Statistiska centralbyrån
Statistics Sweden

Forest
Economic and Environmental Accounting

A pilot study of a first implementation by Statistics Sweden

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Contents

Introduction

Eurostat's Task Force on Forest Accounting has presented a framework for 'Forest Economic and Environmental Accounting'. In the report 10 tables for first implementation was proposed, which now have been tested by Statistics Sweden. The object has been to test the ten tables according to existing statistics and comment on classification problems and data availability. The test is done mainly for the year 1993. The report also contains a discussion about the treatment of forest in SNA. The work have been carried out by the division of National accounts and the division of Environmental statistics (spec. environmental accounts). Data on forest resources (forest balances, area and volume) are compiled by the Swedish University of Agricultural Sciences who is responsible for the National Forest Inventories. The figures presented in the report are preliminary and have not the status as official statistics from Statistics Sweden. Comments and conclusions are based on experiences and the practical work with the tables and are the views of the authors and not necessarily the view of Statistics Sweden.

The authors of the report are senior statistician Marianne Eriksson, Environmental accounting and senior statistician Michael Wolf, National Accounts, Statistics Sweden. BSc (For) Hans Toet from the Swedish University of Agricultural Sciences has compiled the physical tables of forest balances and defoliation.

1 Summary

The object of the project was to test the ten proposed tables for a first implementation. The prerequisite was to start with existing statistics and as far as possible make necessarily recalculations. The report have the following disposition: In *chapter 2* it is a short description of the basic statistics used, *chapter 3* gives a theoretical overview of valuation methods, in *chapter 4* there is a discussion about the treatment of forests in SNA and in *chapter 5* the results of the 10 tables are presented with comments on data availability and quality.

Physical accounts

For the forest balances the original tables have been changed due to both data availability and quality. In Sweden the forest balances should be done for at least a five year period, since sample errors for annual data can be higher than annual changes (special for area changes and growth). Defoliation data are not presented in the balances but in complementary tables. The changes in defoliation between single years must be interpreted with caution, because of a low sample fraction and that some years the effect of the weather are higher.

The classification of exploitable forests into natural and cultivated forests is not applicable for Swedish forests since most of the forest are seminatural. The classification of exploitable forests into subgroups can be done for either the treatment of forests in the SNA or for environmental purposes. For environmental purposes it is for example important to follow the depletion of natural forests. Since there is a problem with separate valuation of the different categories of forests a proposal is to start with only physical data for different forest categories and monetary tables for the total of exploitable forests.

The material flow tables 4, 6, 9 and 10 are possible to compile yearly with the present statistical data. There is a problem with the complementary tables of waste or residuals since industry production statistics and waste statistics are separate investigations and there are risks of dubbelcounting for residuals. Tables 9 and 10 the mass balances with the complementary tables on residuals gives among others a very good possibility to check the consistency between the supply and use tables.

Monetary tables and valuation

The information in the monetary tables is mainly from the Swedish National Accounts (NA). The revision of NA has not come that far so both old and revised data are used to picture the future possibilities. In relation to the proposed framework some classification problems will remain even in the future. The classification of industries holds in all cases except forestry, logging, printing and recycling. The main problem with the product classification is the redistribution of chips, waste wood and paper. But this problem can partly be overcome by additional information.

Yearly forest balances will be compiled in the NA framework. For the moment the method is under development. One of the problems to be resolved is how to handle statistical errors in the Forest Inventory data. The preliminary suggestion is to use five year averages for opening stock, closing stock and gross growth in combination with yearly additional information of other changes. This will not give the same result as in table 2b in this report. It will also be an open question how to relate NA values to official physical data, because NA will use the best available information which might vary from year to year.

A further problem with the Forest Inventory is the ownership classification which is to restricted to fit with the NA. This means that aggregated values have to be broken down by use of additional information. This is not a problem in relation to the proposed frame. The existing NA data on ownership is omitted because it does not fit in with tables 1b and 2b.

The method of valuation for forest land and timber used in this report will be revised. In the discussion of valuation methods no conclusion of method choice is done. The choice is complex and depends among other things on comparability between nations and availability of data. The preferred method at the Swedish NA department will probably be method 1 but for international comparability method 2 might be better. The quality in method 2 depends on price statistics of different sorts of delivery wood and the associated felling costs. A comparison between results of both methods is done in chapter 3.

The treatment of timber growth in the production, capital and stock accounts is discussed in some respect but no proposal is made. In this report some arguments in favour of including timber growth in the production boundary are presented. The conclusion is that this will not raise any principal problems.

2 Basic statistical data sources

The basic data for this report comes from several statistical sources, the main sources are shortly described below, more specific comments are made as comments to the tables.

2.1 The Swedish National Accounts

Introduction

For the moment ESA95 is being implemented in the Swedish NA. This means that the system has not reached its final structure and therefore the description below is tentative in relation to the final outcome. In the 80-ies the Swedish NA integrated an input-output (IO) framework to the NA and this integration will be retained. This means that yearly IO compilations are made. The NA will be divided into approximately 130 industries, about 90 in the goods producing sector and 40 in the service sector. The number of products will be about 380 which is 60 more than in the former IO-system.

The IO-system

In the compilation of IO-tables the structure of previous year is the starting point. Different information on supply and use is added together with information of trade and transport margins, taxes and subsidies etc. This information is rarely as detailed as demanded therefore the structure of previous year helps in dividing aggregate values into the detailed structure. Using information of aggregates on the product level a system of product prices is constructed. This price system is used to deflate or reflate detailed information of inputs and outputs. After this has been done the reconciliation of each product balance takes place.

Finally there is a reconciled system with as small residuals at the product level as the statistics allows. The most reliable information is on the use of products so this information will influence the final outcome more than statistics on production. Many input coefficients do not rely on a firm statistical basis they are rather based on old statistics and gradually changed in the reconciliation process. This should be kept in mind analysing the monetary supply and use tables in the proposed framework.

Forestry and logging

The industry forestry and logging in the Swedish NA is product defined in the sense that there exists no secondary activity. But products of forestry and logging can also be produced in other industries. The compilation of F&L industry is not based on surveys of statistical units but on a national farm like concept. The calculation of output is based on information of uses of F&L products mainly by manufacturing industries, imports, exports and changes in inventories.

In the Swedish NA the following product classification is proposed to be used to calculate total output of F&L:

Natural growth, net
Pulp wood
Saw logs
Fuel wood
Other wood
Construction and maintenance of ditches
Forestry and logging work
Seeds, plants and other forestry products (incl. christmas trees)
Services to forestry and logging

This product classification depends on the method used and does not fulfil international recommendations. Future work will probably be undertaken to modify the product classification. This will be done to allow for more of internal transactions among which logging is the most important.

Forest related industry

When it comes to the forest related industry the proposed classification is possible to implement except for printing, recycling and waste management. In the Swedish NA printing and reproduction of recorded media goes together. The recycling industry is not divided into metal and non-metal recycling. Nor is the sewage and refuse disposal services divided into sub-industries like waste management. But in the product dimension printed and recorded products are separated this is also the case for metal and non-metal recycled products. The accounts distinguish between 28 products in 10 forest related manufacturing industries.

2.2 National forest inventory

The National forest Inventory (NFI) is an annually inventory covering the entire area of Sweden. It is performed as a sampling survey with low sampling fraction. The object of the inventory is to provide basic data for planning and control of the forest resource at the national and regional level and also to give basic data for forest research. The main task is therefore to give information on the state and change of the forest resource and of land use. The NFI is carried out by the department of Forest Resource Management and Geomatics at the Swedish University of Agricultural Sciences. The first inventory started 1923. Since 1953 the inventory covers the entire country every year.

From 1983 the annual sample consists of some 17 000 systematically distributed circular plots. Of these 10-11 000 fall on forest land. The inventory uses permanent plots with a radius of 10 m as well as temporary ones with a radius of 7 m. The permanent plots are reinventoried after 5-10 years, thus allowing an efficient estimation of changes. The main observations on all land are: land use category, ownership category, growing stock, growth, tree distribution and recent felling. On forest land additional observations are made for terrain condition, vegetative cover, cutting class,

age, site quality, recent and suggested silvicultural measures, density, damage and regeneration status (in young stands).

The results of the NFI are in most cases unbiased, but have significant sample errors. The inventory is dimensioned to be able to produce estimations of high quality of the total growing stock by counties with averages of five year material. Data on the forest resource referring to area, stock and growth are usually averages of five year estimate.

