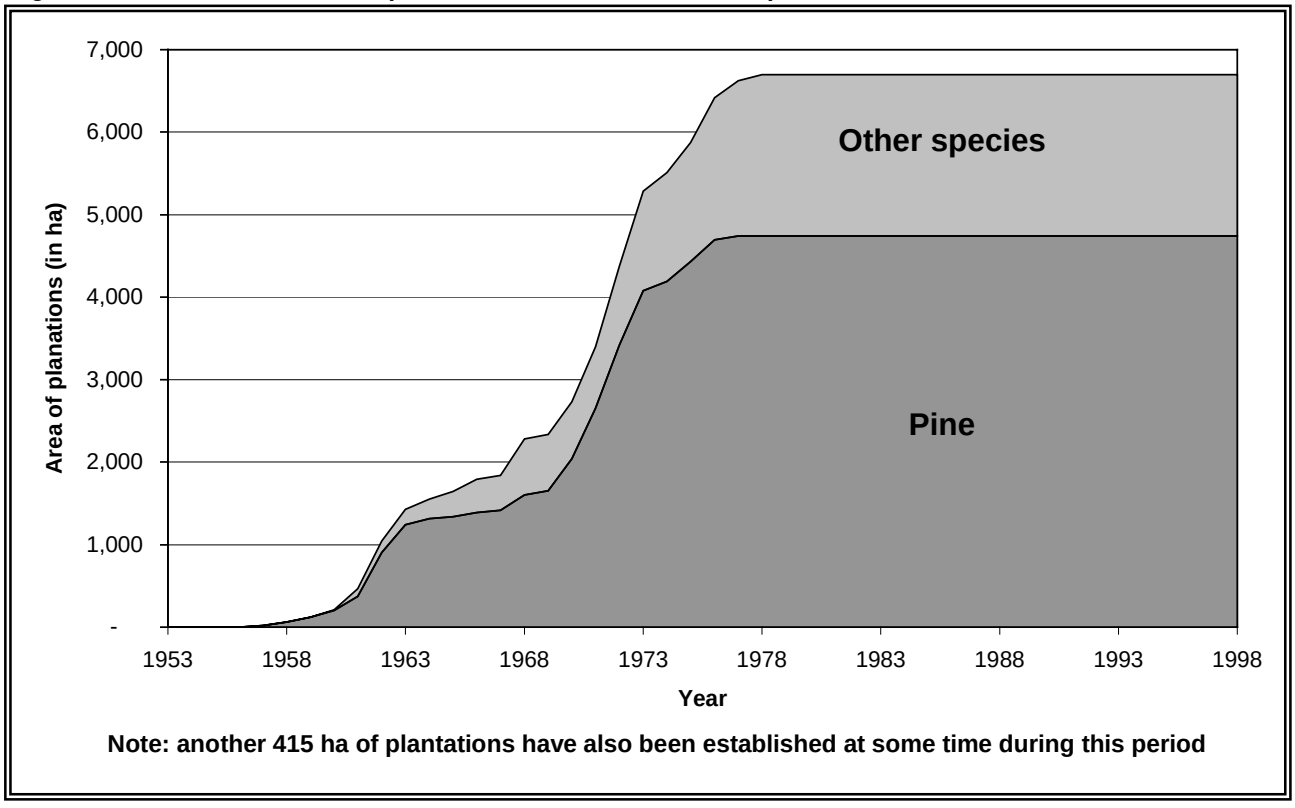
The majority of working forest concessions are in the forest belt, a strip of forest that runs from 50km to 120km inland from the coast, from East to West across the country. A number of older concessions can be found to the North of the forest belt (i.e. closer to the coast), but many of these have been heavily exploited and activity in these concessions is quite limited. Concessions are also now starting to appear to the south of the forest belt (i.e. further inland).

Precise information about the location of production will only become available when the database of forest concessions is completed and fully operational. However, as a working assumption, it would seem reasonable to assume that 60% of production comes from the forest belt, 20% comes from further into the interior of the country and 20% comes from forests closer to the coast.

3.5.5 Production of roundwood from plantations

In addition to the natural forest, Suriname has a small area of industrial forest plantations, which were established over the period 1953 - 1977 (see Figure 4). There is also an unknown area of plantations, which have been established on former opencast bauxite mining sites (the area and potential productivity of these sites is believed to be low). The majority of the industrial forest plantation area is stocked with Caribbean pine (*Pinus Caribaea*), mostly planted in the early 1970's. Other species have been planted in pure plantations, mixtures and strips within and around the pine plantations. Information about establishment activities, silviculture and potential yields are presented in Box 5 and estimates of the total current area of these plantations are given in Table 48.

Figure 4 The establishment of plantations in Suriname over the period 1953 - 1998



Note: another 415 ha of plantations have also been established at some time during this period

Source: *Bosmij*

Box 5 Experience with establishing and managing forest plantations in Suriname

From 1950 to 1980, small areas of plantations were established in Suriname on an experimental basis. These have produced mixed results and currently supply a small sawmill and treatment plant operated by the parastatal company *Bosmij*. Experiences gained with these plantations are summarised below.

Species selection and performance - by far the greatest proportion of the plantation area has been planted with *Pinus caribaea*. The estimated yield of this species in Suriname is 10 m^3/ha/year to 15 m^3/ha/year. Four provenences have been planted: *Hondurensis* (c. 90%); *Bahamensis* (c. 9%); *Elioti* and *Aokarpa* (c. 1%). The *Bahamensis* has been noted to have the best disease resistance, but generally poor form. Other broadleaved species have been planted in blocks and in strips with the pine, including: *Baboen (Virola)* and *Okume*. The *Okume* proved to be susceptible to canker and the *Baboen* has not grown particularly well. Only the pine is currently harvested.

Establishment - Operations to establish the plantations included: brush-cutting (4 hours/ha); collecting the waste into strips (7 hours/ha); burning the waste; ploughing (4 hours/ha); and planting (16 person-hours/ha). D7 bulldozers were used for all of these operations except planting. For planting, an agricultural tractor with a disc attachment was used to make holes for each tree at the correct spacing and workers followed the tractor and planted the trees. Material for burning was collected in rows 7 m wide, approximately 50 m apart. (The trees planted on the burnt strips have grown considerably faster than the rest of the crops). Agricultural tractors were used to weed the crops one year after planting (4 hours/ha).

Silviculture - Most of the pine has been planted at 2.5 m x 3.0 m spacing or 1,300 sph (the other crops have been planted at a variety of different spacings). The crop is selectively thinned down to 700 sph at age 7, then 500 sph at age 9 and 350 sph at age 11. The remaining trees are left to grow on a 25-30 year rotation. The trees aren't pruned, because this is considered uneconomical.

Harvesting - some of the crops are now mature but, due to a lack of capital, *Bosmij* is still only working its way through the thinnings. Felling costs are about Sf 7,000/m^3 - Sf 8,000/m^3 and transport to the mill is Sf 6,000/m^3 - Sf 7,000/m^3. (These costs are roughly the same as the cost of these operations in the natural forest).

In addition to the productive plantations, *Suralco* (Suriname's bauxite mining company) has also been planting pine on former open-cast mining areas. The total area of this is unknown. These sites are extremely nutrient deficient and, although many of the trees have grown in height, they have not grown in volume.

Source: *Bosmij*

Table 48 Area, location and species distribution of industrial forest plantations in Suriname

Region/district	Productive area			Unproductive area	Total area
	Pine	Other species in plantations	Other species in strips		
Coesewijne	1,020	29	414	3,629	5,092
Singrilanti	93	0	0	132	225
Blakawatra	3,333	0	0	819	4,152
Esterslust/Berendslust	0	0	336	0	336
Powakka	134	0	0	0	134
Kamp 8	161	151	1,029	1,681	3,023
Perica	0	415	0	0	415
Total	4,742	595	1,779	6,261	13,377

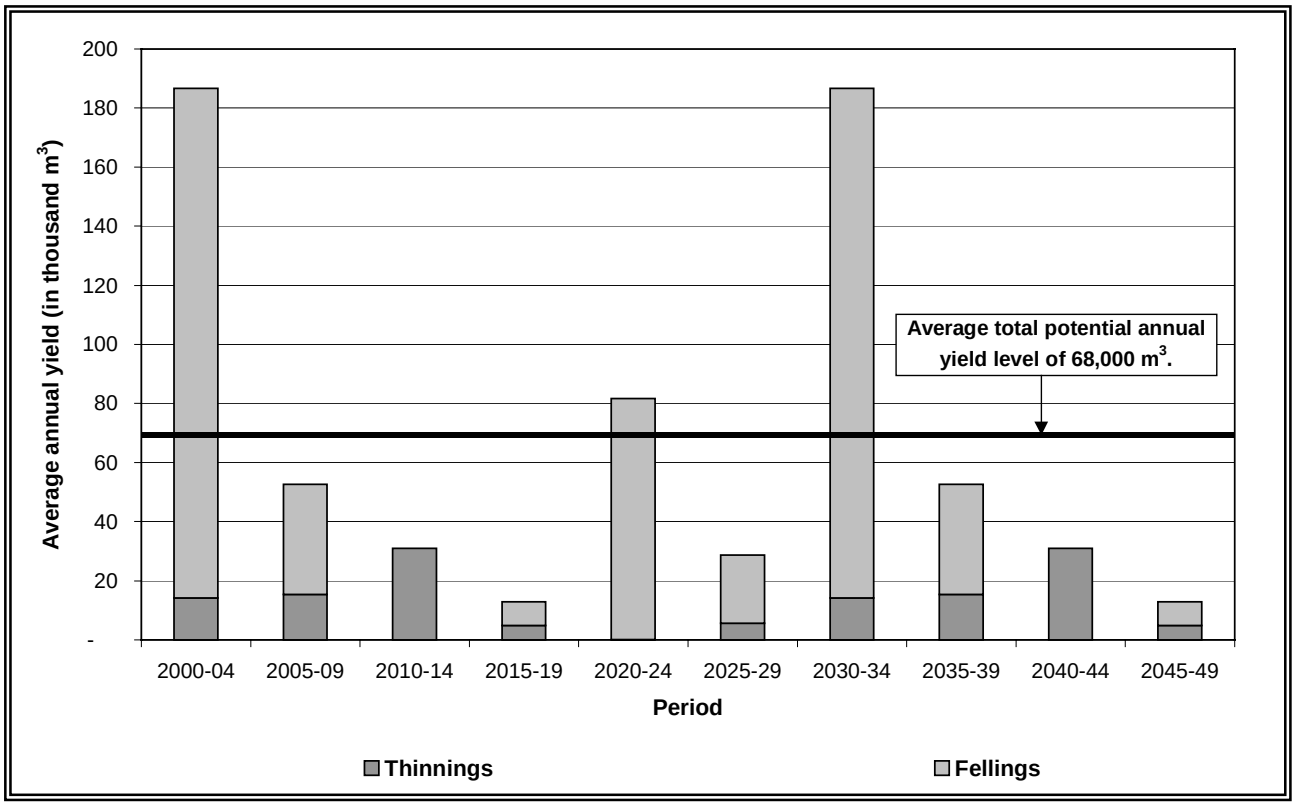
Source: *Bosmij*

The potential production of roundwood from these plantations is quite uncertain. Box 5 above indicated the current thinning regime followed in Suriname and gave an estimated annual yield per ha of the pine plantations (which are the only plantations harvested at the moment). It also noted that some areas are now ready for harvesting, but that *Bosmij*[20] has not got the capacity to keep-up with its production schedule. However, to give a rough indication of total potential yield, the production forecast shown in Figure 5 has been prepared.[21]

[20] The parastatal company responsible for planting, managing, harvesting and processing the wood from Suriname's industrial forest plantations.

[21] The yield assumptions used to prepare this forecast are: 25 m^3/ha in thinnings at years 7, 9 and 11 after planting and a final cut of 340 m^3/ha in year 30. This is approximately equal to 15 m^3/ha/year.

Figure 5 Estimated potential annual yield of pine plantations in Suriname 2000 -2050



Source: Author's own estimate

As the figure shows, with a rotation of 30 years and assuming a maximum mean annual increment of 15 m^3/ha/year, a considerable amount of pine roundwood will shortly be available for processing. The near-term peak in potential production is due to the escalation of pine planting which took place in the early 1970's (see Figure 4). However, even if production was to be smoothed-out in the future, potential yield could be as high as 68,000 m^3/year. If yields are only 10 m^3/ha/year, then production might only be two-thirds of this, or 46,000 m^3/year, but this still a significant amount of roundwood that could be processed.[22]

3.6 Qualitative information on the forest economy of Suriname

In addition to the quantitative information presented above, the discussions with key stakeholders in the forest sector also provided some qualitative information about the current state of the sector. Nearly every person visited raised two issues: access to capital and the current exchange rate policy. Other issues raised were: the lack of a current investment law for foreign investors; restrictive practices in the sector; and favouritism in the government. These issues are briefly described below.

3.6.1 Exchange rate policy

Everybody visited criticised the current exchange rate policy as being very harmful to the promotion of forest product exports from Suriname. Most of the sawmillers said that they had exported in the past but would not currently export sawnwood because they would probably lose money on the transaction. The requirement to give all US$ received from an export sale to the Central Bank, also appears to have favoured certain sectors of the industry. In particular, it is easier for foreign-controlled companies and domestic companies with foreign partners to report the value of exports as the minimum set by *LBB* in order to keep as much as

[22] It should be noted that these figures are estimates of potential yield. Losses during harvesting are likely to ensure that final removals are somewhat lower than the figurs presented here.

possible of their export revenues offshore. Although the under-reporting of export values is technically illegal, it is suspected that some of the largest exporters in the sector are benefiting from such transfer-pricing[23] techniques.

3.6.2 Access to capital

Access to capital was the next most important issue raised by many observers. Most of the forestry and forest processing machinery seen in Suriname is very old and the quality of this machinery has, in part, contributed to the difficulty of developing export markets for Surinam's forest products. Foreign exchange (e.g. US$) could be borrowed from offshore banks at reasonable interest rates, but this would then have to be repaid in foreign currency. As noted above, the current exchange rate policy makes this very unattractive. The alternative to this is to borrow local currency from domestic banks, but domestic interest rates are very high (although not, perhaps, so high in real terms) which also makes this somewhat unattractive. However, several people visited said that the situation was even worse than this and that, no matter what the interest rate was, domestic banks just simply will not lend to forestry companies.

The main consequence of this difficulty to obtain capital is that investment in the sector is limited to the current level of profits. Currently low levels of return in the sector have therefore, limited investment and resulted in the gradual decline in efficiency and competitiveness of the sector. Irrespectively of the level of profit however, such an approach also means that new equipment can only be purchased in small amounts every year and can not be purchased all at one time. This may have contributed to the poor organisation and layout seen at several of the sawmills visited. As above, this problem may have also favoured foreign-controlled companies and domestic companies with foreign partners, who probably have better access to investment funds from overseas.

3.6.3 Investment law

In addition to new capital, many sawmillers also said that they would like to gain access to foreign markets and new technology and that joint ventures with foreign companies was the best way forward for the development of the sector. In relation to this, the current standstill over the development of a new investment law for Suriname (to protect foreign investors, amongst other things) was also sighted by some respondents as a serious impediment to developing joint ventures. Indeed, without a certain amount of legal protection, most foreign investors will be reluctant to enter the sector as joint partners and the only foreign investment that is likely to materialise will be in the form of complete ownership of local companies (e.g. the current investments of *MUSA*, *Tacoba* and *Berjaya*). As above, this will again affect different companies in different ways and will therefore, result in a change in the relative strength of different stakeholders within the sector.

3.6.4 Restrictive practices

Several people interviewed claimed that there were various restrictive practices currently operating in the sector. For example, one of the difficulties of trying to develop export markets for Surinam's forest products is to collect a large enough shipment of a product of the same species and quality. It was noted that most operators do not have enough raw material resources from their own sources to put together a sizeable load of, say, 1st grade *Kopie* sawnwood and that they would have to purchase additional supplies of such material from other producers. However, it was claimed that, in such a situation, other suppliers would quickly realise what was happening and would make this material so expensive, that it would be uneconomic

[23] The process of deliberately selling a product to another company within the same group at unrealistically low prices is called transfer-pricing. Transfer-pricing is a technique commonly used to avoid the payment of taxes and levies by artificially shifting the value-added within a group of companies into countries or parts of the production process with low rates of taxation. Although it is illegal in many countries, it is often difficult to prove, particularly in countries where legal institutions are weak.

to attempt such a task. The small size of most operations and lack of competition (or alternatively, co-operation to develop export markets) is therefore, another hindrance to export development.[24]

Other parts of the production process where collusion and a lack of competition were sighted included: the purchase of roundwood from independent loggers and small forest concessionaires; contract extraction, loading and transportation; and the purchase of export quality products by traders. As long as restrictive practices persist, it will be difficult to develop export markets and promote efficiency within the sector.

3.6.5 Favouritism

A few sawmillers claimed that favouritism in the awarding of forest concessions, granting of other licenses and distribution of foreign exchange, was also harming the sector. While it is always difficult to judge whether such claims are genuine grievances or merely general dissatisfaction with the current government, it would appear that certain sectors have benefited more than others have from current government policies. For example, traders seem to be the only sector able to obtain foreign currency at the official exchange rate and certain large companies seem to have benefited more than others in the awarding of new forest concessions and ICLs. Also, many loggers, sawmillers and local communities raised the point several times that they were unhappy about the way foreign-controlled companies in the sector were being allowed to operate.

[24] The exception to this was one logging operation visited, where the logging manager was swapping roundwood of one species for another with a neighbouring concessionaire and they were also using each others harvesting equipment.

4 DATA COLLECTED FROM INTERNATIONAL SOURCES

In addition to the data collected in Suriname, some data on costs and prices was also collected from international sources for this analysis. Sources used included: statistical reports and publications; manufacturer's and retailer's handbooks and catalogues; and Internet resources. Full details of potential data sources are given in Appendix 1.

4.1 Cost information

Two types of cost information were collected from international sources: the cost of consumable items that can not usually be purchased in Suriname, but have to be imported from foreign suppliers; and the cost of capital equipment (which is always imported, either directly or through a local distributor, such as *Surmac*). In addition to this, information about tariffs was also collected from the Internet.

4.1.1 Consumable costs

Information about the cost of consumable items that can not be readily obtained in Suriname, were collected from the Forestry Suppliers Inc. catalogue for 1998 (Forestry Suppliers Inc., 1998). This catalogue contains a vast amount of information about general forestry items, such as small tools, clothing, safety equipment and other minor items of forestry equipment. The data collected similar to that shown in Table 6.

4.1.2 Capital costs

Information about the cost of various large items of forestry equipment, such as: skidders; bulldozers; trucks; and loaders, were collected from the Internet. A large Internet site containing a lot of information about the cost of these sorts of items can be found at: www.tms-sales.com (TMS Machinery Sales). Other sites giving new and second-hand price information include: www.madillequipment.com (Madill Equipment Inc.); www.equipmentsearch.com; and www.gsnet.com/servlet (Pape Group Caterpillar Dealers). All of these sites only contain information about sale prices in North America. However, they can be used to estimate depreciation rates for machinery and, thus, be used to derive second-hand values from the cost of new machinery in Suriname. A selection of the data collected on capital equipment prices is given in Table 49 to Table 52 below.

Table 49 Prices of new and second-hand logging trucks in North America in 1998

Make and model	Price (in thousand US$)	Age of machinery (in years)
Western Star	102.950	new
Western Star	92.500	new
Western Star	90.450	new
Western Star	77.500	1
Western Star	43.980	3
Western Star + trailer	69.750	4
Volvo Intergenel (self loader) + trailer	52.000	8
Western Star	29.750	8
Western Star (selfloader) + trailer	74.950	9
Western Star (selfloader)	69.500	9
Mack 300 (self loader) + trailer	26.500	9
Freightliner + trailer	16.000	9
Brigadeer (self loader) + trailer	36.500	13
Kenilworth	29.750	14
Chevrolet C70 + trailer	6.750	17
International S1700 + trailer	13.900	18
Chevrolet C65 + trailer	2.500	23
Mack R685LS + trailer	1.500	30

Source: Various internet sources

Table 50 Prices of second-hand forest loaders in North America in 1998

Make and model	Price (in thousand US$)	Age of machinery (in years)
Caterpillar 322 LL	199.500	1
Log Hog 920	60.000	2
Caterpillar 950F II	149.500	3
Caterpillar 990	46.765	3
Caterpillar 926E	55.000	4
Thunderbird L840	125.300	5
Barko 160A	47.250	5
Caterpillar 966C	78.000	6
Prentice 325	47.300	7
Prentice 210C	37.500	9
Log Hog 860	18.000	9
Prentice D625CA	99.500	10
Caterpillar 229	52.650	10
Caterpillar 926E	44.000	10
Caterpillar 950E	37.000	11
Caterpillar 936	57.500	13
Caterpillar 936	59.500	14
Caterpillar 225	37.500	14
Caterpillar 950	38.000	20
Caterpillar 225	41.200	21
Caterpillar 966	38.900	22
Caterpillar 966 C	37.500	25
Caterpillar 966 C	32.000	25
Caterpillar 966C	28.500	29
Caterpillar 950	17.500	30

Source: Various internet sources

Table 51 Prices of second-hand skidders in North America in 1998

Make and model	Price (in thousand US$)	Age of machinery (in years)
Caterpillar 515	118.500	2
Caterpillar 515	110.000	2
Caterpillar 525	169.500	3
Timberjack 1210	166.391	3
Timberjack 450C	72.000	3
Ranger G67	39.000	4
John Deere 548E	69.000	5
Caterpillar 518	68.500	6
Timberjack 480B	65.000	6
Caterpillar 518	38.500	6
Caterpillar 518	34.500	7
John Deere 548D	35.560	8
Clark 668	39.000	9
Tree Farmer C5D	32.500	9
Caterpillar 518	85.300	10
Caterpillar 518	59.500	10
Caterpillar 518	52.650	10
John Deere 648	42.000	10
MRS SK100	25.000	10
Franklin 170-453	37.780	11
Caterpillar 518	35.000	11
Caterpillar 518	59.500	12
Timberjack 230D	32.985	12
Caterpillar 518	28.000	12
Caterpillar 518	66.000	13
Grapple 380	30.000	13
Caterpillar 518	25.000	13
Caterpillar 518	47.500	14
Taylor TS140	19.000	15
John Deere 640	28.000	17
Caterpillar 518	34.000	18
Caterpillar 518	19.500	18
Caterpillar 518	18.000	18
Husky 240	16.126	18
Timberjack 350	13.927	18
Caterpillar 518	36.500	19
John Deere 640	31.200	19
Caterpillar 528	42.500	20
Clark 664B	12.461	24
Timberjack 230	12.000	26

Source: Various internet sources

Table 52 Prices of second-hand bulldozers in North America in 1998

Make and model	Price (in thousand US$)	Age of machinery (in years)
Caterpillar D8N	269.500	3
Caterpillar D6H XLR	115.000	4
Caterpillar D6H	149.500	8
Caterpillar D8N	237.000	9
Caterpillar D6H	76.500	11
Caterpillar D8K	89.500	17
Caterpillar D8K	87.500	18
Caterpillar D8K	49.000	18
Caterpillar D6D	64.900	19
Caterpillar D6D	52.650	19
Caterpillar D6D	52.650	19
Caterpillar D8K	76.500	20
Caterpillar D6D	57.500	20
Caterpillar D6C	36.500	22
Caterpillar D6C	35.300	30
Caterpillar D6C	17.900	34

Source: Various internet sources

4.1.3 Other miscellaneous costs

In order to try to account for the large difference between the USA list prices of harvesting machinery and the prices quoted in Suriname, the import tariffs for Suriname were obtained from the Tradeport trade directory (http://tradeport.org/ts/countries/suriname/regs.shtml). Average import duties for most goods entering Suriname are between 30% and 40%. In addition to this, a consent right and statistical right of 0.5% each also have to be paid on all imports. This would account for some of the apparent 50% to 70% mark-up on the price of harvesting machinery sold in Suriname.

4.2 Manufacturer's estimates of rates of materials consumption and productivity

Estimates of materials consumption, productivity and repair requirements were taken from the Caterpillar Handbook for 1996 (Caterpillar, 1996). Although a few pieces of machinery from other manufacturers are currently being used in the forestry sector, it is likely that this information will be broadly representative of the rates of materials consumption, productivity and repair requirements of this other machinery as well.

Estimates of the expected consumption of fuel, greases, oils and other lubricants (e.g. hydraulic fluids and transmission lubricants) are given in Table 53.

Table 53 Materials consumption for main pieces of harvesting machinery (in litres per working hour)

Type of machinery	Material				
	Fuel		Oils	Grease	Other lubricants
	Type	(amount)			
Chainsaw	petrol	3.00	2.50	0.25	0.25
Bulldozer (D6)	diesel	25.00	0.25	0.02	0.04
Skidder	diesel	20.00	0.13	0.02	0.08
Loader	diesel	20.00	0.11	0.01	0.05
Logging truck	diesel	30.00	0.30	0.02	0.02
Barge	diesel	50.00	0.50	0.05	0.02
Bulldozer (D8)	diesel	35.00	0.27	0.02	0.05

Source: Caterpillar (1996) and author's own estimates

The Caterpillar Handbook also gives various formulae for producing machine productivity rates. These rates can differ widely depending upon terrain, type of work, age and maintenance of the machine, the skills of the operator and the overall management of the work being performed. As noted above, productivity rates in Suriname are very low for a number of reasons, so it would not be appropriate to use the rates given in the Caterpillar Handbook in the cost analysis. They can be used however, as an indication of the current level of efficiency in the forestry sector.

The other important piece of information given in the Caterpillar Handbook is the repair reserve. This is an estimate of the cost of repairs that are likely for each piece of machinery under various working conditions. Although this is based on working trials carried-out by Caterpillar and is mainly a planning tool, this information is not readily available in Suriname and these estimates can be used as working assumptions for the calculation of economic rent. The repair reserves quoted in the Caterpillar Handbook are given in Table 54. These have to be adjusted to reflect the local cost of labour and spare parts and the age of machinery currently being used in Suriname. In order to do this, the Handbook also quotes the cost of labour used in these calculations (US$ 50 per hour) and the proportion of the total cost accounted for by labour costs.

Table 54 Estimated cost of repairs (repair reserve) (in US$ per working hour)

Machine	Repair reserve quoted in the Caterpillar Handbook (in US$ per hour)			Labour cost as a proportion of the total repair cost
	Low	Medium	High	
Caterpillar D6 (skidding bulldozer)	3.50	4.50	6.50	40%
Caterpillar D8 (road construction bulldozer)	5.00	8.00	9.50	30%
Caterpillar 528 (wheeled skidder)	4.50	6.00	8.00	45%
Caterpillar 527 (tracked skidder)	3.55	4.75	6.55	45%
Caterpillar 928 (wheeled loader - 4t capacity)	2.75	3.75	5.00	40%
Caterpillar 950 (wheeled loader - 5t capacity)	4.25	5.00	7.00	40%

Source: Caterpillar (1996)

4.3 Price information

Price information was collected from two main international sources: FAO and the International Tropical Timber Organisation (ITTO). Most of the price information collected by these two organisations is international trade price information (which is generally easier to collect). However, the ITTO and Joint FAO/UNECE office in Geneva do also produce a little domestic market price information. Comprehensive national sources of information (outside Suriname) include the Malaysian Timber Council (MTC) and the Forestry Commission of Guyana.

4.3.1 Trade values for Suriname

The statistics on timber trade are presented by the FAO in their Yearbook of Forest Products (FAO, 1998 - also available on CD-ROM and at the FAO Website). These show trade by volume and by value and, by dividing one by the other, it is possible to calculate average trade prices for broad product aggregates (e.g. sawnwood or plywood). Figure 6 to Figure 8 show export prices derived from the FAO trade data in this way, for the years 1976 to 1996.

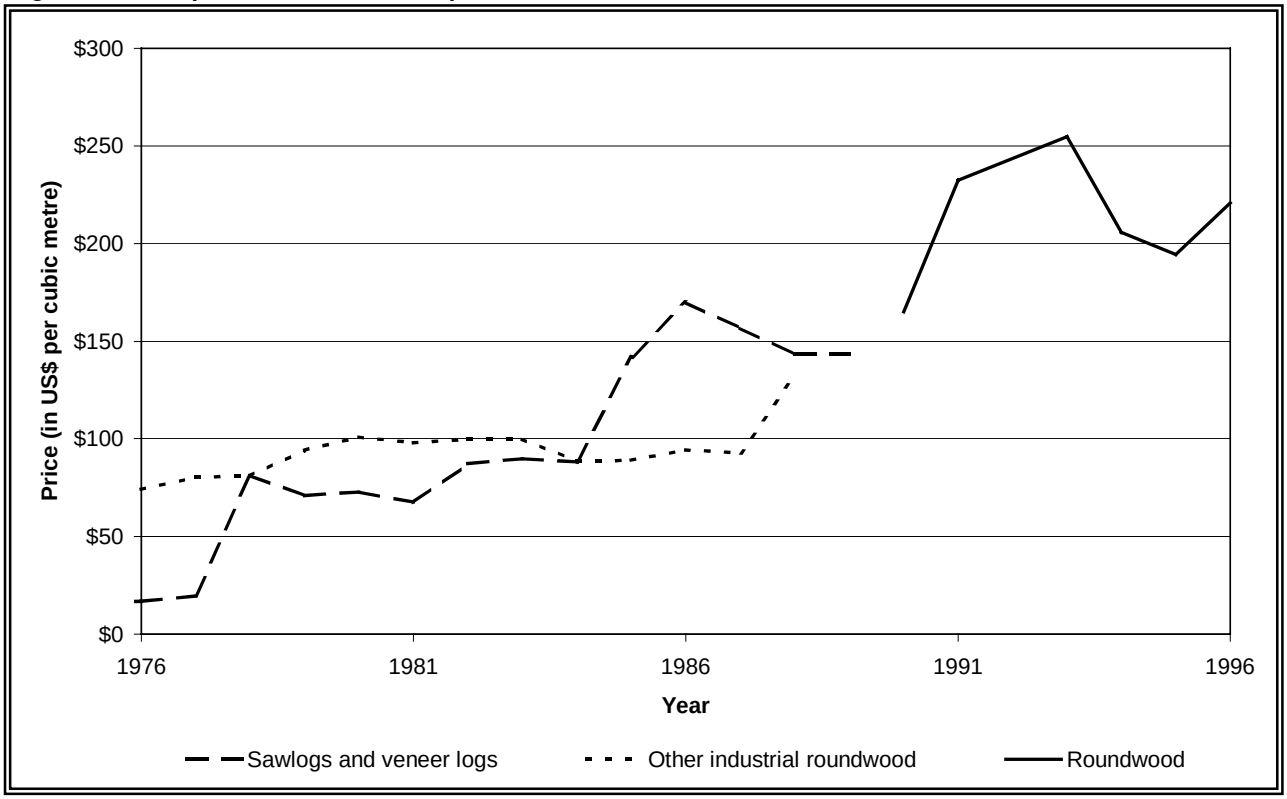
The trade data presented by FAO is taken from questionnaires about forest products production and trade, that are completed by countries each year. Many countries reply only partially to this questionnaire and FAO have to fill-in the missing data using data that has been supplied by national customs authorities to the UN Statistical Office. The replies to these questionnaires are also validated (e.g. if on country says it exports a certain amount to another, this is checked with the other country's statement about imports). In this way, these statistics are adjusted to overcome some of the problems of mis-classification and mis-representation that occur where timber traders attempt to get around trade restrictions and tariffs.

The prices shown in Figure 6 to Figure 8, are higher than those recorded in Suriname, suggesting that there may be some under-reporting of export values in Suriname (this is particularly likely in view of the way in which log export royalties are calculated). However, they may also be slightly on the high side, if they have been validated using import statistics for other countries (which would tend to include the cost of transport and insurance).

In conclusion, after taking into account freight and insurance costs, it would seem likely that the average true export price of forest products from Suriname might be in the order of: US$ 125/m^3 to US$ 175/m^3 for roundwood; US$ 225/m^3 to US$ 300/m^3 for sawnwood; and US$ 350/m^3 to US$ 450/m^3 for plywood. These figures would be more in line with general international trading prices for these types of forest products.