Classification on land

In Sweden the NFI use the following classification on land:

Forest land: Land suitable for wood production and not primary used for other purposes. Potential yield under ideal management conditions are at least 1 m^3 per hectare and year. Includes abandoned agricultural land not yet covered by forests and land partly used for grazing.
Swamp: Peatland without trees or with scattered trees. Potential yield under ideal management conditions less then 1 m^3 per hectare and year.
Rock surface: Land without a soil layer or the soil layer too shallow to allow a potential yield under ideal management conditions of at least 1 m^3 per hectare and year. Scattered trees may occur.
Subalpine woodland: Transitional belt between forest land and high mountains with climatic conditions adverse to wood production. Spare occurrence of coniferous trees which cannot reach the density necessary for a yield of at least 1 m^3 per hectare and year.
High mountains: Land at high altitude above the climatic limit for conifer trees. Stunted conifer trees and an abundancy of birches of a subalpine type may occur.
Pasture land: Agriculture land not tilled used for grazing.
Arable land: Agricultural land regularly tilled used for growing crops or grazing.
Nature reserves: National parks other strictly protected areas, includes forests, other wooded land and other strictly protected natural reserves.
***Urban land*:** Towns and villages, parks gardens, nurseries and athletic grounds.
Other various land areas: Land used for particular purposes and not specified above such as power lanes, road and railways, gravel pits, mines, military wasteland etc.

2.3 Industry production statistics

By law all enterprises with 10 or more persons engaged, are obliged to give information. Among others information are given on production of commodities both in monetary and physical units. The commodities are classified by the HS-nomenclature. Important intermediate products are reported by total production including quantities for further processing within the same plant and quantity and value of production for shipment without further processing. Data quality are mostly better for values than for quantitative data. The cut-off limit of 10 persons engaged cause an underestimation of the production, of commodities in questions for this study, from, above all, the sawmilling industry where the underestimation is about 15% .The tables are adjusted for this underestimation.

2.4 Industry input goods statistics

To get information on the intermediate consumption in physical units there have to be statistics on input goods. Since 1968 there is no statistics on input goods in Sweden except for the intermediate consumption of rawmaterial of wood to the woodprocessing industry (ISIC 33) and the pulp and paper industry (ISIC 3411). Statistics Sweden have from 1995 started to collect data on input goods. Now data are collected for 1/3 of the enterprises yearly.

2.5 Foreign trade statistics

Until 1994 the Swedish foreign trade statistics was based on data collected by the customs authorities on specific forms in conjunction with the declaration of imported goods and the inspection of goods to be exported. In principle the statistics covered the general trade. The foreign trade statistics gives information in monetary and physical units on export and import both. This has been taken advantage of in this study in order to estimate quantities for production where the industrial statistics have only provided monetary values. From 1995 new statistical system are in use i.e. Intrastat.

2.6 Energy statistics

Statistics on the use of fuel in, among others, the manufacturing industry are quarterly collected concerning inventories, supply and use. In that statistics is information on the amount of black liqours in the pulp industry that are used as fuel. In this report we can not publish these data due to secrecy rules. Statistics on black liqours as fuel are when published aggregated with other fuels.

2.7 Waste statistics, recycled material

So far in Sweden there has only been one statistical investigation on waste and returnable raw material from the industry, the survey refer to 1993. Data was collected for branches NACE C and D concerning household waste, industry specific waste and hazardous waste. For 12 groups of branches there was different questionnaires for the branch specific waste. For the industry for wood and wood products the following branch specific waste were to be reported: timber parts, contaminated timber waste, chips, shavings, bark, sludge, ash, soot, dust and slag, hardened adhesive waste, curtain water. For the pulp- and paper industry: bark waste, wood shavings, wood room waste, ash, soot, dust and slag, lime sludge, stock preparation waste, recyclable fibre waste including de-inking waste, black sludge, other sludge, and paper. The establishment should also give information on treatment methods. As the collection of data concerning industry production and industry waste are carried out as at separate investigations one should be aware of, that specially waste wood that are externally treated, can be dubbelcounted in waste statistics and in the industry production statistics, if the waste/returnable raw material are sold. Data on collection and use of recycled paper is compiled by the Forest industry.

In Sweden there is no official classification of waste (or residuals) from logging. In this report waste/residuals from logging are stem wood left in the forest (see further notes in complementary table 6). Above that the Swedish volume figures refer to stemvolume over bark from stump to tip and the part of logging residuals of tops left in the forest is about 5 %.

3 Valuation of land and standing timber

3.1 Introduction

In estimating the combined value of land and timber there exists at least three methods. First of all we can use market values, i.e. the value of transactions in forest land applied to all forest land. Secondly it is possible to estimate the value by use of stumpage values in two ways: corrected or uncorrected for the time until maturity. And finally we can use the Faustmann equation and discount future costs and reciepts over a rotation period for forests of any maturity. The latter method is discussed in some detail in the Planistat report and will not be dealt with in any greater extent.

3.2 Market valuation

The method used in the Swedish NA is of the first category above and for simplicity called market valuation. It is not a genuine market valuation because only part of the stock, the one which has been transacted during the year, is used to value the entire stock. For tax purposes all real estate in commercial use is assessed. For forest land the general assessments are of greatest importance. The assessed value is intended to equal 75 percent of the market value two years prior of the assessment. Each year the values of actual transactions in land are related to the assessed values thereby making it possible to calculate market values. When it comes to forest land there is a drawback because the value of the growth will not affect the assessed value until another general assessment is undertaken and that is done with an interval of six years. Only major changes, i.e. large clear cuttings, in the assessed value between general assessments are recorded.

In the statistics, of relations of transaction values and assessed values, corrections are only made for transactions between family members. The statistics is made for regions which makes it possible to take regional differences into account but other biases like the distribution of mature relative to immature forests in the transactions in relation to the same distribution in the stock is are not corrected. A greater problem is the fact that only few transactions are made in pure forest land. In most of the cases the transaction includes both forest and agricultural land.

A bias is when forest land is bought for other purposes than wood production. To get hunting and/or fishing rights, land is valued higher. A less common case is when forests are bought for recreational purposes like to construction of holiday camps.

The split of the total value into land and timber values can be done with information on land values for alternative use of forest land. But for most of the land the alternative use value is close to zero because there exist no economically significant alternative to wood production. Another method to derive the land value would be to use the Faustman formula (se below).

3.3 Valuation with use of stumpage values

The second method is to value timber by use of stumpage values and add a land value. In a situation where the market of logging rights is large in relation to total fellings the use of logging right values would be a good approximation of the market value of standing timber but in Sweden logging rights accounts for less than 10 percent of total fellings so calculated stumpage values have been used for this method. In the felling season 93/94 the value of logging rights was 50 percent higher per cubic meter standing volume (m3sk) than the calculated stumpage value which probably is due to higher wood quality (saw logs versus pulp wood) rather then felling cost advantages.

The stumpage value reported by NBoF is calculated as the delivery price at forests roads subtracted with the felling and transportation costs. Felling costs follow business accounting practices rather than social accounting rules. This means that intrests on loans rather than rate of return to capital and amortizations rather than consumption of fixed capital are used to calculate the capital costs. Excluded from the felling costs is also the costs of administration.

The Swedish NA calculated the value of net growth until 1979. In those calculations the stumpage value reported by NBoF was corrected (lowered) with the costs of administration. It was thought that all costs in relation to the output should be covered and that the net value thereby better would reflect a resource value. In these estimates of net growth value it was not taken into account that it takes time until growth on young trees can be cut down and sold. So instead of the current stumpage value of the volume of growth which is retained in the forests we should apply the discounted present value of the stumpage value which applies when the growth is possible to realise.
In doing this we should remind us of the fact that the growth rate is higher on younger trees but the timber volume on those trees is smaller.

With this method we need to estimate a separate land value. This can be done in the same way as in the first method, i.e. using the opportunity cost principle.

3.4 The Faustmann method

Finally we can use the Faustmann method. The method can be used to estimate separate present values of land and of timber (c.f. the Planistat report p. 41-45). But to do this we need information of all costs and recipts over the entire rotation period. The rare cases of afforested land are the simple ones and the common cases of not stationary forests are the most complicated. The method is very sensitive to the choice of discount rate.

There is also a difference in perspective which rarely is recognized. The usual way of looking at the valuation problem is taking the private or enterprise view. In this case costs usually enters far ahead of recipts and with a discount rate equal to some normal rate of return making the accumulated capitalized costs growing rapidly. But from a social point of view we should start with a net recipt when virgin forests originally where cut down and then reduce with

the costs of reafforestation until we reach an equal state of the forests as before they where cut down. Starting the next round with net recipts from cutting down the reafforestated forests and so on. Estimating land values in this way will hardly face the problem of discount rate choice.

3.5 Summary and conclusion of the theoretical reflections

From a statistical perspective the first method is probably the most attractive because it uses a minimum of calculations and has a link to observable market values. Having a link to market valuation can also be said about the latter method in the sense that it is used to make valuation of forest land for purchasing and selling purposes but the link to observable values is much weaker. Theoretically it is the most attractive but it has a major drawback because it demands information which rarely exists on aggregate level at statistical departments. The second method is one of more indirect valuation because it starts with the sales value of the output (delivery wood) and then calculates a stumpage value which is used in the forest valuation.
The choice between the first and second method must be done on the basis of availability and quality of data.

3.6 Valuation methods in practice

In this study the second method above has been used. The stumpage value is only calculated for stem wood and as an over all average. Experimental calculations for 1993 where made on a four region level but the regional deviation from the national average was only 2 percent at maximum so it was concluded that this refinement would not improve the final outcome enough to be motivated. Price information for different species and size classes has not been available.