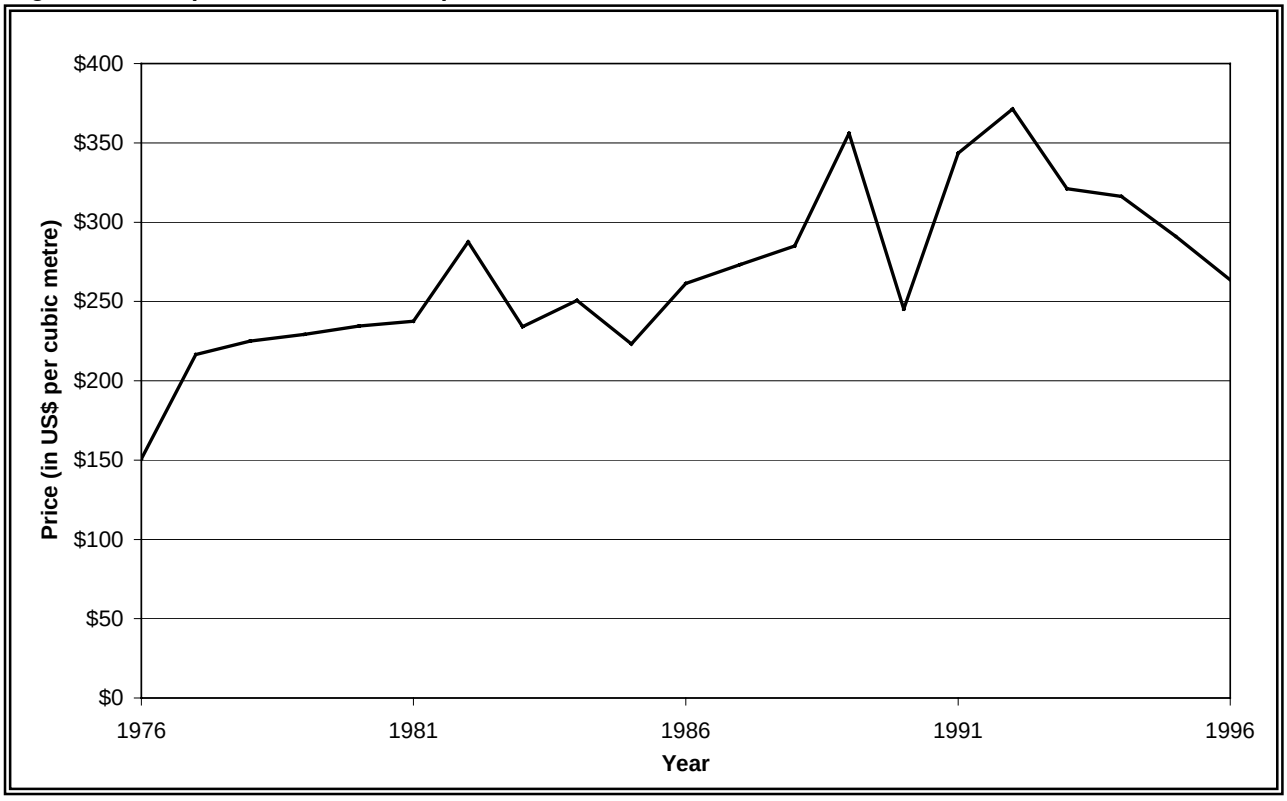
A feature that will be made available in late 1999 is direct access (over the Internet) to the bilateral trade statistics (collected by national customs authorities and collated by the UN Statistical Office). This will make it much easier to check the validity of export prices stated by forest product exporters in Suriname (e.g. the stated value of sawnwood exported to the Netherlands can be checked against the Dutch import statistics for sawnwood imported from Suriname into the Netherlands).

Figure 6 The price of roundwood exported from Suriname 1976 - 96



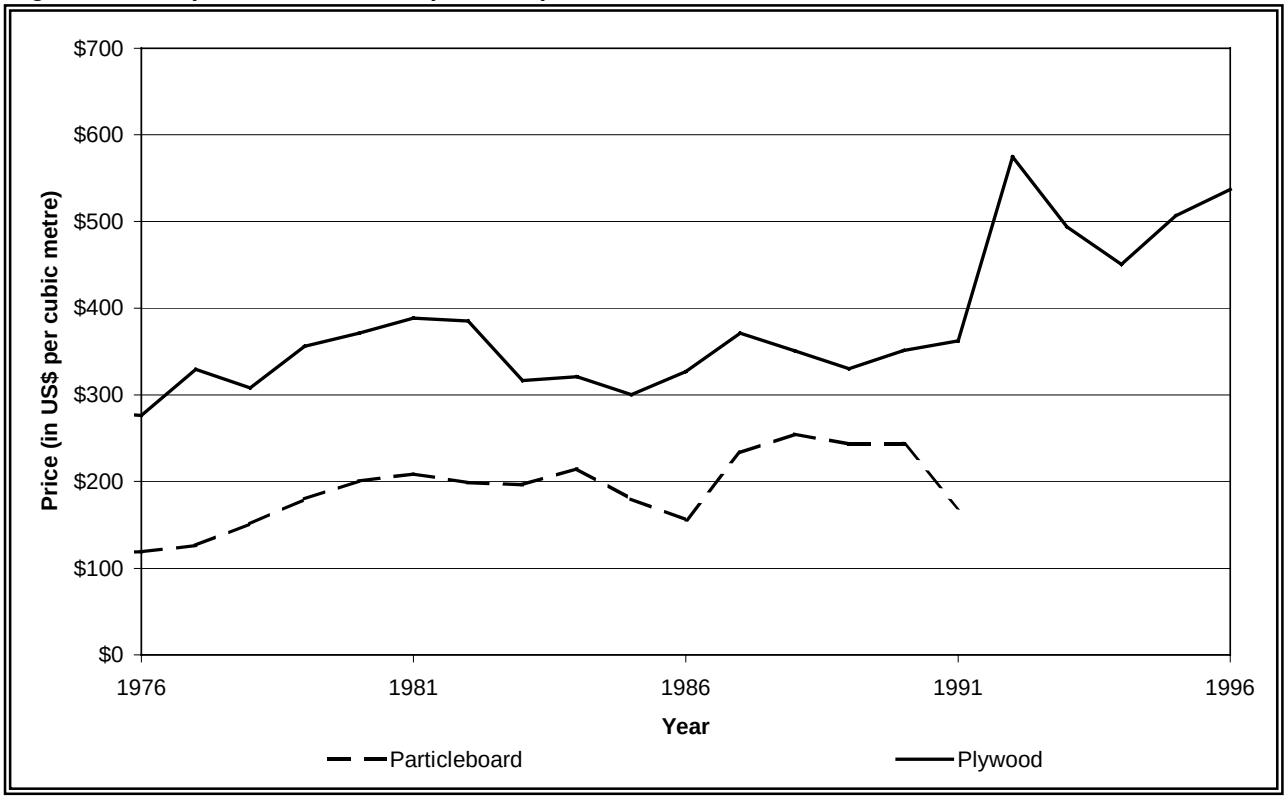
Source: FAO (1998)

Figure 7 The price of sawnwood exported from Suriname 1976 - 96



Source: FAO (1998)

Figure 8 The price of wood based panels exported from Suriname 1976 - 96



Source: FAO (1998)

4.3.2 Domestic prices for neighbouring countries

Of all the neighbouring countries, the most accessible information about domestic timber prices is available for Brazil and Guyana. ITTO, in their Tropical Timber Market Reports, produce regular information about Brazilian log, sawnwood and plywood prices and occasionally produce information about forest product prices in Guyana. A comprehensive time-series of price information for Brazil is also produced in the ITTO Annual Review (ITTO, 1998) and the Guyana Forestry Commission have started to produce annual timber market reports (GFC, 1998). A selection of data from these sources is presented below.

Box 6 Examples of domestic price data available from the ITTO and GFC

Tropical Timber Market Report 1-15th August 1998

Logs – Brazil (US$/m^3)		Sawnwood – Brazil (US$/m^3)		Plywood – Brazil (US$/m^3)	
Logs at mill yard		Northern mills (green ex. mill)		Rotary cut (Northern mill ex. mill)	
Mahogany (1st grade)	335	Mahogany (1st grade)	705	White virola face	150
Ipe	68	Ipe	390	White virola core	120
Jatoba	44	Jatoba	320	MR Grade (Southern mill ex. mill)	
Guaruba	35			White virola 4 mm	520
Mescla (white virola)	45			White virola 15 mm	360
				Mahogany face 4 mm	1,120

Tropical Timber Market Report 16-31st August 1998

Logs – Brazil (US$/m^3)		Sawnwood – Brazil (US$/m^3)		Plywood – Brazil (US$/m^3)	
Logs at mill yard		Northern mills (green ex. mill)		Rotary cut (Northern mill ex. mill)	
Mahogany (1st grade)	340	Mahogany (1st grade)	710	White virola face	150
Ipe	68	Ipe	390	White virola core	118
Jatoba	44	Jatoba	320	MR Grade (Southern mill ex. mill)	
Guaruba	35			White virola 4 mm	510
Mescla (white virola)	42			White virola 15 mm	360
				Mahogany face 4 mm	1,080

Tropical Timber Market Report 1-15th October 1998

Logs – Brazil (US$/m^3)		Sawnwood – Brazil (US$/m^3)		Plywood – Brazil (US$/m^3)	
Logs at mill yard		Northern mills (green ex. mill)		Rotary cut (Northern mill ex. mill)	
Mahogany (1st grade)	344	Mahogany (1st grade)	739	White virola face	150
Ipe	68	Ipe	379	White virola core	118
Jatoba	44	Jatoba	326	MR Grade (Southern mill ex. mill)	
Guaruba	35			White virola 4 mm	510
Mescla (white virola)	39			White virola 15 mm	360
				Mahogany face 4 mm	1,080

Forestry in Guyana: market summary 1997

Logs (special grade)	G$ 5,883/m^3	(US$ 42/m^3)
Logs (Class 1)	G$ 3,885/m^3	(US$ 28/m^3)

Source: ITTO and GFC (1998)

4.3.3 Trade prices for neighbouring countries

Trade prices for Guyana and Brazil can also be obtained from the ITTO and the Guyana Forestry Commission, from the same sources. A selection of this information is presented below. In addition to this, as with the Suriname trade prices shown earlier, the FAO Yearbook of Forest Products can also be used to derive trade prices for all major product categories in all countries. However, it should be noted that trends in prices derived from FAO data may reflect changes within the product category (e.g. there are many different types and grades of sawnwood included in the sawnwood category), rather than true changes in prices.

Box 7 Examples of trade price data available from the ITTO and GFC

Tropical Timber Market Report 1-15th August 1998

Sawnwood – Brazil (US$/m^3)		Plywood and veneer – Brazil (US$/m^3)	
Mahogany (kiln dried – UK market)	990	Veneer	
Jatoba green (dressed)	470	White virola face veneer (2.5 mm)	200-260
Guaruba	n.a.	Plywood	
Angelim pedra	n.a.	White virola 5.2 mm (US market)	290
Mandioqueira	n.a.	White virola 15 mm (US market)	270
		White virola 4 mm (Caribbean market)	370
		White virola 9 mm (Caribbean market)	300

Tropical Timber Market Report 16-31st August 1998

Sawnwood – Brazil (US$/m^3)		Plywood and veneer – Brazil (US$/m^3)	
Mahogany (kiln dried – UK market)	990	Veneer	
Jatoba green (dressed)	460	White virola face veneer (2.5 mm)	200-260
Guaruba	n.a.	Plywood	
Angelim pedra	n.a.	White virola 5.2 mm (US market)	280
Mandioqueira	n.a.	White virola 15 mm (US market)	260
		White virola 4 mm (Caribbean market)	360
		White virola 9 mm (Caribbean market)	300

Tropical Timber Market Report 1-15th October 1998

Sawnwood – Brazil (US$/m^3)		Plywood and veneer – Brazil (US$/m^3)	
Mahogany (kiln dried – UK market)	995	Veneer	
Jatoba green (dressed)	480	White virola face veneer (2.5 mm)	200-260
Guaruba	n.a.	Plywood	
Angelim pedra	n.a.	White virola 5.2 mm (US market)	280
Mandioqueira	n.a.	White virola 15 mm (US market)	260
		White virola 4 mm (Caribbean market)	360
		White virola 9 mm (Caribbean market)	300

Forestry in Guyana: market summary 1997

Logs (US$/m^3)		Sawnwood (US$/m^3)		Plywood (US$/m^3)	
Wallaba	169	Greenheart	412	Baromalli	354
Greenheart	322	Purpleheart	394	Ulu	354
Mora	67	Locust	399		
Wamara	94	Mora	328		
		Crabwood	351		

Source: ITTO and GFC (1998)

5 CONCLUSIONS AND RECOMMENDATIONS

Based on the information collected during this study, this final section of the report presents some conclusions about the quality of the existing economic and general management information available about the forestry sector in Suriname and makes recommendations about how this information can be improved and regularly updated in the future.

5.1 Quality of existing information

Currently, *LBB* has some information in the following areas: domestic product prices; export volumes and values; the structure and location of the sawmilling industry; forest concession area, ownership and production. Major areas where information is currently very unreliable or simply not available would appear to be: forest stocking and production potential; actual production of forest products; production by species; rates of productivity (both in the forest and in sawmills); product recovery rates or conversion factors; and production cost information. Other less important information, which would be useful to have, might also include: local market information (by product type, end-use and location); employment statistics; and information about non-wood forest products. In addition to this, as forest exploitation moves further into the interior, the need for better socio-economic information about rural communities may become greater.

5.1.1 The quality of existing cost information

A considerable amount of detailed information about forestry production costs was collected during this study. This information covered most of the inputs required for all of the main forestry activities. The only serious deficiency was information about inventory and planning costs, which is difficult to collect because very few forest operations are currently carrying-out such activities in Suriname. The information collected showed a reasonable degree of internal consistency and validity. It also seemed reasonable in comparison with similar information collected by the author in other countries (see, for example: Whiteman and Scotland, 1998).

Information about forest industry costs was much more difficult to obtain. It is believed that this was not due to a reluctance of the industry to divulge this information, but rather that many sawmill owners do not appear to keep very good records of such information themselves. The little amount of information that was collected was not very detailed, but seemed to be reasonably consistent. However, it was suspected that this information might have been biased by the currently low rates of capacity utilisation in Suriname. In particular, the labour cost element of current sawnwood production seems rather high compared with other developing countries. This may, in part, be due to the small average size of sawmills present in Suriname.

In conclusion therefore, the forestry cost information presented in this report is probably the best that can be reasonably expected. It should be possible to collect better information on processing costs, but this would require a great deal of time and effort, which might not be a high priority at the moment.

5.1.2 The quality of existing productivity and product conversion rate information

Information about productivity rates and product conversion factors is necessary to convert the raw cost data collected in this study into unit cost data (i.e. cost per m^3 of roundwood or product produced). Almost no reliable information was available about productivity rates in the forestry sector in Suriname. What was available all seemed to be rather low, for a variety of reasons, including: the small scale of many operations; weak planning and management; and other institutional factors (e.g. overmanning in parastatal companies).

It will be necessary therefore, to rely, to a certain extent, on assumptions about likely productivity in the calculation of economic rent. These can be based on the author's own experience of other countries and information collected from international sources, such as Caterpillar (1996). A critical factor in this analysis will be whether current working practices or more efficient practices are assumed in the analysis. There is

likely to be considerable divergence between currently achieved productivity rates and what could be achieved with a more efficient forestry sector. Thus, it would be useful to carry-out the analysis under both sets of assumptions to examine the benefits of removing some of the obstacles to forestry development currently present in the sector.

5.1.3 The quality of existing price information

A significant amount of detailed domestic roundwood and forest product price information was collected during this study. The information showed a high degree of internal consistency and validity. The only potential problem with the data was that it was collected from a small number of producers (five sawmillers and four logging operations). However, the information collected is probably reasonable enough for the purpose of calculating economic rent.

LBB currently collect export volume and value information for all forest products legally exported from Suriname and export prices can be calculated from this information. This information contains a great amount of detail about types of product, prices and market destination. However, due to the current foreign exchange restrictions, imposition of *ad valorem* export tariffs and minimum export prices imposed upon forest products exporters, it is believed that most of this information is significantly biased downwards. This was confirmed by comparison with export prices achieved in neighbouring countries such as Guyana, where forest levies are structured differently. It is likely that it might be necessary therefore, to use price information collected from international sources to calculate what the real level of economic rent is in the parts of the forestry sector currently exporting roundwood and forest products.

5.1.4 The quality of general information about production and trade in the sector

Generally, the information available about forestry production in Suriname is quite weak. Starting with the forest resources, the potential yield of commercial species is unknown and serious questions remain concerning the appropriate harvesting regime (i.e. cutting diameter, growth and cutting cycle) which should be followed. The collection of roundwood production statistics largely relies on forest concessionaires submitting their production information to *LBB,* for the purpose of royalty assessment. It is suspected that the current figures probably underestimate production by at least 20% and almost no information is collected about production by species or quality, other than what is required for the calculation of royalty payments (i.e. production is divided into three broad species groups). Only slightly better information about the production of forest products is available. The 1990 sawmill survey collected some rough information about production from about half of the sawmills in Suriname and an attempt has been made to update some of this. However, as with roundwood production, this information does not collect much detail about species and quality. It also need to be systematically updated (and measured properly) on a regular basis.

Trade statistics are probably somewhat better. With the exception of illegal trade with neighbouring countries, the export volume information currently collected by LBB is probably reasonably accurate and sufficiently detailed to get a reasonably good impression about forest product trade. However, as noted above, the value information is probably quite unreliable.

5.2 Improving and updating the information

In light of the current weaknesses in the information available about the economics of forest operation in Suriname, it is recommended that several small surveys should be implemented to improve this situation. The main recommendations are summarised below, along with an indication of priority for each of these activities.

5.2.1 Recommendations to improve and update cost information

The main weaknesses in the calculation of production costs is likely to be the lack of product recovery rate and productivity information and information about the costs of processing roundwood into forest products. In order to rectify this situation, it is recommended that the following activities should be considered:

Recommendation 1: A regular census of the sawmilling sector should be carried-out every three years. Every sawmill owner should be visited and information should be collected about: estimated capacity and utilisation (sawmillers' own estimates); the number and type of all major pieces of sawmilling equipment they have (by observation - to check on capacity estimates); and employment (sawmillers' own estimates - checked by observation)[25]. Any new mills established in between censuses should also be visited and added to the database of results when they start operations (and need not be visited during the next census). It is estimated that it would take approximately three months for two members of staff to design this census, collect the data and analyse the results. Priority: HIGH.

Recommendation 2: Using the sawmill census as a sampling frame, information about product conversion rates should be collected from a stratified random sample of sawmillers. Information should be collected by direct measurement of roundwood entering the mill and product production over a number of days at each mill. Five one-day visits to 15 mills would probably provide a sufficiently large enough sample to accurately estimate recovery rates by log size, species and type and quality of product. This information should be collected once, then be updated on a less intensive cycle than the sawmill capacity information. Updating could take place every six years or on a rolling programme of, say, three mills per year. It is estimated that the initial survey would take approximately five months for three members of staff (one data analyst and two data collectors) to design the survey, collect the data and analyse the results. Priority: HIGH.

Recommendation 3: Sawmills should be required to provide information on the annual volume of sales every year. It is unlikely that a survey at the end of each year would provide reliable results. Therefore, a postal questionnaire should be sent to a sample of mills every month asking them to record their volume of sales over the coming month. Information collected should include sales volume by species, type of product, and quality, but should not ask about sales revenue. By sending this to six mills each month, it should be possible to survey every mill once per year (a different month each year for each mill). The capacity and capacity utilisation census can be used to convert the monthly results into an annual estimate of production. It is estimated that this survey would take approximately two months for one data analyst to design the survey and analyse the results and three days per month to collect the data. Priority: HIGH.

Recommendation 4: Forest machinery productivity should be estimated using a small stratified random sample of forest concessionaires and independent loggers. General information about productivity should be collected using interviews with forest managers, then detailed productivity information should be collected using standard work-study techniques. Ten days at ten logging operations working in different types of forest and terrain and at different scale of operations, would give an adequate

[25] If sawmillers' estimates appear to be reasonably accurate in the first census, later censuses could be carried-out by postal questionnaire or telephone interview. This would significantly reduce the cost of the census.

sample to produce work-study tables for most of the conditions currently encountered in Suriname. It is estimated that this survey would take approximately two months for one data analyst to design the survey, three months for four data collectors to collect the information (two teams of two) and three months to analyse the results. Priority: LOW.

Recommendation 5: Sawmill processing cost information should be collected from a small number of sawmills (say, five) and be used to model the costs of sawnwood production for a range of different mill sizes, capacity utilisation and product recovery rates and product types. This information should ideally be collected by a qualified independent expert (e.g. an accountant or economist with some forestry experience) examining the records of sawmills. It is estimated that that this survey would take approximately one month for one data analyst to design the survey, three months for one data collector to collect this information (two weeks at five or six mills) and three months to analyse the results. Priority: MEDIUM.

In addition to the above surveys to improve areas where existing information is poor, the cost information, which is reasonably good, should also be updated on a regular basis as follows:

Recommendation 6: Existing information on the cost of labour, consumable and capital inputs used in the forest harvesting and management sector should be revised every year by collecting such information from forest concessionaires, equipment suppliers and other suppliers of consumable items. It is estimated that that this revision would take approximately one month for one staff member to collect and analyse this information each year. Priority: HIGH.

5.2.2 Recommendations to improve and update price information

Information about prices is likely to be the most sensitive information to collect and also the information most likely to be deliberately mis-stated. Therefore, reliable information about prices can only be collected where this is given freely and without fear of later repercussions. It is recommended that price information should be collected and updated in the following three ways:

Recommendation 7: *LBB* should keep a file on domestic product prices containing published list prices obtained from sawmillers and advertisements in local newspapers. It is estimated that that this will be an ongoing activity and will not require significant inputs. Priority: HIGH.

Recommendation 8: Information about domestic roundwood prices should be obtained from casual discussions with individuals operating in the sector during the course of the other surveys listed above. It is estimated that that this will be an ongoing activity and will not require significant inputs. Priority: HIGH.

Recommendation 9: For export price information, *LBB* should supplement the information collected locally from exporters, with information from international sources. Any new price information from ITTO, FAO and MTC should be downloaded from their Internet sites, which should be checked every month. In addition to this, *LBB* should attempt to establish a simple library of this information (and any other relevant international price information that comes their way). It is estimated that that this will be an ongoing activity and will not require significant inputs. Priority: HIGH.

Although the above recommendations do not appear to be systematic, following them should ensure that recent reliable international product price information will be available when it is needed

5.2.3 Recommendations to improve general information about the forestry sector

Information about forest stocking will be collected when the National Forest Inventory is implemented. Similarly, information about roundwood production and forest stocking in individual concessions should improve when the *SBB* becomes operational. The detailed recommendations for information collection during both of these activities can be found in Cox (1998) and Mitchell (1998). Recommendations number one to three above should increase the quality of general information available about the processing sector. The only new suggestion (for general data collection) that arose out of the information collected during this study concerns estimation of growth and yield.

As noted in *Section 3.5.1 Timber yields and cutting cycle*, there is considerable uncertainty about what the level of growth and yield might be in Surinam's natural forest. Such information is usually collected from permanent sample plots, but this takes a considerable amount of time, can suffer from measurement difficulties and often reflects research conditions rather than typical operating practices in the forest. An alternative way in which growth any yield can be estimated however, is to examine stocking across a cross-section of forest areas which have been harvested at different times. This provides a rapid way of estimating regrowth and is more representative of the growth that might be expected after normal forest operations.

Estimating regrowth in such a way is, of course subject to another set of possible biases and measurement difficulties, the most common of which are being able to guarantee that the forest has not been re-logged since it was first harvested and being able to control for differences in original stocking and logging intensity at each site. However, if such factors can be identified and measured, then statistical techniques such as multiple linear regression analysis can be used to extract a simple estimate of growth.[26] Discussions with the logging manager at *Bruynzeel* suggested that, in some of their areas, this might be possible. A preliminary estimate of growth might be estimated therefore, by attempting such an approach.

> **<u>Recommendation 10:</u> The possibility of identifying past logging areas which have not been re-entered and collecting information about the original harvesting intensity of these areas should be examined with *Bruynzeel*. If this information is available, consideration should be given to collecting stocking information from these areas and analysing this information with a view to estimating forest regrowth after harvesting. The inputs required for this special study can not currently be estimated with any great accuracy. However, based on past experience, such a study would probably require two to three months of forest inventory work for two to three teams, plus around three months analysis. Priority: LOW.**

5.3 Institutional considerations

The above section presented a prioritised programme of activities to collect future economic information about the forestry sector in Suriname on a regular basis. This section discusses some of the institutional aspects of data collection, storage and dissemination, which should be considered in the implementation of these activities.

5.3.1 Information storage and dissemination

In order for much of the information collected above to be of greatest value, it should be systematically catalogued and stored for a reasonably long period of time. Much of it should also be disseminated widely throughout the industry in order to help with the management and development of the sector and show

[26] The author has considerable experience of using this technique in Indonesia to estimate regrowth from areas previously harvested using forest inventory data similar to that which would be collected in exploration inventories in Suriname.

companies the results of their collaborative efforts. With respect to this, the following recommendations are suggested for further consideration.

<u>Recommendation 11:</u> Information about sawmilling capacity, capacity utilisation and product recovery rates should be stored on a simple spreadsheet database, which should be continuously updated as new information is collected. The database developed as part of this study could be taken as a starting point for this and could be modified as necessary, to include other information collected in the census and surveys. This can be done as part of the ongoing survey work recommended above and would not require any additional input. Priority: HIGH.

<u>Recommendation 12:</u> Other cost and price information should be stored on paper in referenced files for use as and when required. Reports on costs and prices should be produced from this information every time forest levies are revised (ideally every year) and these reports should be archived in a forestry library (see below). This can be done as part of the ongoing survey work recommended above and would not require any additional input. Priority: HIGH.

<u>Recommendation 13:</u> The FAO Project has collected a considerable amount of project reports and other publications. In addition to this, various sections of *LBB* also have their own reports and publications on a variety of subjects and the surveys recommended above should result in the production of several reports each year. Consideration should be given to establishing a properly referenced forestry library, which should be handed over to LBB when the Project finishes. With respect to this, an internationally recognised classification system for forestry publications is presented in Appendix 3. Responsibility for the maintenance of this library should be gradually handed over to *LBB* or *SBB* during the final year of the Project. In order that maintenance of this library is guaranteed, it will be important to ensure that one member of staff is given responsibility for the management of this resource. It is estimated that that the establishment of the library might take four months for one staff member and one month per year on average to maintain the library. Priority: MEDIUM.

<u>Recommendation 14:</u> Reports of the surveys recommended above should be distributed to all those taking part in the surveys. This information may be of use for the development of their companies and disseminating the information is likely to increase their willingness to collaborate. Such information may also generally promote the development of the sector and such reports should be distributed to other interested parties at *LBB's* discretion.[27] Individual copies of these reports can be produced as part of the ongoing survey work recommended above, but additional resources will probably be needed to produce multiple copies and disseminate these reports. Priority: HIGH.

<u>Recommendation 15:</u> Consideration should be given to producing a simple publicly-available annual report on forestry in Suriname. This should contain summaries of the information collected in the surveys recommended above plus other readily available information about forest resources, the forest industry, production and trade, forestry policy and legislation and the Forest Service. Production of such a report should not

[27] Any commercially sensitive information about individual companies in these reports should, of course, either be cut from the public versions or be concealed in a way in which the individual company can not be identified.

involve much additional work (say, one month) but additional resources will probably be needed to produce multiple copies of the report. Priority: LOW.

5.3.2 The role of *LBB*, industry associations and NGOs

In many countries, several of the surveys recommended above would be carried-out either by private-sector industry associations or by the government in collaboration with such associations. In Suriname however, the forest industry associations do not currently appear to have the capacity to undertake such activities. It would be advisable therefore, to involve them wherever possible in the activities recommended above. This will not only develop their capacity to be of more use to their members, but might also increase collaboration in the collection of this information.

Another factor, which needs to be considered, is the commercial sensitivity of the information being collected. During interviews conducted as part of this study, most respondents appeared to be quite willing to provide information about their operations. If *LBB* were to start collecting this information on a regular basis though, respondents might start to raise concerns about what this information will eventually be used for. Careful thought needs to be given therefore, as to whether independent institutions such as the university should be used to collect some of this information.

These institutional issues should be addressed in the following ways:

<u>Recommendation 16:</u> The private-sector industrial associations involved in the forestry sector in Suriname should be involved in the development and implementation of the surveys recommended above. This does not, of course, mean that the Forest Service has to surrender any control over policymaking to these organisations, but rather that they should be involved in some way in the collection (and possibly the interpretation) of this information. This should not require any additional resources. Priority: HIGH.

<u>Recommendation 17:</u> Consideration should also be given to re-establishing regular round-table meetings with the industrial associations and NGOs. These meetings could be used to disseminate the results of these surveys and discuss additional qualitative information about general issues affecting the sector. This should require only minimal additional resources. Priority: MEDIUM.

<u>Recommendation 18:</u> Confidentiality may be an important issue in several of the recommended surveys. This should be discussed during the above discussion in order to identify areas of concern and potential solutions. If confidentiality does become a problem, *LBB* may have to consider employing independent institutions to collect some of this data. This may have serious resource implications. Priority: HIGH.

5.3.3 Training requirements

The staff of *LBB* Planning Bureau already generally appear to have most of the skills necessary to carry-out many of the activities recommended above. However, in view of the general level of staff resources in the Bureau, it may be necessary to utilise other staff members of *LBB* to collect some of this information. This will require that any survey materials produced are clear and easy to use and that *LBB* Planning Bureau staff have the capacity to train data collectors to help with the collection of this information. The following training is recommended therefore:

<u>Recommendation 19:</u> Staff of *LBB* who will be directly involved in collecting and analysing the information collected in the surveys recommended above should receive additional training in the following areas: survey planning and design;

questionnaire design; data analysis and report writing. Much of this training can probably be accomplished through continued regular contact with the FAO Project and a little technical backstopping from Rome. This should be achieved as part of the ongoing survey work recommended above, which should be started during the remaining year of the Project. Priority: HIGH.

5.3.4 Capacity to implement these activities

The last (but probably most important) consideration is the question of whether LBB have sufficient resources to implement all of these recommendations. The total estimated staff resources required to establish and maintain the ongoing surveys recommended above come to 29 person months in the first year and eight person months thereafter. The additional special studies on forest productivity rates, forest processing costs and yield estimation might require an additional 42 person months to implement.

The initial requirement is clearly well above *LBB* Planning Bureau's current capacity (but could be achieved if additional resources within *LBB* were used to assist with data collection). However, the ongoing staff requirements are much lower and may be within the capacity of *LBB* Planning Bureau to sustain. This leads to the final recommendation below.

Recommendation 20: *LBB* and the FAO Project should consider which of the above recommendations should receive the highest priority and are within the capacity of *LBB* to sustain beyond the end of the project. *LBB* should then start to plan the implementation of these activities and institutionalise them within their annual programme of activities. Priority: HIGH.

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GLOSSARY

ABE	*Associatie van Boxexploitanten* (Suriname Loggers Association)
HKV	*Houtkapvergunning* (Community forest): an area of forest granted in perpetuity to tribal communities to allow harvesting of wood and non-wood products for the community's own use.
ICL	Incidental Cutting Licence: an area of forest granted for a short period of time to cover short-term wood shortages or a specific market need.
LBB	*Lands Bosbeheer* (Suriname Forest Service): the government department with responsibility for the forestry sector in Suriname.
n.a.	Data is not applicable or not available
PRA	Participatory rural appraisal: a technique to collect socio-economic information from rural forest-dwelling communities.
SBB	*Stichting voor Bosbeheer en Bostoezicht* (Foundation for forest management and production control): the proposed foundation, which will check and approve future harvesting plans and monitor roundwood production.