The calculated stumpage price has not been corrected for age differences. The calculation is based on fellings of both immature (thinnings) and mature trees. In relation to the age distribution of the total standing volume the stumpage price approximates a real discount rate of 1-2 percent. This is thought to be a far to low value but no correction has been made. The stumpage price has been used to calculate all stem wood, gross and net growth, fellings, natural losses and the total volume of standing timber. For the latter case the price changes between mid year and beginning as well as end year prices have been used to calculate opening and closing balance values.

The land value has been approximated in a very rough way. The general assessment in 1975 reports both a total forestry and a land value of forests. The land value is 9.1 percent of the total value in 1973 prices. Since 1975 both the timber volume per hectare and the share of mature trees has increased which indicates that the share of land value probably is lower 1993. Using a share of 7 percent gives a land value 1993 of 500 SEK/ha. This value is used both in table 1b and the table below.

An alternative valuation

An obvious alternative in Sweden is to use method 1 above. From the valuation point of view this method has the advantage that the total forest value in principal corresponds to the discounted present value of future reciepts.

In the table below both methods are compared. Stumpage prices are used for all values in method 2 and for fellings and natural losses in method 1. For other values in method 1 the total market or transaction value reduced with an approximated land value is divided to derive a value per m^3sk. This value is used for balances, growth and the statistical discrepancy.

Two different ways of valuing the timber volume of forests 1993
Current prices and constant mid year 1993 prices

	Volume m^3sk(1)	Method 1 (3) constant	Method 1 (3) current	Method 2 constant	Method 2 current
Opening stock	2714	148542	156301	337893	346035
Net natural growth	22.9	1253	1253	2851	2851
Gross natural growth	95.5	5227	5227	11890	11890
Natural losses	3.8	473	473	473	473
Fellings	68.8	8566	8566	8566	8566
Catastrophic losses (2)					
Changes in classification (2)					
Revaluation (4)			58		55834
Statistical discrepancy (2)	-2.9	-159	-159	-361	-361
Closing stock	2734	149636	157453	340383	404359

(1) m^3sk is cubic meter standing volume of stem wood
(2) Statistical discrepancy includes both catastrophic losses and changes in classification
(3) price per m^3sk constant prices equals (160460-500*area)/ ((2714+2734)/2). Area used is 22742 ha.
(4) The market prices on forest land where the same at the beginning and end of 1993 but was approximately 5 percent lower in the middle of the year. The stumpage prices on the other hand was slightly higher in the beginning of the year than in the middle but increased and was much higher by the end of the year.

4 The forests in SNA

Introduction

The problem addressed here is the question of classifying forests as cultivated or not according to SNA93/ESA95. This question can be divided into the conditions for either treatment.

The National Accounts Department at Statistics Sweden has tentatively decided to classify the timber growth in exploitable forests as production. This way of defining the production boundary was also in use until the late 70-ies so it is felt that it is merely a renewed way of dealing with the topic rather than implementing something completely new. In the 70-ies Sweden was probably the only country defining timber growth as production. Both Finland and Norway had dropped this definition in the late 60-ies when SNA68 was implemented.

Sweden also dropped it due to inconsistency with SNA. It was also felt that the calculation lacked a firm empirical basis, e.g. the growth rate, which originally was based on an estimate made in the 30-ies, had been modified in the 70-ies by practical reasons. On the contrary the empirical basis has been developed in the latest 15 years or so which means that the problem is not of the same magnitude it used to be.

The intentions in the revision of SNA

If we look back on the work made in revising SNA by expert groups two things will strike us. The first is that there has been a strong willingness to incorporate growth of trees in the production boundary. This is evident by the fact that the expert groups recommends that the growth of forests and of crops should be treated in the same way as growth of livestock (see paragraph 138 below). The second fact which helps us in classifying is that there is a distinction made between timber tracts and cultivated forests (see paragraph 133 below). This means that if we undoubtedly can classify a forest or part thereof as a timber tract the growth would count as production. If it's not a timber tract then we have to decide whether it is cultivated or not. So, in the preparatory work on SNA93 it was strongly advised to include growth of forests in the production boundary with an exception, virgin forests. Virgin forests is the most obvious example of non-cultivated forests.
Excerpts from: SNA Review Issues, Discussion paper for 1990 Regional Commissions meetings on SNA, UN Statistical Office

"133. /.../ Under produced fixed assets is included a main category called natural cultivated assets, which is further broken down as follows:
Animals for breeding, dairy, draugth, etc.
Timber tracts and cultivated forests
Plantations(orchards, vineyards, etc.)
Fisheries

134. These assets are the products of natural growth which are to be considered as output in the revised SNA."

"138. The EGC3 (Expert Group Meeting on SNA Co-ordination, September 1989) agreed that /.../ in the future natural growth of crops and forests should be treated in the same way as growth in livestock, fish etc., that is, it would count as production when it was cultivated by human activity ... "

SNA93
We now turn to the actual text in SNA93. In chapter six, the production account, the following paragraph is found:
"6.94 First, it should be noted that the growth of crops, trees, livestock or fish which is organized, managed and controlled by institutional units constitutes a process of production in an economic sense. Growth is not to be construed as a purely natural process which lies outside the production boundary. Most processes of production merely exploit natural forces for economic purposes: for example, hydroelectric plants exploit rainfall and gravity to produce electricity."
According to this paragraph we should ask us if forests are treated in the way the text points out. Does national practice meet the demand of growth being organized, managed and controlled? In deciding upon yes or no we should not merely observe how forests owner treat their property but also consider the law and how the legislators intentions are implemented.
In Sweden there exists a Forestry Act. The act makes two main objectives compulsory for each (forest) land owner with an average yearly growth of minimum 1 m^3 standing volume per hectare. The first is the production goal, maximum growth and the second is the aim of biodiversity. These are conflicting objectives and in reality the production goal is dominating due to economic interests. The National Board of Forestry and the County Forestry Boards acts together as supervising authority. Besides implementing the Forestry Act they aid forest owners with management planning, advisory service, etc. State subsidies for different measures are granted and paid by the County Forestry Boards. The measures include reforestation, nature conservation, afforestation in connection with the conversion of farm land and forest road construction.

According to the Swedish Forestry Act there seems little doubt that institutional units owing forests would not fulfil the SNA criteria of being within the production boundary, i.e. producers of timber. The silvicultural methods used are the most advanced known and the forest owners who don't care to follow the law and are revealed will be judged. The judgement in most cases lead to injunctions and prohibitions. The average number each year in the 80-ies was about 500. In approximately 70 cases each year fines where imposed.

Comments to SNA93

In annex 1 to SNA some comments are made about the changes from SNA-68. In paragraph 71 (see below) the borderline between cultivated and non-cultivated is exemplified by timber tracts as being cultivated and forests used for logging as being non-cultivated. What is not stated in this paragraph is the difference between timber tracts and forests used for timber logging. The

difference can be generalized as a matter of intention. In forests only used for timber logging no other silvicultural activity is undertaken and the logging activity might not even be regular. That is to say that the intention is not to maximize timber growth neither in a quantity and quality sense. A timber tract on the other hand is managed by modern silvicultural methods to archive highest productivity, that is the maximization of growth in relation to the use of resources. After a final felling different reforestation measures are undertaken. Among those we find cleaning, scarification incl. burning, planting and sowing. Later on complementary sowing, forest fertilizing, forest draining and precommercial thinning takes place. These activities may only in exceptional cases occur in forests only used for logging. This clarification makes the difference between cultivated and non-cultivated forests more operational.

”71 The 1993 SNA includes in output the growth of cultivated assets including the growth of livestock and fishstock, vineyards, orchards, plantations and timber tracts, as well as the growth of agricultural crops and fruits which are products of plantations and the like. Prior to the harvest or use of the products, the growth of agricultural crops, livestock for slaughter, timber, etc., is to be recorded as work-in-progress (part of changes in inventories). Cultivated growth should be distinguished from growth of biological resources, which are not cultivated but are under human control (such as forests used in timber logging); such growth is treated as other volume changes in the 1993 SNA. Output based on controlled but not cultivated growth and also output based on non-controlled natural assets (e.g., gathering of fuel wood, fruit gathering, hunting, etc.) continues to be recorded when the products are harvested. The 1968 SNA included in output (and subsequently in gross fixed capital formation) only the natural growth of livestock and fishstock. Output of agricultural products, orchards and timber tracts was recorded only at the moment of harvest.”

Problems in implementing SNA

First of all it should be stated that Swedish forests consist of three main types. One category is planted forests which includes afforestated agricultural land and forests planted with foreign species like Lodgepole pine (Pinus contorta). Another category is virgin or natural forests which have been unaffected by humans for several hundred years. And finally the main category is what oftenly is called semi-natural forests. Obviously the problem lies in classifying the latter category.

In reality we might lack statistics to make a clear distinction between cultivated and non-cultivated. In this case as elsewhere in the system the most criterion is useful. The importance to our accounts is the growth of timber so in first instance we should use areal statistics in combination with site productivity and secondly only area. To use the volume of standing timber might be misleading because the age structure will influence the values. Looking for the planted forest area is not enough to decide upon. Planting is only one of several silvicultural measures. We have to take all different measures into account but avoid double counting.

In the case of Sweden the following information has been estimated. The clear cutted area since 1945 is about 60-65 percent of the total forest area. Summing values for artificially regenerated stands from 1945 on gives a far lower value about 30 percent of total area. But only about 65 percent of the total regenerated area is artificially regenerated. To this should originally naturally regenerated but later beeted area of about 10-15 percent of total area be added. The beeting is a result of not approved natural regeneration by the County Forestry Boards. Looking farther back in time will raise the area under cultivation. So, in the Swedish case there is little doubt that the largest part of forest area is cultivated.

Another way of looking on the cultivated forests is to assume that the degree of cultivation is related to ownership. A large company operating in the forest related manufacturing industry have a greater interest in maximizing growth of timber than a farmer with only a small forest land area. But this kind of information might not be of great help because it depends heavily on the assumed relation between forest size and management.

The estimation of non-cultivated forests on the other hand is more problematic. The Swedish Environmental Protection Agency has an operational definition of unprotected natural forests. The forest has to be at least 30 years older than the age of maturity and unaffected by human activity the latest 25 years. An estimate gives a share of 3.9 percent (unadjusted for site productivity) of total forest area in Sweden fulfilling this definition. This also indicates that forests to a very large extent are cultivated.

Economic relations and analysis

The change from only accounting logging as output to the inclusion of net growth of standing timber will affect some analytically important balancing items. Among those GDP, GNI, disposable income (especially for households) and net savings are the most interesting. Net lending will remain unaffected because net growth in its whole is recorded as changes in inventories thus counter balancing the change in net savings.

It can be argued that the inclusion of net growth of timber in inventory might distort the possibility of analysis. But this can be said of other items in the NA as well, e.g. the inclusion of the housing services of owner occupied dwellings. Another argument of this kind is that with a long term growth of the timber volume some part of the production will never be realised and therefore it is better only to account for the harvested volume. But uncertainty of the future is a fundamental problem in economics and a description of the economy should not try to avoid this kind of difficulty for the purpose of having an ex ante true description. The NA system records losses of inventories in the same way, no matter if it is unsellable food or unharvestable timber. The problem lies more in information of value and volume of the losses then how they should be recorded.

From a resource point of view it is important that timber growth is accounted for in NA. In the case of negative net growth the production would be overstated. The relation between production and the using up of resources is fundamental in economics. Analogous, the using up of other natural resources

like oil reserves and mineral deposits should in some way, as intermediate consumption or consumption of fixed capital, be taken into account as costs of production and thereby affect production and savings.

Net growth can be both positive and negative but in the foreseeable future it seems unrealistic to assume net growth being negative. In the last 15 years or so the volume harvested represents only about 70 percent of total growth in Sweden. But deciding upon production boundary and accounting principles should be done without regarding contingent empirical facts.

5 Tables with comments

The suggested 10 tables for first implementation of the accounting framework are presented and commented below.

For table 1-2 the original tables are changed. The reasons are that it is not possible to present data in the forest balances on defoliation as was suggested. The basic physical data can not be disaggregated as proposed and information on defoliation are presented as complementary tables. At present there is no information available with sufficient reliability that will make it possible to estimate values of land or timber connected to defoliation data concerning the proposed context.

The classification of exploitable forests into natural and cultivated forests is not applicable for Swedish forests since most of the forest are seminatural. The classification of exploitable forests into subgroups can be done for either the treatment of forests in the SNA or for environmental purposes. Since most of the forest in Sweden are seminatural, their treatment in the SNA are discussed in chapter 4.

In this report the exploitable forest have been dived into three classes, afforestated forest, natural forests and other forests. Natural forests are supposed to have higher 'non timber' values connected to biodiversity, landscape, recreation, existing-values etc. The valuation of forests in SNA are based on timber and land values, but there is no valuation of other 'non-timber' values. Since the valuation of non-timber values are very much discussed, it is here suggested that, that the physical tables have information on afforestated, natural forests and other forests but not the monetary tables. The monetary tables will then show the total value of exploitable forests , see further comments to table 1b and 2b. For environmental reasons it is very important to present data for following up on depletion of natural forests.

A severe problem connected to forest land not shown in the accounts, are acidification due to deposition of nitrogen and sulphur and forestry methods In the long run that will affect the production capacity.

Table 1-2 are not disaggregated to ownership categories. The NFI can provide data for ownership in four categories, the State, Other public forests, Company forests and Private.

Tables 1-2

Table 1a and 2a

Data on both area and volume for forest and other wooded land are based on data from the National Forest Inventory (NFI). Since the Swedish definition on forest and other wooded land do not correspond to the definitions used for example by OECD or in this framework a recalculation of the NFI have been done so the definitions will correspond to the internationally used. In the report are used the following definitions:

***Forest exploitable for wood production*:**
Forest land except some montane forest (mostly high share of old trees and sometimes regeneration difficulties. The montane forests are managed by special statutes from the National Board of Forestry).

Exploitable forests are divided into three classes, afforestated forests, natural forests and other forests.

1. *Afforestated forests*: forests on former agricultural land, afforestation less than 20 years ago
2. *Other forest*: Exploitable forest except afforestated forest and natural forest
3. *Natural forest*: there is no distinct definition of natural forests in Sweden . One definition sometimes used by the National Environment Protection Agency, is forests 30 years older than recommended final stand age with no intervention the last 25 years. Alternatives to natural forests are to compile data for mature forests that have reached recommended final stand age.
   Thus a second and third alternative have been defined as mature forests ≥recommended final stand age with no intervention during the last 25 years and mature forests ≥ recommended final stand age but with interventions during the last 25 years.

The interpretation of the data will of course be quite different depending on which definition that is chosen. Natural forest with the first definition will try to indicate forest with high nature value, while mature forest will indicate the potentials for final fellings.

As comparison the results for the three definitions are shown:

	Area, 1000 ha	% of exploitable area	Volume, milj m^3	% of exploitable volume
1 Natural forests, 30 years older than final stand age and no intervention the last 25 years	866	3,9	165	6,4
2 Mature forests ≥ rec. final stand age with no intervention during the last 25 years	3489	15,8	708	27,9
3 Mature forests≥ rec. final stand age with interventions during the last 25 years	4849	22,0	984	38,7

In this report SCB have chosen to use the first definition. With this definition it is possible to get data from the NFI, and a ‘best available’ definition on natural forests.

In 1993 the NFI increased the collection of ‘non-timber’ data and from 1997 new data on natural forest area will be available according to a new definition based upon field judgement such as stand age, biodiversity, reserved trees, tree dimensions and the occurrence of non-living trees.

Since there are discussions going on of the classification of cultivated, seminatural and natural forests it would be useful to continue the discussion of classification of forests and compare with the terms and definition in UN-ECE /FAO Forest Resources Assessment 2000 and the use of this classification in the Forests Accounts.

***Forest and other wooded land non exploitable for wood production*:**
- Montane forests,
- Forests in strictly protected areas,
- Subalpine woodland,
- Swamps and other waste land with crown coverage >20 % and 50 % of the area with crown coverage 1-20 %,
- Rock surface with crown coverage >20% and 50 % of the area with crown coverage 1-20 %.
- Subalpine woodland, swamps, other waste land and rock surface according to definitions above in strictly protected areas

***Protected area*:**
Strictly protected area of forests and other wooded land ;i.e. other strictly protected areas are defined as 'other land'

In table 1 and 2 data of changes are given for a five year period, which is a minimum period to give balance data. Yearly data on changes are not available with significant statistical confidence. Opening stock refer to inventories for the periods 1988-1990, the changes are aggregates for the years 1989-1994, and closing stock refer to inventories for the periods 1993-1995.

Table 1a forest balance, area
As are shown in table 1a the changes in area are very small in Sweden,
The net land use changes during the early 1990s are quite small. There are presently two opposite trends in Sweden concerning the area
forest and other wooded land. The first one is the afforestation on agricultural land. So far, the areas afforestated are relatively small. According to unsure estimations only some 2000 to 3000 ha have been planted annually.
The other trend is the increasing of areas set aside for natural conservation purposes. During the late 1980s and early 1990s some 1800 to 2000 thousand hectares have been declared as natural reserves along the Fennoscandian mountain range; much of which is productive forest land.

Table 2a forest balance, volume
The volume of exploitable forests are increasing in Sweden.
Forest volume balances showing the net volume changes can be made in two ways.

1. opening stock +/- changes
2. closing stock - opening stock (inventory data on stocks)

The two methods will give different results due to statistical errors, in generally method 1 with measured changes added to opening stock will be

more reliable since the effects of statistical errors can be worse for estimations on opening and closing stock

The two methods of estimating the netgrowth of Swedish forests shows with the first method an increase of volume by 105 milj.m^3s on b for a five year period, 21 milj m^3s on b /year. With the second method the net increase in volume is 193 milj m^3s on b or 39 milj m^3s on b /year. In Sweden the volume balances are mostly done for a ten year period to reduce the statistical errors. The data used for netgrowth in table 6 are based on method 1.
The Swedish volumefigures (m^3 s o b) refer to stemvolume over bark from stump to tip.