APPENDIX 1: USEFUL DATA SOURCES

The following sections provide a brief description of various sources that may be useful for the economic analysis of the forestry sector in Suriname as well as more general forestry policy analysis. All of the sources listed here are free. The text also contains hyperlinks (shown as underlined text) to each of these sites[28]. If the electronic version of this document is loaded into a computer with internet access, it should be possible to connect directly to each of these sites, simply by clicking once (with the left-hand mouse button) on any of the hyperlinks.

Timber prices

Three international agencies present regular information about timber prices on their Internet sites and one national institution produces some tropical timber price information that may be of use to Suriname. In addition to these, a few other organisations produce some price and marketing information (mostly for the USA) which may be of limited use.

The Food and Agriculture Organisation of the United Nations

The Food and Agriculture Organisation of the United Nations (FAO) is the UN specialised agency responsible for international forestry policy development, statistical collection and analysis and currently has 175 member countries and territories. The general FAO Internet address is: http://www.fao.org.

The FAO has a substantial on-line forestry statistics database within its World Agricultural Information Centre (WAICENT). The database contains annual statistics showing: production volumes; trade volumes; and trade values[29], from 1960 to the most recent available year[30]. The database contains over 30 forest product categories (plus many aggregated categories) for all countries and territories of the world. Time series data for individual countries and products can be downloaded for free by the general public[31].

The main strengths of the FAO forestry database are that it: covers all the countries of the world; has data stretching back over a long period of time; and includes a comprehensive set of product categories. The main weaknesses are that it is not very up-to-date and that the product categories included on the database are rather broad. It is mostly useful therefore, for long-term trend analysis. The WAICENT forestry database can be found at: http://apps.fao.org/cgi-bin/nph-db.pl.

In addition to the forestry database, the FAO Forestry Department also has an internet site within WAICENT which contains a wide range of information, including: publications; additional forestry databases; links to other forestry sites; information notes; regional reports; reports of meetings and statutory bodies; and reports of current activities. The FAO Forestry Department's Internet service is also currently being upgraded to offer more information in the future. The Forestry Department's current homepage can be found at: http://www.fao.org/waicent/faoinfo/forestry/forestry.htm.

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28 Note - any spaces in internet adresses must be typed using the "_" key on the computer, eg. ITTO's market news service must be typed as"market_news".

29 Prices are not explicitly presented in the database, but trade prices can be calculated by dividing the total value of trade by the total volume of trade for any country and any year.

30 The forestry statistics on WAICENT are updated every quarter. It generally takes between 12 and 18 months for a complete set of new data to be constructed. Thus, for example, by the middle of 1998, preliminary data for 1997 started to appear in the database.

31 However, *LBB*, as a data provider, can also apply to get better free access privileges, which would enable *LBB* to download much larger data sets, should the need arise.

The International Tropical Timber Organisation

The International Tropical Timber Organisation (ITTO) is an intergovernmental organisation established by international treaty. Members of the ITTO include all of the major producers and consumers of tropical wood products. ITTO currently has 23 consumer country members and 26 producer country members (of which Suriname is the latest to join). The general ITTO Internet address is: http://itto.or.jp/index.html.

The ITTO produces the following two sources of information on timber prices:

1. the Annual Review and Assessment of the World Tropical Timber Situation; and
2. the Tropical Timber Market Report

The ITTO Annual Review is produced for the annual meeting of the International Tropical Timber Council in December each year and is usually made available on the ITTO website at around this time. It contains a complete description of developments in solid wood product[32] markets for all ITTO member countries. Statistics are presented for the previous 2-5 years, and the ITTO Annual Review includes estimates of most statistics for the current year. Data presented in the ITTO Annual Review includes statistics in the following areas: production; consumption; trade; and prices, plus general information on individual countries and trade issues.

The ITTO Annual Review is a good source for up-to-date information about timber markets in ITTO member countries in the current and recent years. It is less useful for the analysis of longer-term trends. The ITTO Annual Review for 1997 can be found at: http://itto.or.jp/timber_situation/index.html.

The ITTO Market Report is produced twice every month and contains domestic and export price information for all solid wood products made from tropical timber species across all ITTO member countries. It also features reports from individual countries (mostly Asian countries) which present recent developments in their markets and occasional articles on thematic topics. This is a very useful source of recent and short-term price information and goes into some detail (e.g. prices by species, grade and product). However, only a few recent copies of the report are kept on the internet site, so it is less useful for getting long-term information (unless it is regularly downloaded and printed-out) The ITTO Market Report can be found at: http://itto.or.jp/market_news/index.html or can be automatically received by e-mail, by requesting this service from mjadams@itto.or.jp.

The ITTO also produces some general tropical forestry information and information about the ITTO, which can be obtained from the general Internet address given above.

The United Nations Economic Commission for Europe

The United Nations Economic Commission for Europe (UNECE) is an agency of the UN Economic and Social Council. Members of the UNECE include all the countries of Western Europe, most of the states of the former USSR, the United States of America and Canada. The UNECE has a Timber Section (which is jointly funded by FAO) and their general Internet address is: www.unece.org.

The Timber Section produces a rang of marketing information, including: bulletins of forest products prices; an annual market review; outlook studies describing likely future market developments and special papers on various timber marketing issues. They also arrange study tours in Europe and America (mostly for East European countries). Very little of the information produced by the FAO/UNECE Timber Section is currently available on the website at the moment, but there are plans to increase the amount of information that will be presented on-line.

[32] The ITTO Annual Review only examines products made from tropical timber species and includes information about the following products: roundwood, sawnwood, plywood, veneer sheets and, to some extent, secondary wood products (eg. mouldings and furniture) and reconstituted panels.

Malaysian Timber Council

The Malaysian Timber Council (MTC) is a Malaysian forest industry association and produces a range of information about Malaysian forestry, including some price information. The MTC Internet site is one of the better national forestry Internet sites and can be found at: http://mtc.com.my.

This site contains some data of relevance to Suriname, such as general market reports and price series for exports of Malaysian tropical timer. The MTC also host the International Timber Marketing List (see below).

Other sources

In addition to the above, there are a range of other sources of price information produced in the USA. Most of the price information available from these internet sites is for species and grades of wood products produced in the USA and is not, therefore, particularly relevant to Suriname. However, most of these sites also contain general information about global market conditions, which may be of use.

The **Western Wood Products Association (WWPA)** is a private company which provides an independent timber grading service and other marketing and technical services to the forest industry in the north-western USA. The WWPA regularly produces timber market reports, covering prices and supply and demand conditions around the world, which may be of interest in Suriname. The WWPA Internet site can be found at: http://www.wwpa.org.

The **Mississippi State University Extension Service** is produces timber price reports for the State of Mississippi every two months. While this information is not particularly relevant to Suriname, it does provide some general information about timber market developments in the southern USA. The service's current timber market report can be found at: http://ext.msstate.edu/anr/forestry/forestinfo/misstimber.html. The previous year's market reports can also be obtained from this address.

The World Bank produces a quarterly commodity market review: **Commodity Markets and the Developing Countries**. A summary of the latest copy of the review (August 1997) is available at the following Internet address: http://www.worldbank.org/html/extpb/comq/comq897.htm. The summary contains some very brief information about timber prices and general commodity market developments. However, it would probably be necessary to subscribe to the review to get all of the information available. Also, the last edition of the review available on the Internet site is over a year old and it is not known whether the World Bank is still producing this information.

Production cost information

Very little information about production costs is available from international sources. Most of the information that is available only covers new and second-hand equipment prices in the USA. However, this may be useful to get a general impression of equipment prices in Suriname. (With freight charges, insurance and import duties, it seems that prices of equipment in Suriname are roughly twice the prices quoted in the USA).

Many suppliers in the USA have Internet sites that contain information about equipment prices and a useful Internet site, which provides links to a wide range of suppliers, is the **Forest Industry Network**. This network also provides many links to a range of other forestry information sources, and can be found at: http://www.forestindustry.com. The two largest Internet sites, which contain a vast amount of information about equipment prices, are described below.

TMS Machinery Sales

The largest source of information about equipment prices is the TMS Machinery Sales Internet site, which can be found at: http://www.tms-sales.com. TMS Machinery Sales is a company specialising in selling forestry equipment (new and second-hand) using the internet and their equipment listing includes around 3,000 pieces of equipment for sale. Each sale record includes the type of equipment, manufacturer and

model, details of any additional equipment included in the sale, location, price, condition of the equipment and, sometimes, the age of the equipment. A wide range of types of equipment are contained in the listings, including: bandsaws; gangsaws; edgers; planers; chippers; generators; fork lift trucks; log carriages; grinders; dryers; sorters and stackers; panels saws; hoists; cranes; loaders; logging trucks and trailers; skidders; bulldozers; plus many other minor items.

Equipment Search

Another large source of equipment price information is Equipment Search, which can be found at: http://equipmentsearch.com. Equipment Search is a search engine that allows the user to specify what type of equipment they are interested in, then it supplies links to dealers who currently have that equipment for sale. Equipment Search covers a wide range of heavy equipment, including forestry machinery such as: bulldozers; skidders; logging trucks and trailers; and loaders. Each record indicates the manufacturer and model of the equipment, details of any additional equipment included in the sale, the age of the equipment, location and price. In some cases it also provides a picture of the equipment being sold.

Journals

There are a number of on-line journals currently available, covering a wide range of topics. The ones that are most relevant to forestry are described below.

Unasilva

Unasilva is the journal of the FAO Forestry Department and is published four times per year. Each issue of the journal usually concentrates on a particular forestry topic that is likely to be of interest to a wide range of countries. Recent issues have covered: global fibre supply; computers and forestry; forest extension; and forest products trade and marketing. The Unasilva Internet site contains the last 12 issues of the journal. The Unasilva Internet address is: http://www.fao.org/waicent/faoinfo/forestry/unasilva/default.htm.

Tropical Forest Update

Tropical Forest Update is the journal of the ITTO and is published four times per year. The journal covers a range of topics that are likely to be of interest to forestry policymakers in Suriname, including: advances in tropical forest management; market information; international agreements and meetings; and reports from individual countries. The journal is available free from ITTO by mail, or can be accessed from the following Internet site: http://itto.or.jp/forest_update/index.html. The site carries the last eight issues of the journal.

Timber Processing

Timber Processing is an American trade magazine dealing with the solid wood processing industry. The magazine covers a range of issues such as: market developments; technology; and new products. The magazine is available free to anyone working in the forest processing industry, but only, unfortunately, in the USA. However, a summary of some of the magazine's articles can be found on the magazine's Internet site. The Internet address for Timber Processing is: http://www.timberprocessing.com.

CINTRAFOR News

CINTRAFOR (the Center for International Trade in Forest Products) is an independent research organisation within the University of Washington. The main focus of CINTRAFOR's research is global supply and demand studies, but the centre also produces research on particular regions (especially the North-western USA and Pacific Rim) and on forest management and industry development topics. CINTRAFOR News presents the results of the center's recent research, information about current and forthcoming research activities and other information about the center. The main CINTRAFOR internet address is: http://www.cintrafor.org and the last two issues of CINTRAFOR News can be found at: this address.

Discussion groups and listservers

Discussion groups and list servers are e-mail services that automatically e-mail messages on the topic the group is interested in to members of the group. Some act as discussion groups, where every member of the group can post a message to all the other members of the group. Others act mainly to disseminate information from a particular organisation (e.g. CIFOR's POLEX listserver). Joining the group is usually achieved by sending a message that is formatted in a particular way to the list owner. The most useful forestry listservers are described below. However, it is worthwhile noting that some of these listservers are very active and often send many messages to group members every day.

Forest Mailing List

The Finnish Forest Research Institute (METLA) maintains the Forest Mailing List. The list is intended to be a general-purpose forum for all issues related to forestry that can be put into an e-mail. The list tends to cover temperate forestry issues rather than tropical forestry issues. The list can be joined by sending an e-mail message to listserve@listserve.funet.fi, leaving the subject line empty and typing in the first row of the message: subscribe forest your name (i.e. type in your name). The listserver will identify the sender's e-mail address from their message and e-mail the sender to confirm that they wish to join the list. Then it will send full instructions for using the list. Expect about 3-4 e-mails per day from this listserver.

International Forest List

The International Forest List is similar to the Forest Mailing List, but with a tropical forestry focus. The list can be joined by sending an e-mail message to forest-request@tech2000.org, leaving the subject line empty and typing in the first row of the message: subscribe forest list. The listserver will identify the sender's e-mail address from their message and send full instructions for using the list. Expect about 3 e-mails per day from this listserver.

International Timber Marketing List

The International Timber Marketing List is a fairly new listserver, maintained by the Malaysian Timber Council. The aim of the list is for buyers and sellers of forest products to advertise their needs or products and make contacts with others in then business. About one-third of notices on the list are for products available for sale, another one-third come from buyers looking for products; and one-third are general notices from companies indicating their products and services. This list may be particularly useful for Surinam's forest industry to develop contacts and marketing opportunities in other countries. The list can be joined by sending a message to timber-biz-request@mtc.com.my, leaving the header subject line empty and typing in the first row of the message: subscribe timber-biz. It is also necessary to include the following information in the message: your full name; your job title/profession; the full name of your organisation/company; your full postal address; a contact number (i.e. fax and telephone number); and e-mail address and homepage (if any). The listserver will identify the sender's e-mail address from their message and send full instructions for using the list. Expect about 2 e-mails per day from this listserver.

POLEX Listserver

The POLEX listserver is maintained by CIFOR (the Center for International Forestry Research). Unlike the other listservers, the list is only used to disseminate information from CIFOR and is not a general discussion group. POLEX is an acronym for POLicy EXchange and messages from the listserver mostly discuss the results of policy studies recently carried-out at CIFOR or (occasionally) present results of other policy studies. The geographical scope of POLEX is world-wide, but the studies disseminated through the list mostly examine policy issues in tropical countries. The list can be joined by contacting David Kaimowitz at the Center for International Forestry Research (phone 62-251-622-622, or e-mail: d.kaimowitz@cgnet.com). Expect about 1 e-mail per month from this listserver.

NTFP Biocultural Digest

The purpose of the NTFP Biocultural Digest is to promote the advancement of knowledge about human dimensions of world-wide non-timber forest product use. The list allows some commercial activity (e.g. announcement of NTFP books for sale), but in general the list is not intended for promoting and selling goods and services. This list can be used to share research materials, event announcements, funding, job and training opportunities, relevant newsletters, and news in general regarding non-timber forest products. The list can be joined by sending a message to Majordomo@igc.org, leaving the header subject line empty and typing in the first row of the message: subscribe ntfp-biocultural-digest <your e-mail address>. The listserver will identify the sender's e-mail address from their message and send full instructions for using the list. Expect about 2 e-mails per month from this listserver.

General forestry and economic information

In addition to specific information sources about forestry, there is also a wide range of other Internet resources that may be useful for forestry policy analysis in Suriname. Some of these provide general information about global forestry or forestry policy in other countries and others provide general economic information. A brief description of the resources, which are likely to be most useful, is given below.

GAIA Forest Conservation Archives

The GAIA Forest Conservation Archives present a wide range of information about forestry and conservation issues all over the world. The archives can be found at: http://forests.org. One of the most useful parts of the archives is the database of newspaper reports and press releases, which can be used to discover what the international community is saying about forestry in Suriname. Currently, the archives contain 22 articles on forestry in Suriname covering issues such as: the proposed new nature reserve; indigenous rights; gold mining and forestry; ecotourism; and foreign-controlled companies applications for forest concessions.

The US Forest Service

The US Forest Service Internet site contains general information about forestry policy and research in the USA. The Internet address of the US Forest Service is: http://www.fs.fed.us/. One of the most useful parts of this Internet site for forestry policymakers in Suriname, is likely to be the International Forestry Issue Briefs produced by the Service. These can be found at http://www.fs.fed.us/global/about/policy/ibindex.htm. Recent articles have included topics such as: labelling tropical timber imports; forest certification; debt for nature swaps; forests and employment; and various articles about CITES.

The Committee for the National Institute for the Environment

The Committee for the National Institute for the Environment (CNIE) is a non-governmental organisation in the USA concerned with environmental isses. Their Internet address is: http://www.cnie.org. This site may be of interest because it contains reports of the US Congressional Research Service into the way timber levies are set in the USA (see, for example, Gorte, 1995 and 1995).