Table 1a Forest balance, area

1000 ha

Opening area: 1988-1990 / Closing area: 1993-1995	Forest and other wooded land																									
	Exploitable for wood production												Total	Non-exploitable for wood production									Total	Total	Other land	Total land	
	Afforestated forests < 20 years				'Other forests'				Natural forests					Protected				Non-protected								
	Conifero	Broadl	Mixed	Total	Conifero	Broadle	Mixed	Total	Conife	Broadl	Mixed	Total		Conifer	Broadle	Mixed	Total	Conifero	Broadl	Mixed	Total					
Opening area	**309**	**51**	**17**	**377**	**18378**	**1002**	**1389**	**20769**	**757**	**59**	**50**	**866**	**22013**	**958**	**256**	**233**	**1447**	**3248**	**628**	**658**	**4534**	**5981**	**27994**	**13057**	**41051**	
Changes in cover																										
Due to economic activities																										
Afforestation				..				..				..	..				..				..	..	..	..	..	1)
Deforestation				..				..				..	-45				..				..	..	-45	45	..	2)
due to other causes																										
natural colonisation				..				..				..	..				..				..	..	..	..	..	
environmental conditions				..				..				..	..				..				..	..	..	..	..	
Changes in use/ status				..				..				..	-300				300				50	350	50	-100	..	2)
Statisitical discrepancy																	44				9	-35	36	-13	-99	
Closing area	**291**	**55**	**17**	**363**	**18014**	**1000**	**1531**	**20545**	**664**	**50**	**45**	**759**	**21668**	**1127**	**302**	**274**	**1703**	**3268**	**659**	**665**	**4593**	**6296**	**27963**	**12989**	**40952**	

1) See note: net land use changes

2) Main ***net*** land use changes in classification/ use/ status:

- Urbanisation : appr. 45 000 ha
- Areas set aside for natural conservation purposes : appr. 300 000 ha
- Negigible *net* changes between land use classes within non-exploitable forest land and other wooded land; i.e. before changes for areas set aside for natural conservation purposes.

Table 2a Forest balance, volume

Milj m3sk (Growth, Fellings, Unrecovered natural losses and other changes 1989-1994)

Opening stock: 1988-1990 / Closing stock: 1993-1995	Forest and other wooded land																				Total	Total land
	Exploitable for wood production												Total	Non-exploitable for wood production								Total		
	Afforestated forests				'Other forests'				Natural forests					Protected				Non-protected						
	Spruce	Pine	Broadl	Total	Spruce	Pine	Broadl	Total	Spruce	Pine	Broadl	Total		Spruce	Pine	Broadl	Total	Spruce	Pine	Broadl	Total			
Opening stock	..	..	..	**11**	**1078**	**937**	**349**	**2365**	**75**	**67**	**23**	**165**	**2541**	..	..	..	**80**	..	..	..	**179**	**259**	**2801**	**2845**
Natural growth	..	..	..	**2**	**209**	**181**	**78**	**467**	**7**	**5**	**3**	**15**	**484**	..	..	..	**3**	..	..	..	**11**	**14**	**498**	**515**
Fellings	..	..	..	**0**	**-190**	**-94**	**-46**	**-330**	-	-	-	-	**-330**	-	-	-	-	..	..	..	**-11**	**-11**	**-341**	**-341**
Catastrophic losses																								
tempests	..	..	..	**0**	**-5**	**-1**	**-2**	**-8**	..	..	..	**-1**	**-8**	..	..	..	**-1**	..	..	..	**-3**	**-4**	**-12**	**-12**
Natural losses	..	..	..	**0**	**-4**	**-3**	**-3**	**-10**	..	..	..	**-1**	**-11**	..	..	..	**0**	..	..	..	**-2**	**-2**	**-13**	**-13**
Other changes																								
conversion													..				..				..	..	..	..
deforestation																								
due to changes in land classification			..	0	-8	-8	-4	-21	-5	-4	0	-9	-30	..	..	..	26	..	..	..	4	30	-	-
Total changes	..	..	..	*2*	*2*	*75*	*23*	*98*	*2*	*1*	*3*	*4*	*105*	..	..	..	*28*	..	..	..	*-1*	*27*	*132*	*149*
Statistical discrepancy				-5	51	46	11	109	-2	-12	-5	-16	88	..	..	..	-14	..	..	..	-13	-27	60	51
Closing stock	..	..	..	**8**	**1131**	**1058**	**383**	**2572**	**75**	**56**	**21**	**153**	**2734**	..	..	..	**94**	..	..	..	**165**	**259**	**2993**	**3045**

Total standing volume : Living and non-living trees>=1.3 m (i.e. diam at breastheight 0+ mm), stemvolume included bark and tops.

Defoliation

Since 1984 defoliation is registered using a special inventory on forest conditions in the National Forest Inventory. Selected trees, pine and spruce, are judged in about the same way as in Germany and many other European countries. The judgement have in view defoliation in relation to a full normal amount of needles for the tree. Defoliation data are usually presented as percentages of number of trees by stand age. The inventories are not designed for estimations of area damaged or volume damaged. Defoliation does not indicate the reasons for the damage, but should be seen as an indicator on the general vitality of the trees. For instance the average defoliation within a certain age class is normally highest in the far north due to the high degree of climate stress there. The changes between single years must be interpreted with caution, because of a low sample fraction and that some years the effect of the weather are higher.

Defoliation data should be shown in complementary tables not in balances.

Defoliation data are only available for the Swedish landclass forest land and species of pine and spruce in special treeclasses, so in the report defoliation data are given only for exploitable forests.

Exploitable forests, defoliation 1991-1995
Percentage distribution of treenumbers of pine and spruce in to defoliation classes and stand age

	Pine					Spruce				
	Defoliation %					Defoliation %				
Stand age	0-10	11-25	26-60	61-95	96-100	0-10	11-25	26-60	61-95	96-100
0-20	92,0	6,5	1,2	0,3	0,0	93,9	2,4	2,6	1,1	0,0
21-40	92,9	6,3	0,8	0,0	0,0	94,3	4,9	0,8	0,0	0,0
41-60	80,0	18,0	1,9	0,1	0,0	63,8	28,7	7,2	0,3	0,0
61-80	61,5	33,5	4,9	0,1	0,0	38,1	44,5	15,9	1,4	0,0
81-100	48,6	43,0	8,1	0,2	0,0	23,4	47,6	26,6	2,4	0,0
101-120	43,4	44,6	11,8	0,3	0,0	16,9	40,4	39,1	3,6	0,0
121-140	36,0	50,7	12,8	0,4	0,0	12,0	39,6	44,0	4,5	0,0
141-160	29,3	52,9	16,5	1,2	0,0	10,9	33,1	47,6	8,4	0,0
161-	20,9	48,1	30,2	0,7	0,0	5,9	32,9	49,1	12,2	0,0
All	69,1	25,6	5,2	0,2	0,0	54,1	27,5	16,6	1,8	0,0

Note: Occurrence of seed trees and reserved trees in stand age class 0-20

However since 1995 an annually special inventory is carried out on forest conditions for all species providing data for mean plot defoliation together with other tree and site related data. This inventory with very low European fraction level is based upon a statistical choice among the formerly mentioned permanent observation plots in middle-aged and old-aged forests. The results are reported for publications on forest conditions by the United Nations Economic Commission for Europe and the European Commission (UN / ECE - EC).
The figures below present the results for the year 1996.
The calculated degrees of mean plot defoliation to each type of tree species have been based upon calculated mean plot defoliation on plots with a minimum number of five sample trees qualified for defoliation judgement.

Defoliation, exploitable forest 1996
Middle-age and old-age forests (maturity class C-D),
Degree of mean plot defoliation

	None 0-10	Slight 11-25	Moderate 26-60	Severe >60
Pine	36,4	55,9	7,6	
Spruce	20,2	41,8	35,9	2,2
Broadleaves	45,9	44,4	9,2	0,5
All species	26,6	53,4	19,0	1,0

Table 1b and 2b

Table 1b

General remarks

The valuation has been done in a very rough way for the total of exploitable land. Because of different state of maturity and in place productivity there is no meaning in valuing specific types or parts of forests with an over all average land value. But to make the balances fit with the changes this average land value has been used to value both deforestation and changes in use. Opening and closing balance are valued at prices January 1:st 1989 and 1994 respectively. Changes are valued at 1991 mid-year prices. Revaluations includes statistical discrepancies.

Forest and other wooded land

The value per hectare used for 1993 is 500 SEK which is derived using an relation between land and total forest value from 1975. This is more than twice the value of waste land. The relation has been modified according to the increase in timber volume per hectare. The share of total forest value 1993 is assumed to be 7 percent. To make valuation for other years the price change of total forests has been used.

Forest and other wooded land not exploitable for wood production has a very low economic use value. The value has been set to zero.