The Export Hotline

The Export Hotline is a privately owned American company, which produces trade statistics and reports on trade by country and by sector. There is a fee to print reports, but they can be accessed for free using the Internet. Some of the reports may be of use to the forestry sector in Suriname (e.g. marketing reports on furniture, forestry equipment, sawmilling and woodworking equipment and the paper industry). The Export Hotline Internet address is http://www.exporthotline.com.

Tradeport

Tradeport is another useful general source of information about trade. Subjects covered at this site include information about trade barriers, tariffs and taxes for every country in the world. Although the data is not very detailed, it provides general background information about trading with other countries which may be useful to Suriname. The Tradeport Internet site is at: http://tradeport.org.

Other useful sources of data

Most of the information described above is also available in the form of publications (many of which are free) from the various organisations. These can usually be obtained by e-mailing them or writing to their postal address (which can often be found on their websites). In addition to these, there are many trade publications, but very few of these are free.

APPENDIX 2: RECORD OF DISCUSSIONS WITH STAKEHOLDERS

During the course of this study, the International Consultant (Forest Economist), local consultants and *LBB* counterparts met with many stakeholders in the forestry sector in Suriname, including: six staff of the Ministry of Natural Resources; three industry association and NGO representatives; nine sawmillers; five loggers; six members of local communities; and one representative of an international agency. These interviews did not follow a set question and answer format, but attempted to gain an insight into the current economic condition of the forestry sector in Suriname through general discussion. Cost and price data was also, of course, collected when respondents freely offered this information. By carefully steering the discussions, the interviews attempted to collect the information about the following aspects of the forestry sector in Suriname:

1. the basic size and structure of the logging and sawmilling industry;
2. the physical and economic condition (i.e. profitability) of the industry;
3. relations between the industry, government and local communities;
4. cost and location of log supply;
5. timber markets and marketing;
6. industry productivity and costs;
7. current and planned investment; and
8. the major challenges facing the forestry sector.

The following text presents a record of these discussions.

Discussions with LBB Planning Division staff - 1 October 1998

Shortly after arriving, the International Consultant (Forest Economist) discussed the current structure and status of the sawmilling industry and logging sector with counterparts from the Planning Division of *LBB*.

The sawmilling industry

The last survey of the sawmilling industry in Suriname indicated that there were about 45 sawmills in operation, most of which are in the major towns near the coast (i.e. Paramaribo, Nickerie, Albina, Paranam and Moengo)[33]. There are also an unknown number of sawnwood producers who manufacture sawnwood in or near the forest using only a chainsaw (locally referred to as "Stihl mills"). Since the survey was carried-out in 1990, a number of larger, more modern mills have been built with the aim of producing sawnwood for export. Foreign investors have mostly built these (including: MUSA and Tacoba).

With the exception of the new mills, most of the sawmilling capacity in Suriname is quite old. Much of it was installed before the 1970's, often with second-hand equipment imported from Europe. The results of the survey indicated that many sawmills use gangsaws originally built before 1940. Because much of the sawmilling machinery is so old, it was considered that normal economic measures of performance, such as return on capital, are not really applicable to the situation in Suriname (i.e. most of this machinery was completely depreciated or written-off many years ago). It was felt therefore, that most sawmillers and (and loggers) in the industry look for a profit margin or mark-up on top of their current expenditure. It was suggested that the expected profit margin is currently around 20%.

Installed capacity in the sawmilling industry is several times the level of current production and capacity utilisation is as low as 5-10% in some mills. Nearly all mills work only one shift so, technically, capacity utilisation is even worse than this. Historically, the sawmilling industry has managed to survive under these

[33] The results of the sawmill survey have been updated as part of this assignment and information on the current size and structure of the industry can be found in Table 41.

conditions, in part, because of the very low domestic roundwood price. However, the current economic downturn in Asia has reduced the demand for exports from many of the newer, larger mills and these mills have turned to supplying the domestic market with sawnwood at very low prices. Consequently, many of the older mills are now finding it particularly difficult to stay in business under current circumstances.

A major concern of sawmillers at the moment was believed to be security of supply. Since the 1992 Forest Management Act was passed, most old concessions have come to an end[34] and very few new concessions have been issued. Consequently, most sawmills are not currently properly integrated with forest concessions and sawmillers are having to rely on a variety of sources (including some, such as former concessions, which are technically illegal) for their roundwood supplies.

It was considered that the sawmilling industry has shown little desire or capacity in the past to expand or modernise. It was generally felt that there is a strong need to rationalise and modernise the industry, particularly in light of the newer more competitive mills operating in the sector. However, given their past performance and current economic conditions, it was felt that this would be difficult to achieve.

The logging sector

As well as the sawmillers with their own logging operations, there is a small independent logging sector in Suriname. With the exception of *Bruynzeel* and the newer sawmills, most sawmills and independent loggers have very small forest operations. Most operations typically consist of 1-3 chainsaw crews (of two people each), a skidder and possibly a D6 bulldozer and a log loader. Some operations have their own trucks, but most use contractors for transporting roundwood. As with the sawmilling sector, much of this machinery is very old (typically 5-10 years old and often much older than this).

There is little planning in the logging sector[35] and most operators are often re-logging previously harvested areas. There is also currently very little infrastructure development in the sector. *Bruynzeel* and the forest operations of the newer sawmills have permanent forest camps and are building some roads. However, most loggers are using existing roads (often built by *Bruynzeel* or *LBB* in the 1970's and 1980's) and skidding timber for distances of up to 2 km. This reluctance to invest in the sector may be due to the insecurity of current forest operations. However, it is may also be a sensible economic decision, in that it is probably cheaper to extract logs in this way rather than incur the cost of new road building, as long as loggers are allowed to constantly re-enter previously logged stands.

Field visit to sawmills in Paramaribo - 2 October 1998

In order to get an idea of the profitability and current challenges facing sawmills operating in Paramaribo, the Chief Technical Advisor, International Consultant (Forest Economist) and *LBB* counterparts visited two typical sawmills located on the outskirts of Paramaribo.

Sawmill number 1

The first sawmill visited was a medium-sized sawmill, supplying both the export and domestic sawnwood markets. The mill was established in the 1950's and is part of a group of two mills (the other produces furniture and higher value-added products). The mill is equipped with one horizontal bandsaw (used for primary log breakdown), three old gangsaws, a small crane, an edger and a planer. The mill also has a loader, a forklift and a couple of trucks, but most log transport is by barge. Current roundwood intake is about 5,000 m^3/year, which is estimated to be about 50% capacity utilisation (based on one shift working). The mill

[34] Technically, all old concessions should have been revoked after two years from the date the Forest Mangement Act was passed, but many former concession holders are still operating in their former concessions.

[35] Following subsequent field-visits, *Bruynzeel* appeared to be the only logging operation attempting something close to reasonable planning of forest operations.

employs 50 workers, including a couple of expatriate workers who are training the local staff in modern sawmilling techniques.

Roundwood supply is from three former concessions in the Moengo area, which the sawmiller has been allowed to continue working in (although part of one has been re-issued as an ICL). The forest operation (supplying both mills) employs 15 workers and comprises: five loaders; four bulldozers; four skidders; two tugboats; and two barges. This equipment is all old and in various states of repair[36].

The mill owner has expansion plans and has already installed a US$ 300,000 sawdoctoring shop and bought a one-year old US$50,000 horizontal bandsaw. It was estimated that it would cost a further US$50,000 to install this as a second line and that sawing with the gangsaws would gradually move over to sawing with the two bandsaws. Working on a two-shift system, it is expected that roundwood intake would expand to 12,500 m^3/year or about 65% capacity utilisation (two shift working). The mill owner is also in the process of erecting some more drying sheds and plans to build a kiln to increase the marketability of the sawnwood produced.

Sawnwood recovery is currently 25% of export quality sawnwood, plus 7% second quality sawnwood, to give a total of 32% recovery. All sawnwood production is air-dried sawnwood of a mixture of grades. With the new production line, kiln drying, some production of small mouldings and other quality improvements, it is anticipated that the sawnwood recovery rate will increase to 40% export quality plus 10% second quality. The considerable volume or residues produced in the mill are currently sold for fuelwood or mostly burned on site.

The mill owner had two significant things to say about the current challenges facing the sector. The first was the highly detrimental effect of the current exchange rate policy, whereby foreign exchange from exports must be converted back into Suriname Guilders at far below the market rate (he also commented that there were ways around this and that maybe 40% of his export revenues never come back into the country). The second point raised was a feeling of discontent with the way forest concessions and ICLs are currently being awarded. The importance of family and political connections was stressed as being a major source of discontent.

Sawmill number 2

The second sawmill visited was of a similar size to the first, but operating in an entirely different manner. The mill was also established in the 1950's and was equipped with a circular saw for primary log breakdown, four old gangsaws (only one of which is currently used), a crane, an edger and a planer (hardly ever used). The sawmill also has a loader, a forklift and a truck, a large storage/drying shed plus some accommodation buildings for its workers. The sawmiller indicated that log input was maybe 10-15 logs per day (which would be roughly equal to 5,000 m^3/year to 7,500 m^3/year), but then went on to state that total input was probably only 1,500 m^3/year (the sawmiller seemed quite unclear as to what the true rate of log input actually was). Given the current level of working, the latter figure is probably closer to the truth. Comparing this with the total capacity estimated in the 1990 sawmill survey, this would indicate that the sawmill is probably working at between 5-10% of installed capacity (based on one shift working). The mill employs 10 full-time workers and 10 part-time workers and is currently working for one shift, four days per week.

Roundwood is supplied from *HKVs* and an ICL in the Moengo area. The sawmiller pays Sf 3,000/m^3 to the village captain for logs taken from the *HKV*. The sawmiller also has a former concession in the same area, but can only use this during the dry season. He also said that it was more expensive to work in his former concession area. The forest operation employs four workers (in two crews of two) plus contract tree fellers

[36] During the discussions, the sawmiller showed us some photographs of his forest operations. An interesting photograph showed how he had dug a trench for a timber lorry and was using one of his bulldozers to push logs onto the back of the lorry from the side of the trench. While this obviously saves on the cost of owning a loader, it certainly is an interesting approach to loading logs!

(local villagers) and comprises: two skidders, a barge and a bulldozer for road construction. The bulldozer is hardly ever used.

Production from this sawmill is mostly air-dried rough sawnwood, all for the domestic market. The sawmill had a very large stock of unsold products of a wide variety of sizes, grades and species. The only current investment in the mill was replacement of part of the roof of the sawmill. The sawmill manager stated that the main problem facing his operation was the wide range of species present in Suriname and the currently low prices in the domestic market (due to the supply from the large, newer mills).

Discussions with Minister's advisors - 6 October 1998

On 6 October, the International Consultant (Forest Economist) and Chief Technical Advisor met with the two senior advisors to the Minister of Natural Resources, to discuss the consultant's preliminary assessment of the economics of the sector and present a proposed list of outputs from the assignment.

It was explained that a major factor, which will affect the scope for increasing forest levies, will be the extent to which the government will be prepared to accept a restructuring of the current industry. Given the size and types of mills currently operating in the sector, there is massive overcapacity, which will have to be closed or modernised to meet export quality requirements, if forest levies are increased. Much will also depend on the government's attitude to macroeconomic reforms to tackle issues such as the divergence between official and market exchange rates and access to investment funds.

The Minister's advisors showed great interest in these issues and agreed to a broadening of the consultant's terms of reference to look at issues such as: the structure and profitability of the current forestry sector; investment and marketing requirements for the development of the sector; macroeconomic issues such as exchange rate and investment policy; and a stakeholder analysis of who will gain and who will lose from increases in forest levies.

Visit to sawmill number 3 in Paramaribo - 7 October 1998

On 7 October, the International Consultant (Forest Economist) and *LBB* counterpart made a very short visit to a large sawmill in Paramaribo that supplies both the domestic and export markets. The *LBB* counterpart accompanying the consultant had already made arrangements to visit the mill to collect some data. The logging operations manager was very helpful and supplied detailed product price and operating cost data for all machinery working in the forest (this data is presented in the main section of this report). He also agreed to arrange a field-visit to the company's largest forest concession.

The logging manager reported that machine utilisation was very low, which was why some of the cost data (e.g. fuel consumption) looked very low. The data supplied provided all the information necessary to calculate machine-operating costs except the depreciated value of the equipment. When asked about depreciation, the logging manager reported that the company fully depreciated the value of all machinery over four years using a straight-line depreciation method, then revalued each asset and fully depreciated it again over another four years. This must lead to some overestimation of depreciation costs.

Discussions with head of the Loggers Association - 12 October 1998

The Suriname Loggers Association (*Associatie van Boxexploitanten* or *ABE*) was founded in 1977 and currently has 38 members. The independent logging sector is one of the three sectors of the forest industry, which harvest timber. The other two are sawmillers with their own forestry operations and some of the forest concession holders (none of whom are members of the loggers association). Currently none of the independent loggers have their own concessions and they mostly work in *HKVs* and ICLs. A few work in former forest concessions which have been abandoned or never been worked.

The average size of *ABE* members operations is 1-2 skidders, possibly with a bulldozer as well, plus 5-6 workers. The average age of harvesting machinery used by *ABE* members is about 20-25 years old.

The head of the *ABE* is also a logger and estimated that typical production costs in Suriname might be as follows:

Payment to village captain to harvest standing timber in HKV:	Sf 2,500/m^3
Harvesting and extraction cost:	Sf 7,500/m^3
Transport cost:	Sf 5,000/m^3 - Sf 8,000/m^3
This would give a total delivered cost (to Paramaribo) of:	Sf 15,000/m^3 - Sf 18,000/m^3

He confirmed the view of *LBB* that the loggers are generally looking for a 20% mark-up or profit on the delivered wood cost. He also stated that selling prices are currently around the following levels:

1st grade logs for the domestic market:	Sf 25,000/m^3
2nd grade logs for the domestic market:	Sf 20,000/m^3 - Sf 22,000/m^3
3rd grade logs for the domestic market:	Sf 15,000/m^3
Logs for export:	US$ 90-100/m^3

The head of the *ABE* had two main things to say about the current state of the industry. The first was that it was unfortunate that, in his opinion, political influence was being used too much to determine the development of the sector. It was felt that the forestry sector in Suriname has traditionally had very good consultation between the industry and the government. The Minister of Natural Resources has, for example, a Timber Council where all interested parties can be consulted and express their opinions about forestry policies. However, the current Minister has not used this very much.

The second point raised was that there is some conflict between the sawmillers in the sector and the independent loggers. The sawmillers tend to want to restrict roundwood exports so that they can have access to supplies, while the independent loggers want to get the best price they can for their roundwood, which often means exporting a proportion of it. It was also claimed that part of this problem is that many sawmillers built mills in the 1950's and made large profits due to low logging costs and little domestic competition. Very little of these profits were re-invested in the industry and the sawmillers have become used to earning large profits. Now, however, they can no longer compete with the newer mills being built in Suriname and are reluctant to make the investments necessary to compete on world markets.

From the independent loggers point of view, the head of the *ABE* suggested that four measures would help their development. Firstly, the loggers feel that they should be allowed to apply for forest concessions on an equal basis with other stakeholders. Secondly, the current exchange rate policy and access to investment funds makes it very difficult for them to invest in the development of the sector. The third point raised was that there was a feeling that a lack of port facilities was making it difficult for them to get the best prices for their export-grade roundwood. In particular, a lack of storage facilities means that most small loggers have to sell their timber to traders, who have better access to port facilities and can extract a proportion of the selling price in the process of exporting the timber. The last point raised was that it was felt that there is considerable need for training in improved forest management, machinery operation and harvesting techniques within the sector. The head of *ABE* noted that there had been discussions of holding workshops with major machinery manufacturers such as Stihl and Caterpillar, but that these had mostly come to nothing.

Field trip - 14 October 1998

On 14 October, the International Consultant (Forest Economist) and International Consultant (Forest Concessions) visited a small sawmill and forest logging operation to the east of Paramaribo. The purpose of the visit was to discuss the way in which concessions are issued with the sawmiller and local communities and collect cost and price data. The sawmiller also discussed the hewn square and pole production side of his business (including the wharf used to load the hewn squares and poles) and the opportunity was taken to collect a little socio-economic information about local communities in the area.

Sawmill number 4

The sawmill visited was formed from the merger of two former sawmills, which were partly destroyed during the civil war. The mill is equipped with: an old horizontal bandsaw; two edgers (one single-sided and one double-sided); a loader; and a truck. Current roundwood intake is about 8,000 m^3/year, which is estimated to be about 80% capacity utilisation (one shift working). The mill used to employ 30 workers, but this has just been reduced to 18 due to poor current market conditions.

The mill owner has plans to expand into the export market and is currently constructing a rest house above the sawmill office and rebuilding various pieces of old machinery, including a second skidder and a more efficient vertical bandsaw with sliding log carriage. The mill owner is also building a separate factory, which will produce higher value-added products, with a loan from a foreign bank. This factory (located elsewhere) will use the sawnwood produced by the sawmill. The mill owner wanted to get a loan of US$ 150,000 to upgrade the sawmill, but couldn't get the financing for this locally, so all current capital investments are funded from profits.

Sawmill recovery was estimated to be 30% (around 2,400 m^3 product volume per year), of which about 15% is second grade sawnwood which cannot be sold on the domestic market under current market conditions. All sawnwood production is undried rough sawnwood of a mixture of grades and species, none of which is stored under cover. It was estimated that 60% of production goes to Paramaribo; 10% to Moengo; and 30% to Albina. A local bakery takes some of the sawmill residues to use as firewood, for a small fee.

Logging operation number 1

Roundwood supply for the sawmill, hewn square and pole production comes from two *HKVs* and one ICL in the Moengo area. The forest operation comprises one skidder operating on a 12-hour shift system (two skidding crews each work for 12 hours per day for three days per week and perform cleaning and maintenance of the skidder on Sundays). By doing this, the skidder is utilised for roughly twice the amount of time that would be normal elsewhere. Contractors are used to load and haul timber to supplement the sawmiller's own equipment. The sawmill manager acts as exploitation manager and, besides him, the operation employs four people (two skidding crews) and contract tree fellers (some local villagers, plus villagers from elsewhere).

The logging operation produces three species used for hewn square and pole production (*Basralocus, Groenhart* and *Walaba*) and about 12 other commercial species that are used in the sawmill.

Felling costs are as follows:

Payment to village captain to harvest standing timber in HKV:	Sf 3,000/m^3
Contract felling cost (contractor with own chainsaw):	Sf 2,000/m^3

This would give a total felled at stump cost of Sf 5,000/m^3. For comparison, the sawmiller also said he could buy logs felled at roadside for between Sf 8,000/m^3 and Sf 18,000/m^3, depending on the quality of the log and species[37].

[37] The reason this price is so low, is that some workers of a large local company (in another sector) use that companies machines (at no cost to themselves) to extract timber for sale.

Contract loading and transport costs quoted by the sawmiller were as follows:

In forest loading:	Sf 3,250/m^3 (US$ 5/m^3)
Transport to the sawmill or wharf (35km):	Sf 6,500/m^3 (US$ 10/m^3)
Unloading:	Sf 2,000/m^3 (US$ 3/m^3)

The same prices are charged for logs and hewn squares but, if the load is hewn squares (i.e. for export), the contractors expect to be paid in US$.

Other cost information collected from the sawmiller was that the charge for a fully loaded timber lorry to use the ferry across the Suriname River was Sf 125,000 (or about Sf 9,000/m^3 to Sf 12,500/m^3, depending on the size of the load) and that he had just replaced the four tyres on his skidder (after two years use) at a cost of US$ 3,200 each.

In discussions about issuing new concessions, the sawmiller noted that, if he could get a new concession close to his sawmill, he would no longer be interested in working in the *HKVs*. The sawmiller already had in mind an area that he wished to enter.

Production of hewn squares and poles

A second company owned by the sawmiller and his partners produces hewn squares and poles for the domestic market and export. Hewn squares made from *Basralocus* are produced for export (mostly to the Netherlands), while *Groenhart* and *Walaba* utility poles are sold on the domestic market[38]. All of this production is transported by barge from the area to Paramaribo (to avoid the high cost of road transport and the ferry charge). Production of hewn squares is roughly one container load (26 m^3) of 12 m lengths every two weeks, plus one 200 m^3 load of longer lengths every four months. Total production of hewn squares can, therefore, be calculated as roughly 1,300 m^3/year. (Based on an average form factor of 0.7, recovery can be estimated at around 30%). Loading 200 m^3 of hewn squares takes roughly 5-6 hours, while loading a similar volume of logs takes around 4-5 hours.

Local villagers are used to produce the hewn squares by hand. On average, it takes one villager three days to produce a hewn square (but the really fast workers can produce one in around a day). Based on this information, the total employment from hewn square production can be calculated as roughly 10 full-time jobs. In addition to the costs given above, hewn square production costs are as follows:

Hewn square cutting:	Sf 10,000/m^3
Loading at the wharf:	US$ 5/m^3
Water transport to Paramaribo:	US$ 20/m^3
Unloading in Paramaribo:	US$ 10/m^3
Current containerised freight charge to the Netherlands:	US$ 65/m^3

As noted above, because hewn squares are produced for export, all the contractors (except the villagers cutting the hewn squares) want payment in US$. Another interesting comment the sawmiller made was that if he transported logs or poles for the domestic market to Paramaribo, then the barge operator and crane-owner in Paramaribo only charged him about 60% of the usual fee (Sf 10,000/m^3 for water transport and Sf 4,000/m^3 for unloading) and were happy to take payment in Suriname Guilders.

[38] It was also interesting to note that, at the wharf, the forest manager was swapping Bruinhart logs for Basralocus logs with another forest manager. These were then being turned into hewn squares at the wharf. This was one of the few examples of co-operation encountered in Suriname.

Socio-economic information

A small amount of socio-economic information was also collected as part of this field trip. Discussions with villagers indicated that they had two main interests in the way in which forest concessions are awarded in the future. The first was to ensure that the areas they needed for their agriculture and other purposes was clearly identified and respected. The second was that they wanted to get some employment in forest concessions. In this particular area, forestry is the main source of cash income for local communities. A small amount of cash income is also generated from the sale of surplus crops, but this income is relatively small and unreliable.

Villagers currently use a fairly short 5-year shifting cultivation cycle. Land is cleared by burning, then the land is intensively cropped for 12 - 18 months. Crops grown in this area are: melon (for three months), then cassava (for six months) and finally pineapple (for 6-9 months). It was noted that the villagers are increasingly turning to planting permanent crops (e.g. fruit and nut trees) on their agricultural areas once they have cropped them. It was not possible to estimate the total area under cultivation, but it was said that the main local village (200 inhabitants) had cultivated areas along the riverbank, up to 15km away.

Field trip - 15 and 16 October 1998

Over the following two days, the International Consultant (Forest Economist) and International Consultant (Forest Concessions) made further visits to the interior of Suriname (to the south of Paramaribo) to discuss the way in which concessions are issued with loggers and local communities and collect cost and price data. During this trip, discussions were held with representatives of two local communities (one with a logging operation and one with a new forest concession), a small independent logger and one of the large foreign-owned logging companies.

Logging operation number 2

The first logger interviewed during this trip was a very small independent logger, who had been working in the area for 5 years. The logger employed an assistant, but didn't own any capital machinery except for his chainsaw. All other forest operations were contracted-out.

The logger is working in a 200 ha block of savannah forest, for which he has an agricultural clearance licence issued by the District Commissioner in Brokopondo. The logger also has a licence for gravel extraction from the same area[39]. The logger is working in this area because he can not get permission to log on the *HKV* around his own village (further into the interior) from the village captain. It became clear that the logger had no intention of really clearing this area for agriculture, but was simply using this licence as a way to get permission to cut the trees[40]. For example, the logger said he would apply for another licence when this area had been logged-out. It was also unclear as to whether he was still operating in his licensed area or had already moved beyond its boundaries. When asked why he didn't apply for a concession in the area, he said he couldn't raise the Sf 400,000 needed to carry-out the survey required for an application[41].

The logger claimed that he produced 1,000 logs per month. However, based on the scale of his operation, it was thought likely that this was a vast overestimate of production (1,000 logs per year seemed more likely). The logger sells most of his logs to *Bruynzeel* and had paperwork showing that *LBB* have collected levies from him and cleared the transportation of logs produced from the area.

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39 The logger claimed that the gravel production side of his operation was more profitable than the forestry side, which seems likely.

40 However, in subsequent discussions with *LBB* staff, it was noted that the logger should still have had a separate licence from *LBB*, such as an ICL, to cut and remove the trees from this area.

41 The exact meaning behind this statement may have been that the logger felt that he would have to pay some unauthorised fees in order to get a concession. Certainly, the survey and production of a simple map (which used to be required for a concession application) should not cost Sf 400,000.

The logger quoted the following contracting costs:

Skidding (long distances but over easy terrain):	Sf 8,000/m^3
In forest loading:	Sf 1,500/m^3
Transport to the sawmill or wharf (80km):	Sf 4,000/m^3

This would give a total production cost (excluding the loggers own felling expenses) of Sf 13,500/m^3. Given the loggers position in the market, he seemed to have to produce a fairly high quality product. For example, he had a long list of log specifications, which he had to meet in order to sell to *Bruynzeel*. It is likely, therefore, that he is only producing a small volume of high quality logs (and, consequently, high-grading or creaming the forest he is operating in).

The logger also quoted the following delivered log prices:

Plywood species (1):	Sf 18,000/m^3
Sawnwood species (22):	Sf 22,000/m^3
Export species:	US$ 45/m^3 - US$ 60/m^3

It is worth noting that the price paid for plywood species is less than the price paid for sawnwood species. This is generally the opposite of what would be expected, but might reflect the fact that there is only one buyer in the market for plywood species (*Bruynzeel*).

By subtracting the loggers contracting costs from delivered wood prices, it can be calculated that he is currently earning a surplus of Sf 4,500/m^3 - Sf 8,500/m^3 (and maybe up to Sf 25,000/m^3 for export quality logs) to cover his profit and felling expenses.

Logging operation number 3

The next logging operation visited was a group of villagers (mostly relatives and friends of the local village captain) logging in the village's *HKV*. The operation has two crews of seven people working on felling and extraction. The villagers are paid Sf 13,000/m^3 for logs at roadside and have to pay Sf 8,000/m^3 for hiring the skidder. The skidder owner buys the logs, so he is effectively paying them Sf 5,000/m^3 felled at stump. They claimed that a proportion of this is paid into a village fund. Currently, *bruinhart* is being taken from the area for making utility poles.

The villagers noted that the *HKV* is almost logged-out and that they have to skid 2 km or more to extract logs. They want a larger *HKV* and have taken steps to unilaterally extend their *HKV* into a neighbouring concession[42]. Although the villagers appeared to be quite militant about expanding their *HKV*, they stated that their main concern was earning a cash income. However, when asked how many people wanted to work in the forest, they claimed that most villagers were not interested in such work and that they were the only ones with the necessary skills and experience for this sort of work[43]. They said that they would be interested in applying for a forest concession if they were given the opportunity to apply for one.

[42] The villagers had recently stopped the owner of the neighbouring concession from restaring operations in his area, by claiming that they were promised the area as an extension to their *HKV* as part of the civil war peace agreement. They took the concession owner to court and won the case.

[43] Indeed, the villagers did appear to have some knowledge of timber prospecting, felling and extraction methods, although probably not at the sort of level which will be expected in the future.

Logging operation number 4

The last logging operation visited was a large foreign-controlled operation working in an area where they had been given an exploratory licence for 150,000 ha[44]. The operation employs 30 workers (11 local people and 19 foreigners). Monthly production from the area is currently between 2,000 m^3 and 3,000 m^3 (equal to about 24,000 m^3/year to 36,000 m^3/year). The operation has 11 log trucks (proper log trucks, rather than the homemade variety which is more common in Suriname), 20 bulldozers (only five of which are currently working), three skidders and a grader. The manager said he used the grader to grade parts of the main road to Paramaribo as well as his forest roads. He claimed to have built 40 km of roads since starting operations just over a year ago.

The manager said he gave local villagers chainsaws and fuel and paid them Sf 700/m^3 for tree felling. There are no villages within the boundary of the exploration licence area and the manager claimed that he didn't have any problems with surrounding villages[45]. *LBB* currently come to inspect his operations every four months.

Discussions with leaders of a local community

On the second day of the field trip, a village far to the South of Paramaribo was visited and discussions were held with three *Bashas* or under-captains of the village about their plans for development and their opinions about the existing situation regarding forest concessions in their area.

The village originally had a population of about 800-900 but, being so far into the interior, was badly affected by the civil war, when most of the village's inhabitants fled to Paramaribo. The village now has about 300 inhabitants and retains strong links with former villagers who have settled in Paramaribo.

At the time that many villages in Suriname were granted *HKVs*, most forestry activities were only taking place in the forest belt. Consequently, potential conflicts between villages and forest concessionaires were not considered to be an important issue in villages that were far into the interior. Thus, villages such as this one, were never issued *HKVs*. The village captain has applied for an economic zone (covering rights to timber, agriculture, hunting and mining in the area) and recently applied for a *HKV*. The application for an economic zone has not been resolved, but the application for a *HKV* was rejected.

Following this rejection, the villagers set-up a foundation, in the hope that if a foundation applied for a concession on behalf of the village they might be more successful. (This idea came from former villagers now living in Paramaribo, who helped to set-up the foundation along with the NGO Forum). They were correct in their assumption and the village has just been awarded a concession covering the land around their village[46].

The villagers had two main concerns about the current situation regarding forest concessions in the area. Firstly, they were worried about concessions interfering with their hunting and agricultural activities and taking timber which they needed to build houses. The second concern, was that they were disappointed that the concessions (mostly foreign-owned) didn't consult them about their activities or offer any income or employment to local villagers. (Now that they have their own concession, some of these concerns may be lessened, but the villagers were still generally unhappy about the way things have been implemented). They

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44 The logging manager said the company had been given 850,000 ha of forest to work in. When it was explained that a concessionaire can only legally hold 150,000 ha of concessions, he said that the company had many concessions throughout Suriname. While this may be partly true, it is doubtful whether they really controlled an area as large as he was stating.

45 It is difficult to say how true this might be. From discussions with a range of people on the field trip, it was discovered that one of the other foreign-controlled logging operations working in the area definately does not employ local people and many people were upset about this.

46 The foundation has also already provided other benefits to the village as well, such as better facilities to store and process some of their agricultural products.

also expressed the view that, in their opinion, a lot of these companies were recklessly destroying the forest and that, in a few years, there would be very little timber left. They have no current plans to try to stop these concessions from operating, but said that they would make sure that they didn't encroach on the concession that the village had been given[47].

With respect to their own concession, the villagers are at a very early stage of planning. They had plans to mark the boundary in the field and were looking to potential donors or *LBB* for technical assistance with this.

Field trip - 18 October 1998

On 18 October, the International Consultant (Forest Economist) and *LBB* counterpart visited a large forest logging operation to the west of Paramaribo.

Logging operation number 5

The logging operation was one of the best-organised operations visited in Suriname. The operation was following some sort of exploitation plan, was building roads into new areas of forest and seemed to keep quite good records of machinery-use, other inputs and production. However, even this operation was suffering from problems such as low productivity and underinvestment.

The forest area is divided-up into annual working blocks and further subdivided into inventory units of 12.5 ha (500m x 250m). Before felling, the forest inventory crew walks through each inventory unit, marks every commercial tree and produces a simple plan showing the location of each tree. (Stocking is about 8-10 trees per ha or 16 m^3/ha to 20 m^3/ha). The inventory crew is expected to cover two inventory units or 25 ha per day. (Thus, the inventory crew can produce these plans much faster than the felling crews can log the area - see below). These plans are then given to the felling crews, so that they can locate all the commercial trees in each unit[48].

The operation has five felling crews, each of which is expected to fell 21 trees per day (they are paid a monthly salary rather than piece rates). However, the logging operation only has four working chainsaws and, with other maintenance problems, generally only 3-4 crews are working at any one time. The logging manager also stated that the crews often did not meet their targets and generally, only cut about 17 trees per day. Assuming an average tree volume of 2 m^3 and five days holiday every three weeks[49], this would give a daily production rate of about 80 m^3 (equal to around 5 ha) or an average annual production of around 30,000 m^3 in total[50].