Other land

Other land consists mainly of agricultural land and land underlying buildings etc. The values are from the balance sheets of the Swedish NA. The land values are based on the same type of information as the forest values in method 1 discussed in the valuation part of this report.

Table 1b Forest balance: wooded land (monetary value)

	Forest and other wooded land		Other land	Total
	Expliotable for wood production Total	Non-exploitable for wood production Total		
Opening area	9797		1492851	1502648
Changes in cover/quality	-23		23	0
due to economic activities	-23		23	0
afforestation				
deforestation	-23		23	0
due to other causes				
natural colonization				
environmental conditions				
Changes in use/status	-152		-11208	-11360
Changes in classification				
Revaluation	1748		-446020	-444272
Statistical discrepancy				
Closing area	11370		1035646	1047016

Table 2b

General remarks

Stumpage prices has been used in the valuation of standing timber. The valuation has only been made for the total of exploitable land. The value of timber not exploitable for wood production has been set to zero. Valuation is made according to the prices prevailing at the same points in time as for table 1b.

Table 2b Forest balance: standing timber (monetary value)

	Forest and other wooded land		Other land	Total
	Expliotable for wood production	Non-exploitable for wood production		
	Total	Total		
Opening stock	358281			
Natural growth	71535			
Fellings	48774			
Catastrophic losses	2808			
fires	1182			
tempests etc.	1626			
Other changes	4434			
conversion				
deforestation				
due to changes in land classification	4434			
occasional fellings				
Changes in classification				
Revaluation	17553			
Statistical discrepancy	13006			
Closing stock	404359			

Table 3

Table 3a Output related to ”wooded” land.

General remarks
As stated in the general description the Swedish NA uses a different product classification than NACE rev. 1. Though some improvements will be made in the future the proposed classification of output according to table 3a will probably not be achieved. The values in the table are according to the former product classification which is very close to the revised one. The only reclassification made is for berries and mushrooms which formerly where products of forestry and logging but now belongs to agricultural products.

Wood in the rough
According to the Swedish product list the output of wood in the rough has not the same classification as proposed for table 3a. But by using secondary information of wood used in different activities, export and import by species it has been possible to make a crude transformation of the values of pulp wood and saw logs into values by species. But because of errors in the NA IO-tables these values have to be revised.

Other products
Other forestry products includes seeds and plants as well as christmas trees. Services are mainly construction and maintenance of forest roads and ditches. For berries and meat no own account output is recorded.

Industries
The industries are classified according to NACE rev. 1. But as will be evident by checking the table the agriculture and forestry industries use a sharp distinction between farm and forest concepts. This division is constructed by splitting each farm into two units; one for agriculture and the other for silviculture. Secondary activity except for forestry and logging belongs to the agricultural unit. For the industry of recreational, cultural and sporting services no information exists relevant to the table. The output of other industries consists of government sales.

Table 3a Output related to "wooded" land 1993

current basic values, million SEK

	Industries Agriculture	Forestry and logging	Manufacture of wood and wood products	Recreational, cultural and sporting serv.	Other	Total
Market and own account output						
Natural growth		11417				11417
resinous						
broadleaves						
Wood in the rough		17613	554		211	18378
logs of coniferous wood		15365	45		131	15541
logs of non-coniferous wood		1605				1605
logs of tropical wood						
fuel wood		607	509			1116
other wood in the rough		36			80	116
Other forestry products		132			115	247
natural gum						
natural cork						
other forestry products		132			115	247
Services incidental to forestry and logging		1340			102	1442
plantation, etc.		1340			102	1442
forest inventories, etc.						
protection of forests against fires, etc.						
Other non market output						
plantation, etc.						
forest inventories, etc.						
protection of forests against fires, etc.						
Other products related to forests and other wooded land	427					427
agricultural products growing in forests	93					93
forest growing animals	223					223
meat, as hunting sub product	111					111
charcoal						
recreational services in forests						
Other products						
Total output	427	30502	554	0	428	31911

Table 3b Detailed accounts for forestry and logging

General remarks
In this table the problem with different product classifications also occurs. The accounts for forestry and logging is not made up or broken down by product (or activity) except for output, import duties, trade and transport margins as well as for taxes less subsidies on products. No future work will be done in this area except for the inclusion of products which both are output of and input in the forestry and logging industry thus allowing more of internal transactions.

Variables as value added, compensation of employees, labour inputs etc. are not easily divided between different products when the same staff undertakes more than one type of work. This also goes for the input structure of materials.

Trade and transport margins etc.
The values of trade and transport margins and taxes less subsidies on products are calculated by use of the same share as for the aggregated value for each product.

Closing stock and capital formation
The closing stock is the value net of capital consumption according to SNA68 definitions. This implies that no capital consumption have been calculated for forest roads and ditches. The average service life used is 40 years. The value of the 1993 closing stock in 1991 prices was 66131 million SEK. It should be noted that gross capital formation includes changes in inventory.

Labour input
The labour input noted in the table is the number of employees. This number corresponds to the value of compensation of employees. To get a figure of total employment we have to add the self employed (entrepreneurs) which is the major part or 19600 persons on average. There also exist information of hours worked for each category. Employees worked 25.99 million hours 1993 whereas the self employed worked less or 25.13 million hours.

Table 3b Detailed accounts for forestry and logging 1993

current prices, million SEK

	Market and own account output					Other non market output	Total forestry
	Natural growth	Wood in the rough	Other forestry products	Services	Other products		
Output (purchasers prices)	11417	19754	169	1340			32680
Trade and transport margins		2141	26				2167
Taxes less subsidies on products			11				11
Output (basic prices)	11417	17613	132	1340			30502
Intermediate consumption (purchasers prices)							12818
Gross value added (basic prices)							17684
Consumption of fixed capital							1371
Net value added (basic prices)							16313
Taxes less subsidies							69
Compensation of employees							4087
NOS/mixed income							12157
Closing stock of fixed assets							58021
Labour inputs (number of employees)							15700
Gross capital formation							4220

Tables 4-7

The physical and monetary data are at the moment not quite comparable. Basic data for table 4 and 6 are compiled from industry statistics and monetary data table 5 and 7 are from the national accounts. Due to the work in progress with revision of the National Accounts to fit ESA95 data on quantities are at present not available from the national accounts. When the revision are completed it will be possible to compile both physical and monetary data from the national accounts and there will also be a better co-ordination with the industrial statistics.

Physical tables 4 and 6

Data for forestry and logging should be taken from the forest balance, table 2, to get a good link between the tables. But as the forest balance shows an average of growth and fellings for a five year period, (see comments to table 1-2). and table 4 and 6 shows data for a single year it is not possible to directly use the figures from the forest balance. That is specially applicable for data for fellings because in the yearly accounts the data on fellings must be consistent with data on intermediate consumption and output of industries. In Sweden data on fellings are compiled in two ways

1. By the NFI fellings are measured by a stump enumeration, the yearly estimates have a standard error of 5 %, by the NFI you get information about spices and felling methods
2. By The National Board of Forestry, who uses data from the industry production statistics from Statistics Sweden based on timber consumption and by that method information will be given about assortments such as sawnwood, pulpwood or fuelwood

The results from the two ways of calculate felling can differ for single years, in some years the fellings are higher with the first method and other years with the second method.
For data on fellings the first methods is used in the forest balance and the data from the second method in the supply-use matrix.

In table 4 data on net growth are taken directly from the forest balance, and show the average netgrowth for a five year period, data on yearly growth are not available, see comments in table 2. Capital formation for standing timber are 1/5 of the netgrowth from table 2.

In table 6 output from logging is gross fellings. Removals are gross-fellings minus residuals left in the forests. Table 6 shows only quantities for shipments.

The main data sources for these tables are the industry production statistics and input goods statistics. For compiling table 4 you need data on inputgoods, until now such data exist only for woodmaterial, pulp and recycled paper for NACE 20.1, 20.201-203 and 21.11-21.12, so table 4 and corresponding table 9 can only be done for these branches. It is possible to compile a complete supply-use tables but then some of the statistics must be based on rather rough estimates with temporary data from various industrial organisations or technical coefficients (se report Carbon Flow analysis in Sweden).

Tabell 4 Use table, physical data 1993

Comments, Data are only avaible for NACE 20.1-20.4 and 21.11-12

		Intermediat consumption by industries																	
		Forest	Logging	Sawmilli	Veneer, pa fibreboards	Builders etc.	Wooder	Other p	Pulp	Paper and paper boa	Articles paper and p.b	Publ	Print	Recy	Othe	Total	Final consum.	Capital formation	Export 2)	Total
	NACE	02. pa	02. part	20.1	20.2	20.3	20.4	20.5	21.11	21.12	21.2	22.1	22.2							
Products	hs Unit 1000 tal																			
Standing timber 1)	m3 on b		63800															19950		83750
Saw logs	m3 on b.			32335	252	171	195									32953		-2803	585	30735
Pulp wood	m3 on b.			161	177				13897	20709						34944		-3934	392	31402
Fuel wood	m3 on b.																4312	0	10	4322
Sawn wood	m3																			
Veneer	ton																			
Particle board	ton																			
Fibre board	ton																			
Builders carpentry	ton																			
Wood containers	ton																			
Other wood products	ton																			
Pulp																				
Mechanical	ton									99						99		60	244	403
Chemichal	ton									1391						1391		130	2620	4141
Paper and paper products	ton																			
Waste woods (product)	m3			18	883				3086	3427						7414				
Waste paper (product)	t									1203								169	137	1509

1) Logging = Gross felling
2) incl statistical errors, Capital formation standing timber = net growth 5 year avarage 1990-1995

Tabell 6 Supply , Physical data 1993

		Output of industries													
		Forestry	Logging	Sawmilling	Veneer, part	Builders	Wooden	Other	Pulp	Paper and	Articles of	Publishing 2) Printing		Recyc. Other	Import	Total
					fibreboards e	carpentry	containers	wood prod.		paper board	paper and p.b					
	NACE	02. part	02. part	20.1	20.2	20.3	20.4	20.5	21.11	21.12	21.2	22.1	22.2			
Products	Unit 1000 tal															
Standing timber 3)	m3 on b	83750														83750
Saw logs 1)	m3 on.b.		30000	113											722	30835
Pulp wood	m3 on.b.		27200	41	5										4156	31402
Fuel wood	m3 on.b.		4300												22	4322
																0
Sawn wood	m3			15848	12	41	34	1						7	177	16120
Veneer	ton				47										77	124
Particle board	ton			2	407										113	522
Fibre board	ton				110										77	187
																0
Builders carpentry	ton			6		145	0	0						2	15	168
Wood containers	ton			45		2	284	46							8	385
Other wood products	ton			1	1		0	14						4	19	39
																0
Pulp																0
Mechanical	ton								320	50					33	403
Chemichal	ton								3351	620					170	4141
																0
Paper and paper products	ton				1	1	1			9197	643		12	18	507	10380
																0
Waste woods (product)	m3			14306	63	84	79	2						31	508	15073
Waste paper (product)	ton									1	38		17	911	542	1509

1) incl other wood
2) no quantitative data
3) Growth 5 year avarege 1990-1995

Complementary table 4 and 6

Data for the complementary tables are taken from the waste statistics. Since there probably are a dubbelcounting between the industrial production statistics and waste statistics data have been adjusted. Data in the complementary tables 4 and 6 are from investigation of industrial waste but are corrected for dubbelcounting with the industry production statistics.
Wood residuals from the sawmilling industry are often sold as rawmaterial or fuel to other industries. The energy statistics have data on black liqours used as energy but it is not possible to take them into the accounts due to secrecy reasons. The waste statistics do not contains data on black liqours only on black sludge, this data are not presented here.
There is no established classification on wood waste from logging, so here it might be better to call it residuals from logging. In the tables wood residuals from logging consists of

- stem wood, that for different reasons are left in the forest
  and
- tips, not useful for the industry, left in the forest.

Tabel 4 complementary table,'Waste not accounted for in the output of industries 1993

	Uses by industries										
	Forestry	Logging	Sawmilling	Veneer, pa	Builders c.	Wooden co	Other prod	Pulp	Paper and	Articles of	Publishing
				fibreboards etc.					paper board	paper and p	and printing
NACE	02. part	02. part	20.1	20.2	20.3	20.4	20.5	20.11	21.12	21.2	22
Internal use											
Wood waste			1634	33	93	2	12	276	833		
Recycling											
Incineration			1620	32	93	2	12	248	786		
Landfill			12	1	0	0		25	45		
Other			2					3	2		
Left in the forest		2280									
Paper waste									3	2	1
Recycling									1	2	0
Incineration											
Landfill									2	1	
Other											1
Black liquors											
Black sludge											
Landfill								31	44		
External											
Wood waste				69	44	4		104	32	0	
Recycling				61				53	8		
Incineration				5	42	3		38	15	0	
Landfill				2	1	1		2	9		
Other				1	1		0	11			
Paper waste											
Recycling									3	14	46
Incineration									1	1	1
Landfill									4	3	2
Other											1
Export										1	
Black sludge											
Landfill			0						4		

Table 6 Complementary table, production of waste 1993

				Production of residuals by industries										
				Forestry	Logging	Sawmilling	Veneer, pa	Builders c.	Wooden cc	Other prod	Pulp	Paper and	Articles of	Publishing
							fibreboards etc.					paper boar	paper and	and printing
			NACE	02. part	02. part	20.1	20.2	20.3	20.4	20.5	21.11	21.12	21.2	22
			1000 tonnes											
Waste (residuals)														
Industry specific														
	Waste wood	m3 f onb			2280									
	Waste wood	tonnes				2347	37	138	6	12	288	849	0	
	Waste paper	tonnes										11	22	51
	Black liqours	m3												
	Black sludge	tonnes									32	47		

Tables 4 and 6
Classification of sectors and products

In 1993 the used classification system for industry branches was ISIC and an transformation have later been done to NACE classification.
The industry branches that are important for wood material accounting are

NACE	Branch
20.1	Sawmilling
20.2	Veneer, particle board, fibre boards etc.
20.3	Builders carpentry
20.4	Wooden containers
20.5	Other products of wood
21.11	Pulp
21.12	Paper and paper board
21.2	Articles of paper and paperboard
22.1	Publishing
22.2	Printing

The classification used for products are the HS classification system,.
The main product groups are

Product group	HS
Sawn wood	4407, 4409
Veneer	4408
Particle board	4410
Fibre board	4411
Mechanical pulp	4701,4705-6
Chemical pulp	4703-4
Paper and paperboard	4801-23, except 4812, 4815, 4816,
Wood containers	4415
Builders carpentry	4418
Other wood products	4414, 4416,4417, 4419-21,
Waste wood	4401
Waste paper	4707

Monetary tables 5 and 7

Table 5 Use, monetary data

General remarks
Except for the value of standing timber and final uses all values are from the preliminary 1993 IO-tables of the Swedish NA. Final uses are from the former NA system and redistributed to the new product groups in a simple way. This is one reason why the residuals take large values, the other is that the system has not yet been reconciled. In NA growth of standing timber is a net concept and therefore no input in logging is calculated. For the moment there exist no value of total input in each industry. Only input of agricultural, forestry, fishing and manufacturing products are in the system for the moment. This means that only row totals can be calculated.

Standing timber
The value is the same as in tables 3 and 8.

Waste wood and waste paper
Waste wood is mainly produced in the sawmilling industry and recorded in NA as output of sawn wood. The known part of waste wood which is recorded in the industrial statistics has been reclassified to the waste wood category in table 5. This has been done for the product classes 20.10.23 and 20.10.4 (HS 44012/3).The same goes for waste paper produced, 21.12.6 (HS 4707). This is not in accordance with the proposed classification of products but it will not at all be possible to receive this information in a reconciled IO-system from the NA.

Table 7 Supply, monetary data

General remarks
The information contained in table 7 comes mainly from the preliminary NA IO-table 1993. Data on margins and taxes are calculated using approximated shares from the former 1993 IO-tables. Standing timber is also calculated separately.

Recycling industry
The recycling industry is only NACE 37 and no additional information has been used to calculate a value of the recycled paper waste from waste management of NACE 90. The output of non-metallic material in the recycling industry is probably to a large extent non-wood material like glass. This figure has not been used in the table.

Tabel 5 Use table, monetary data 1993

		Intermediat consumption by industries																
		Forestry Logging	Sawmilli	Veneer, pa	Builders	Wooder	Other p	Pulp	Paper and	Articles	Publishi	Printing	Recyc.	Other	Total	Final	Capital	Export	Residuals	Total
				fibreboards etc.					paper boa	paper and p.b						consum.	formation			
	NACE	02. part	02. part	20.1	20.2	20.3	20.4	20.5	21.11	21.12	21.2	22.1	22.2-3							
Products																				
Standing timber		8566													8566		2851			11417
Saw logs			10513	55	143	25	25							9	10770		-148	221	52	10895
Pulp wood			27	15	14				4071	6341				41	10509		-823	118	30	9834
Fuel wood			12	8	10	1			11	187	1			760	990	85	87	5	801	1968
Other wood				3	16	24	23							196	262		-107		-120	35
Sawn wood (1)			1496	144	996	167	162		56	595		7		6353	9976	64	-2522	14475	348	22341
Veneer,particle board etc.			12	39	459	69	66		2	4				2073	2724			1893	-1416	3201
Builders carpentry		91	82	11	1287	40	38			146				5801	7496		-119	1235	996	9608
Wood containers		4		6	11	5	4		26	250	1	2	3	1169	1481	655		689	-1118	1707
Other wood products		5		3	8	6	6		15	66	1			1114	1224	613		618	-509	1946
Pulp																				
Mechanical										826				6	832			561	20	1413
Chemichal										4217	8			208	4433			8170	-649	11954
Paper and paper board (2)		6	8		9	1	1		22	1807	2858	1915	2429		3992	13048	6143	-192	38580	-5584	51995
Paper products		8	11	3	18	2	1		30	722	653	448	561		8359	10816		-95	986	5158	16865
Books, newspapers		56	48	5	40	3	2		28	135	94	2117	2652	2	14034	19216	20361		1549	-11571	29555
Graphical products		22	17	3	17	1	1		11	54	74	1899	2391		6933	11423	38		198	21175	32834
Waste woods (product) (3)			3	98					1100	1175					2376			77	432	2885
Waste paper (product) (4)										686					686			177	-537	326