The operation has three skidders (plus two broken skidders) and one bulldozer for skid trail construction (plus one broken skidder). These skid logs to the landing where they are loaded by one in-forest loader (which loads about 80 m^3 per day). The skid trails were not particularly long, but didn't seem to be planned very well.

Logs are hauled by three trucks to the logyard. The company owns one log truck and two belong to contractors. The contractors charge US$ 1.50/m^3 for the 30 km haul to the logyard. Logs are graded at the logyard and loaded by the company's other loader onto barges for the journey to Paramaribo.

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47 Interestingly, these comments were in direct contrast to statements made by the logging manager of the company the villagers were referring to. At a discussion with the manager in Paramaribo, the manager claimed that he had plans to use local people for 90% of his operations and recruit local foresters to improve his operations. This plan doesn't appear to have been put into action to-date.

48 But they are not, unfortunately, given to the bulldozer drivers so that they can plan sensible skid trails.

49 Working hours are 7.30 - 4.00, but most workers finish around 1.00 (despite not meeting their production targets). Employees work every day and are then given holiday from Thursday to Monday every three weeks.

50 Productivity may be slightly better than calculated here. *Bruynzeel's* production plan for this area indicates an annual production level of 37,000 m^3.

The company used to run its own barges, but now water transport to Paramaribo is contracted-out, at a cost of Sf 45,000/day for rental of the barge plus Sf 17,500/hour operating cost. This gives a total water transport cost of around Sf 3,000/m^3 to Paramaribo[51].

The company has one bulldozer for road building and one grader. This is inadequate and, with maintenance problems, the road building programme in the forest is about one year behind schedule. The logging manager would like to build better roads with a gravel surface, but the company's dump truck and bucket loader are both broken-down.

Overall, the logging operation employs 60 people in this area, plus 50 people in other forest areas and 30 in the factory at Paramaribo (140 out of a total of 900 employees for the whole of the company). Wages are currently very low (about Sf 100,000/month), which may account for some of the productivity problems. However, the logging operation is overstaffed. This is partly due to the history of the company. The company had to take on a lot of workers as a condition of the peace agreement, but this has led to overmanning and low labour productivity. Many of the employees are villagers (but not from within the forest area, which does not have any villages within its boundary) and it would be politically difficult to reduce the size of the workforce.

Visit to sawmill number 5 in Paramaribo - 29 October 1998

On 29 October, the International Consultant (Forest Economist) and *LBB* counterpart visited a medium-sized sawmill on the outskirts of Paramaribo. The sawmill has currently stopped operations (since April) due to poor market conditions, but the manager was still able to provide some information about the operation.

The sawmill was established in 1975 with mostly new equipment, but none of the equipment in the sawmill has been replaced since that time. The mill is equipped with one crane, one bandsaw (for primary log breakdown), two gangsaws, two edgers and a planer. The mill also has two loaders and a D4 bulldozer for moving logs around, a saw-doctoring shop and extensive storage sheds. The capacity of the mill is estimated to be 8,000 m^3/year to 10,000 m^3/year log input (based on one shift working). In the last few years, the mill has been processing about 2,000 m^3/year to 4,000 m^3/year (or working at around 30-50% capacity). The product recovery rate was about 40-45% and the mill employed 30 people when it was working.

The mill obtained its timber from its own former forest concessions: one of 30,000 ha in western Suriname and another of 30,000 ha in central Suriname, and the mill used 8-10 species from these areas. The mill produced a wide range of products for the domestic market, including: rough sawnwood; planed sawnwood; squared utility poles; shingles; flooring and mouldings (as elsewhere, none of the products were systematically dried). The mill also worked to try to introduce less well known species to the market and examined in-forest processing (which, in the managers opinion, was not a success and was far more expensive than operating in Paramaribo). The mill is currently not working because the domestic market is so depressed. For example, it took two months to sell the very limited stocks the sawmill had after it stopped production. There are no immediate plans to re-start production.

Apart from the current state of the domestic market, the sawmill manager had other opinions about why the current situation for sawmills was so bad in Suriname. He had drawn-up investment plans to try to attract foreign investors, but had been unsuccessful in attracting anyone because investment law in Suriname is so weak[52]. He suggested that partnerships with foreign companies (rather than loans) were the best way

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51 This contract water transport cost is lower than figures quoted elsewhere. However, the logging manager's own calculations showed that water transport costs were significantly less than this when the company used to use its own barges. This raises the question of why the company has stopped performing this activity itself.

52 The Surinamese government has drafted an investment law, but this has not been implemented yet. This was a further deterrent to foreign investment cited by several people interviewed. Without a strong investment law, there is a significant risk that foreign investors would have great difficulty recovering their money if any joint-venture turned sour. Consequently, many potential investors have been reluctant to invest in the sector and the

forward, because the industry needed more than just capital. It also needed access to new technology, modern management methods and marketing skills. He also said that it was difficult to develop a better sawmill in Suriname because it was difficult to get information about the requirements in foreign markets and advances in sawmilling elsewhere.

Visit to sawmill number 6 in Paramaribo - 30 October 1998

On 30 October, the International Consultant (Forest Economist) and *LBB* counterpart visited a small sawmill on the outskirts of Paramaribo. The sawmill uses a Woodmizer portable bandsaw to cut relatively small logs (average volume 1.5 m^3) and has an edger and planer. Total input capacity of the mill is 1,300 m^3/year (based on one 8-hour shift and five day working), but current log input is about 550 m^3/year (about 40% capacity utilisation). The sawmill manager had detailed log input and product output statistics, which showed that the current product recovery rate is about 55%.

The sawmill obtains all its wood supplies from its own forests. The company had tried sawmilling with the portable bandsaw in the forest, but had decided that this was not efficient. To put it bluntly, the sawmill manager complained that the villagers he had worked with did not want regular employment and always wanted too much money. Current sawing costs in Paramaribo are estimated to be: US$ 45/m^3 (single-cut) to US$ 70/m^3 (double cut). Edging costs are US$ 40/m^3 (single-sided) to US$ 60/m^3 (double-sided). In addition to the direct production costs, the manager estimated that his overhead costs were about a further 30% (which he considered to be far too high).

The sawmill produces a variety of sawnwood products, mouldings and utility poles. The sawnwood currently sells for around US$ 180/m^3 and the poles sell for US$ 215/m^3. The sawmill has exported a very small amount of sawnwood in the past, but is not currently exporting because of the exchange rate differential. All products from the sawmill are air-dried and the sawmill is currently moving into prefabricated wooden house production.

Field trip - 9 November 1998

On 9 November, the International Consultant (Forest Economist) and *LBB* counterparts visited three sawmills to the west of Paramaribo.

Sawmill number 7

The first sawmill visited was a medium-sized sawmill with an annual log input capacity of 10,000 m^3. The mill employs 31 people (working one 8 hour shift, five days per week) and is currently running at about 50% capacity. All the equipment in the mill was quite old (around 20 years at least) and included one vertical bandsaw (for primary log breakdown), two gangsaws, an edger and a planer. Other equipment included a crane and a winch (for dragging logs from the logyard), a bulldozer and loader and a machine for making broom handles. The edger is not currently used (the second gangsaw is used to double-cut all the sawnwood produced). Overall, the mill was one of the most carefully laid-out mills seen in Suriname. The sawmill also has a sales depot in the town and all sawnwood produced is immediately transported there after production. The sawmill manager was fairly new to the job and wasn't sure about the product recovery rate, but estimated that it might be around 50 - 60%.

The sawmill has its some former forest concessions, but part of these had recently been given to local villagers (and the sawmill manager wasn't very happy about this). The sawmill uses about five species and produces a range of products for the domestic market, including: rough and planed sawnwood; mouldings; flooring and broom handles. Only the flooring and mouldings are air-dried. The sawmill has never exported

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only ones that have, have been companies that have good connections or others that have, more or less, taken over a complete operation (thus, reducing their risk).

sawnwood, but the manager said that local traders had exported some of his sawnwood in the past. The list of product prices for this mill is presented in the main text of this report.

The manager was facing two main problems at the moment. The first was that the local economy in this area was very depressed and people were not buying as much sawnwood as they had in the past. The second was the deterioration in the exchange rate, which was increasing his operating costs (and also contributing to the depression in the local market). The manager said that he believed that developing export markets was the only way forward, but that the current exchange rate ruled-out any possibility of this.

Sawmill number 8

The next sawmill operation visited consisted of two small sawmills adjacent to one another. The mills were first established in 1930 and the current owner had bought them in 1963. Each sawmill has an annual log input capacity of 6,000 m^3. One of the sawmills has not been operating since April and the other is only using about 30 m3/week (giving a capacity utilisation figure of around 8% for the combined operation). The manager estimated that product recovery rates were about 70% for *Basralocus* and 60% for other species (which seemed rather high compared with estimates obtained elsewhere). Sixteen people are employed at the operating sawmill and another four are performing maintenance operations at the sawmill that is temporarily closed. The manager hoped to restart operations at the closed mill next April. Each mill was equipped with the following (very old) equipment: a circular saw (for primary log breakdown); two gangsaws; and a planer.

Roundwood is supplied from two former forest concessions and local *HKVs*. Roundwood is also purchased from other former concessions and the manager reported paying US$ 11/m^3 for such material (this price seems very low - perhaps these were prices for felled and extracted roundwood). All roundwood is transported by barge to the mill.

The mill produces a range of products for the local market, including: rough and planed sawnwood; mouldings and flooring. None of these products are dried or stored very carefully (they are just piled-up in the yard until somebody comes and buys them). The mill has exported sawnwood in the past to the USA and Caribbean markets, but not for a long time. The manager believed that developing export markets is the only way forward for the industry.

The sawmill manager was very critical of the current government's economic record. Problems he mentioned included: the currently depressed local market; the exchange rate problem; and a perception that favouritism was creating unfair advantages to particular sectors of the economy. He also believed that the government was not particularly concerned about the local economies of areas outside Paramaribo.

Sawmill number 9

The last sawmill operation visited consisted of another two sawmills adjacent to one another. One mill was established in 1949 and the second in 1980. The larger sawmill has an annual log input capacity of 18,000 m^3 and the smaller sawmill has a capacity of about half of this. Only the large sawmill is working at the moment and uses around 3,600 m^3/year of roundwood (giving a total capacity utilisation rate of 13% for the whole operation). The sawmill manager estimated the following product recovery rates: 60% for *Gronfolo*; 50% for *Kopie*; and 35% for *Mora* and *Rode Locus*.

The sawmill is supplied by several former concessions, totalling around 80,000 ha. In addition to this, the sawmill manager has applied for a further 35,000 ha of new concessions and gets some logs from *HKVs*. The logging operation had about 10,000 m^3 of felled timber in stock in the forest, but much of this was taken by local villagers during the civil war (along with a lot of the sawmillers other forest equipment). They now want to sell this roundwood back to him. The villagers also want employment in the logging operation. The sawmill manager has a couple of villages in his former concession and has worked with one of them (but not

the village that stole his equipment and stock). He allows them to use his truck at weekends to take their agricultural products to market.

The sawmiller is just starting to rebuild his logging operation and has cleared some channels through swamp areas and is building a road. He has also marked-out a much longer road, which he plans to build to give him access to other parts of his former concessions and access to his current operations during the wet season. The manager seemed to be following some sort of exploitation plan. Felling costs are Sf 2,000/m^3 - Sf 2,500/m^3 in his former concessions. In *HKVs*, he pays Sf 4,000/m^3 - Sf 5,000/m^3 for felling and has to supply all the equipment and materials to villagers. He also has to pay Sf 1,000/m^3 to the village development fund.

The larger mill has one bandsaw to split very large logs in half and a circular saw for primary breakdown. The mill also has two gangsaws and a planer. The newest piece of equipment was installed in 1978. The sawmill manager plans to install a third gangsaw and a second planer plus two edgers to produce sawnwood for export. He estimated that each of these pieces of machinery would cost him about 60,000 DM to 100,000 DM to purchase and roughly the same cost again to install. His current cutting costs are Sf 25,000/m^3 - Sf 30,000/m^3.

The mill currently produces a full range of sawnwood products and mouldings, none of which are dried. As in many other mills visited, these are just piled-up in the yard until somebody comes to buy them. The sawmiller isn't exporting at the moment, but has exported in the past.

The sawmill manager quoted the same problems facing other sawmillers in the area: depressed local markets; the exchange rate differential; and a difficulty to attract foreign investment. This sawmiller can get loans because he has a good relationship with his local bank and they can see from his bank statements that he has made money in the past. At 38% interest however, he is not interested in borrowing to finance his expansion and is currently financing everything out of his operating profits and capital reserves.

APPENDIX 3: THE FOREST DECIMAL CLASSIFICATION

The FAO Project GCP/SUR/001/NET has a small collection of publications. These are not currently organised in any systematic way. It is highly recommended that one of the project counterparts should be given the task of organising and maintaining this library. For this purpose, the Forest Decimal Classification system, which is widely used by forestry libraries throughout the world, is presented below and it is suggested that all project publications and reports should be catalogued according to this system.

The Forest Decimal Classification - headings and subheadings

1 FACTORS OF THE ENVIRONMENT - BIOLOGY

- 10 General
- 11 Site factors
- 12 General biology
- 13 General zoology
- 14 Systematic zoology
- 15 Animal ecology, game and fish management, hunting, shooting and fishing
- 16 General botany
- 17 Systematic botany
- 18 Plant ecology
- 19 Miscellaneous

2 SILVICULTURE

- 22 Silvicultural systems
- 23 Forest regeneration and planting
- 24 Forest maintenance and improvement operations
- 25 Treatment of defective, derelict or very open stands
- 26 Agroforestry
- 27 Arboreta and arboriculture
- 28 Cultivation of non-wood forest products
- 29 Miscellaneous

3 WORK SCIENCE, WOOD HARVESTING, LOGGING AND TRANSPORT, ENGINEERING

- 30 Work science (work studies) - general
- 31 logging and transport - general
- 32 Felling and related operations
- 33 Forest utilisation and waste
- 34 Storage of wood in the forest (landings)
- 35 Performance measurement
- 36 Tools, machinery and equipment
- 37 Transport
- 38 Forest engineering
- 39 Miscellaneous

4 FOREST DAMAGE AND PROTECTION

- 41 Forest protection - general
- 42 Damage from inorganic agencies (other than fire)
- 43 Forest fires
- 44 Damage by harmful plants and viruses
- 45 Damage by animals
- 46 Damage by man
- 48 Damage from other causes
- 49 Miscellaneous

5 FOREST MEASUREMENT, SURVEYING AND MAPPING

- 51 Systems of measurement
- 52 Volume and diameter measurement
- 53 Special measurements of trees (e.g. crown cover)
- 54 Assessment of site quality
- 55 Age determination
- 56 Increment measurement
- 58 Surveying and mapping
- 59 Miscellaneous

6 FOREST MANAGEMENT, ECONOMICS, ADMINISTRATION AND ORGANISATION

- 61 Forest management - general
- 62 Management techniques, working plans, yield regulation
- 63 Other forest management issues
- 64 Forest economics - general
- 66 Costing of logging operations
- 67 Financial appraisal, accounting, statistics, planning and financing
- 68 Administration and organisation of forest enterprises
- 69 Miscellaneous

7 MARKETING OF FOREST PRODUCTS, ECONOMICS OF FOREST INDUSTRIES

- 71 Marketing of forest products - general
- 72 Supply and demand studies
- 73 Prices
- 74 Trade policy
- 75 Trade customs and statistics
- 76 Business planning and administration, accounting
- 77 Marketing - miscellaneous
- 78 Economics of forest transport
- 79 Economics of forest industries

8 FOREST PRODUCTS UTILISATION

- 81 Wood and bark - structure and properties
- 82 Conversion, shaping, assembling and finishing - general
- 83 Timber manufacturing industries and products
- 84 Wood preservation and treatment
- 85 Grading
- 86 Pulp and paper industries
- 88 Wood substitution
- 89 Minor forest products

9 FORESTS FROM THE NATIONAL POINT OF VIEW, SOCIO-ECONOMICS OF FORESTRY

- 90 General
- 91 Land-use
- 92 Forest ownership
- 93 Public supervision and regulation of forestry
- 94 Other methods to implement policy
- 95 Forest taxation
- 96 Forest employment
- 97 International forestry policy and collaboration
- 99 Miscellaneous