(1) except CPA 20.10.23 and 20.10.3
(2) except CPA 21.12.6
(3) CPA 20.10.23 and 20.10.3
(4) CPA 21.12.6

Tabel 7 Supply , monetary data 1993

		Output of industries																			
		Forestry	Logging	Saw milling	Veneer, part fibreboards e	Builders carpentry	Wooden containers	Other wood prod.	Pulp	Paper and paper board	Articles of paper and p.b	Publishing	Printing	Recyc	Other	Sum of industr.	Import	Total	Trade a transpo margins	Taxes o products net	Total
	NACE	02. part	02. part	20.1	20.2	20.3	20.4	20.5	21.11	21.12	21.2	22.1	22.2-3								
Products																					
Standing timber		11417														11417		11417			11417
Saw logs			8902	9											10	8921	811	9732	1163		10895
Pulp wood			8104	26	2											8132	597	8729	1105		9834
Fuel wood			1392	490	1											1883	6	1889	79		1968
Other wood				8	1										10	19	9	28	7		35
Sawn wood (1)				20077	25	162	56	2							22	20344	724	21068	1188	85	22341
Veneer, particle board etc.				24	1804										4	1832	1102	2934	267		3201
Builders carpentry				162	5	8188	6	2							79	8442	421	8863	745		9608
Wood containers				122	4	5	1111	150							15	1407	36	1443	213	51	1707
Other wood products				8	9		1	933							195	1146	452	1598	258	90	1946
Pulp																					
Mechanical									801	91						892	86	978	435		1413
Chemichal									9205	1733						10938	417	11355	599		11954
Paper and paper board (2)					7	4	6			42639	306		0		195	43157	2777	45934	5593	468	51995
Paper products										2914	8612		95		205	11826	2776	14602	2255	8	16865
Books, newspapers												21045	56		131	21232	4110	25342	3231	982	29555
Graphical products										1	138	747	26188		380	27454	1593	29047	2403	1384	32834
Waste woods (product) (3)				2507	13	33	15								3	2571	160	2731	154		2885
Waste paper (product) (4)										1	21		6			28	263	291	35		326

(1) except CPA 20.10.23 and 20.10.3
(2) except CPA 21.12.6
(3) CPA 20.10.23 and 20.10.3
(4) CPA 21.12.6

Table 8

General remarks
The calculation is made for the entire F&L industry. No internal transactions are recorded except for production which leads to capital formation. Information of inputs are rather old and extrapolated by assuming the input coefficient to be constant over time. There is no further breakdown of the total of F&L industry in NA. NBoF are calculating output in the same manner as NA and they also try to calculate costs of F&L for different activities but their classifications and concepts does not fit NA purposes very well. The breakdown is made for activities not for industries which is the division in table 8. Large effort has to be made to reconcile NBoF and NA figures.

Interest, rent and net income
To derive net income information of interests and rents are needed. But statistical surveys covering enterprises mainly operating in forest and logging activities have big sample errors.

Public financing
There exists a lot of information on public financing of forestry but it is not compiled in a systematic way to fit table 8.

Acquisition of land and land area
There exist no information divided by industries of land area and acquisition or disposal of land. At the best such information can be made up for enterprises but such a figure will include all land area not only area of forests and other wooded land. For the industry the forest land area probably will be very close to the total forest area which can be used as an approximation. The same goes for changes in forest land area. This information is found in table 1a.

Table 8 Economic accounts for forestry and logging 1993

current prices, million SEK

	Total	of which: forestry	logging
Current transactions			
Intermediate consumption (purchasers prices)			
Natural growth	8566		
Other products	4252		
seeds and plants	377		
energy	573		
fertilizers and soil improvers	23		
material, small tools etc.	700		
services	2254		
other and adjustment	325		
Gross value added (basic prices)	17684		
Compensation of employees	4087		
Taxes less subsidies on production	69		
Consumption of fixed capital	1371		
Net operating surplus/mixed income	12157		
interests			
rent			
net income			
Output (basic prices)	30502		
Market output			
Own account output			
Other non market output			
Capital transactions	4220		
Gross Fixed Capital Formation	1816		
construction	1268		
equipment	548		
other gross fixed capital formation	0		
Changes in inventories	2404		
of which work in progress	2851		
Net acquisition of land			
Public financing			
Other non market output			
Subsidies			
Investment grants			
Other transfers			
Supplementary data			
Labour inputs (number of employees)	15700		
Stocks of fixed assets	58021		
Land area			

Table 9-10

Table 9-10 correspond to table 4 and 6. It has only been a conversion from m^3 or tonne into tonnes of dry material of wood.
The conversion coefficients are the same that was used in the report Carbon Flow Analysis in Sweden (ref. B. Andersson, Statistics Sweden).

Used coefficients

Product	Used unit in table 4 and 6	Conversion coefficient
Sawlogs	m^3 on b	0,41
Pulp wood	m^3 on b	0,39
Fuel wood	m^3 on b	0,4
Sawn wood	m3	0,388-0,488
Veneer	ton	0,88
Particle board	ton	0,88
Fibre board	ton	0,88
Mechanical pulp	ton	0,9
Chemical pulp	ton	0,9
Paper and paper products	ton	0,7-0,9
Wood containers	ton	0,88
Builders carpentry	ton	0,88
Other wood products	ton	0,88
Waste wood	m^3	0,4
Waste wood	ton	0,88
Waste paper	ton	0,9

Tabell 9 Material balance use table 1993

			Intermediat consumption by industries																		
			Forest	Logging	Sawmilli	Veneer,	Builders	Wooder	Other p	Pulp	Paper an	Articles	Publishi	Print	Recy	Othe	Total	Final	Capital	Export	Total
						fibreboards etc.					paper bo	paper and p.b						consur	form		
		NACE	02. pa	02. part	20.1	20.2	20.3	20.4	20.5	21.11	21.12	21.2	22.1	22.2							
Products	hs	Unit 1000 tal																			
Standing timber		m3 on b		25520															7980		33500
Saw logs		m3 u.b.			12867	101	75	77									13120		-13428	308	13428
Pulp wood		m3			64	70				5914	8545						14593		-14854	261	14854
Fuel wood		m3																1725	-1740	15	1740
Sawn wood		m3																			
Veneer		ton																			
Particle board		ton																			
Fibre board		ton																			
Builders carpentry		ton																			
Wood containers		ton																			
Other wood products		ton																			
Pulp		t																			
Mechanical		t									89						89		-309	220	309
Chemichal											1252						1252		-3790	2538	3790
Paper and paper pro		ton																			
Waste woods (produ		m3			7	353					1371										
Waste paper (produc		t									1083										

Tabell 10 Material balance use table 1993

			Output of industries															
			Forestry	Logging	Sawmilling	Veneer, particl	Builders c	Wooden	Other p	Pulp	Paper and	Articles of	Publishin	Printing	Recyc	Other	Import	Total
						fibreboards etc.					paper boa	paper and p.b						
		NACE	02. part	02. part	20.1	20.2	20.3	20.4	20.5	21.11	21.12	21.2	22.1	22.2				
Products	hs	Unit 1000 tal																
Standing timber		m3 on b	33500															33500
Saw logs		m3 on.b.		12300	45												315	12660
Pulp wood		m3 on.b.		10608													2874	13482
Fuel wood		m3 on.b.		1720	16	2											24	1762
Sawn wood		m3			6328	6	16	13	0								104	6467
Veneer		ton				42											67	109
Particle board		ton			2	358											99	459
Fibre board		ton				97											68	165
Builders carpentry		ton			5		128									2	13	148
Wood containers		ton			40		1	250	40								7	338
Other wood product		ton			1				12							4	17	34
Pulp		t																
Mechanical		t								287	45						30	362
Chemichal										3016	558						153	3727
Paper and paper pr		ton					1	1			8018	577	11			18	443	9069
Waste woods (prod		m3			5731	25	34	31	1							12	380	6214
Waste paper (produ		t									1	34	15		820		487	1357

Table10 Complementary table, production of waste 1993

				Production of residuals by industries										
				Forestry	Logging	Sawmilling	Veneer, pa	Builders c.	Wooden cc	Other prod	Pulp	Paper and	Articles of	Publishing
							fibreboards etc.					paper boar	paper and	and printing
			NACE	02. part	02. part	20.1	20.2	20.3	20.4	20.5	21.11	21.12	21.2	22
			1000 tonnes											
Waste (residuals)														
Industry specific														
	Waste wood	m3 f onb			912									
	Waste wood	tonnes				2065	32	122	5	11	254	747	0	
	Waste paper	tonnes										10	19	46
	Black liqours	m3												
	Black sludge	tonnes									..	..		