SECUNDAIRY DATA-ANALYSIS MAPANE–PLOTS 1981-1997

J.J. Jansen[1], F. Bongers[1], N.R. de Graaf[1], W.B.J. Jonkers[1], F.J. Sterck[1], B.M. Stuiver[1] and J. Wirjosentono[2]

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[1)] *Forest Ecology and Forest Management Group, Centre for Ecosystem Studies, Wageningen University*
[2)] *CELOS - Centre of Agricultural Research in Surinam*

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Hence! This page is added in 2018 for the internet version.

Research with the focus on sustainable forest management using natural regeneration has been done in Surinam through a cooperative relation between the Centre of Agricul-tural Rsearch in Surinam (CELOS) and the department of Forest Ecology and Forest Management of the Wageningen University since 1965. This eventually led to the development of the Celos Management System (CMS), which can be split into the Celos Harvesting System (CHS) and the Celos Silvicultural System (CSS). This research has been adjourned in the early eighties.
The Celos Management System is a polycyclic forest management system. Every 20 to 25 years approximately 20 m3/ha of commercial timber species is harvested. The harvest results in a temporary increase in light and growth; also for the commercial species. The annual growth of the commercial species however is not enough to make a new harvest possible. To guarantee a sufficient annual increment (1 m3/ha/yr) of the commercial tim-ber species De Graaf proposes to perform a cleaning right after the harvest and after 8 and 16 years a liberation-treatment. In Mapane CSS was tested, and field data were recorded in 1981 and 1997.

In this study the recordings were analyzed and positive results were found within CHS for Hendrisons' controlled logging sytem and within CSS for De Graaf's cleaning with D-rate and up.

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Contents

1. Introduction

The following report concerns research on a contract basis performed by the Forest Ecology and Forest Management department requested by CELOS. Bus and Laumans conducted a research in the Mapane-area for this department in 1997. The following subscription is pretty much literally cited out of their report (Bus and Laumans, 1997b), although it has been translated.

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> *The Celos Management System is a polycyclic forest management system. Every 20 to 25 years approximately 20 m^3/ha of commercial timber species is harvested. The harvest results in a temporary increase in light and growth; also for the commercial species. The annual growth of the commercial species however is not enough to make a new harvest possible. To guarantee a sufficient annual increment (1 m^3/ha/yr) of the commercial timber species De Graaf (1986) proposes to perform a cleaning right after the harvest and after 8 and 16 years a liberation-treatment. In experiment 67/9 B (Akintasoela) De Graaf performed the most promising cleaning methods as suggested in previous studies on 25 ha. Taking into consideration the economical and ecological preconditions, this could be promising in the meaning of sufficient annual increment of commercial timber species. The same method has been the base for a practical experiment in natural forest regeneration for the Suriname Forest Service (Dienst Lands Bosbeheer) (De Vletter, 1980). For this matter, a representative area of Mapane-area has been split up in patches of 10 hectares. The intention was to monitor the consequences of cleaning at 23 Permanent Sample Plots of 1 ha each. Deliberately a distinction has been made between a relatively rich and a relatively poor soil, in the Tibiti district in the southern region and the Rama district in the northern region respectively. Hendrison conducted his research on the differences between traditional harvesting methods and controlled harvesting (CHS*) w*ithin this sample area. After the harvest of 1981 (aim: 15 m^3/ha, effectively 5-6 trees/ha) it was the intention to clean the area according to the method of De Graaf (return the basal area to 12.5 m^3/ha).*

All 23 experimental plots were recorded in 1981/82; a cleaning treatment has been done on part of the experimental plots in 1984. In cooperation with Bus and Laumans, CELOS has recorded all experimental plots again in 1997/98. In 2002, CELOS' department of Forestry placed an Excel-file with the data of both recordings to the disposal of the Department Forest Ecology and Forest Management of the WUR with the request to investigate what conclusions could be drawn out of the data (see appendix IV for the assignment).

First a description and analyses of the available material is given, followed by the problem definition and the formulation of the research questions. These are based on the proposed research question and the possibilities the material offers. The report will follow the usual steps "methods", "results", and "discussion".

2. Material: Experimental plots and tree data

In the Mapane district, 23 experimental plots are located that were recorded by Celos in 1981 or 1982 and once again in 1997 and 1998 by Celos in cooperation with Bus and Laumans. The timeframe between the two recordings is approximately 16 years. Certain treatments were carried out in part of the experimental plots in 1984.

Experimental plot data

The experimental plots were originally planned for monitoring as part of an extensive practical experiment. The map (*Figure 1*) of treatments suggests a well-constructed experiment in which two variations of the Celos Silvicultural System (CSS) would be tested. Locations were pointed out with a similar starting situation in which untreated (0), S-treatment and D-treatment experimental plots were present. Next to that, there were locations with only two of the three treatments and solitary experimental plots with one of the three treatments, see *Figure 1* for the location, code and treatment. However, only the experimental plots with the 0- and D-treatment were recorded again. In cases that a cluster consisted of two or three treatments, only one was chosen. Nothing can be recovered from the original location-effect, and thus you can hardly speak of any sort of random sampling outline. It can thus be considered as an imperfect experimental field outline with some effects that could influence growth. For an extensive description of the experiment and analyses of the tree species composition, see Ter Steege et al (2003).

The recordings of 1981/82 (right after the exploitation harvesting) served on one hand to describe the starting situation and on the other hand to quantify the cleaning measurement of 1984. The cleanings should have been a bit earlier in the CSS. Subsequently a liberation treatment should have been done after 8 and 16 years, these were not performed.
Bus and Laumans initially already announced a difference between the North and the South. There is a growth difference between the North and South of Mapane according to Wyb Jonkers (personal announcement). The area northeast of the road (see *Figure 1*) therefore is indicated as North and the remains as South. There possibly also is a difference in the species distribution between North and south, according to Reitze de Graaf (personal announcement) Brownheart (*Vouacapoua americana*) occurs in the North while this is hardly the case in the South. Afterwards, this appeared to be the case, but no attention has been paid to it in this research. According to the map several experimental plots are also located in the exploitation patches of Hendrisons' research. Hendrison (1990) makes a distinction between the traditional harvest (T) and the controlled harvesting (C). In the case of controlled harvesting, he has some variations, of which only "winches" appears here, this is not important in this study. Next to this, there is the 0-treatment (not in Hendrison-research).

The treatment of 1984 comes down to the cleaning of all Non Commercial Timber Species (NCTS) above a certain diameter (in such a way that the trees are girdled with the consequence that the tree dies after some time). The diameter is chosen in such a way that afterwards a basal area (including all species) of 12.5-15.0 m^2/ha with a minimal diameter of 25 cm remains. The data of the experimental plots are listed in *Table 1*. A lower value in diameter proportionally meant a heavier cleaning. It is a systematical cleaning, with the single criterion of diameter. The individual tree treatments and the distribution over the area are not taking into account.

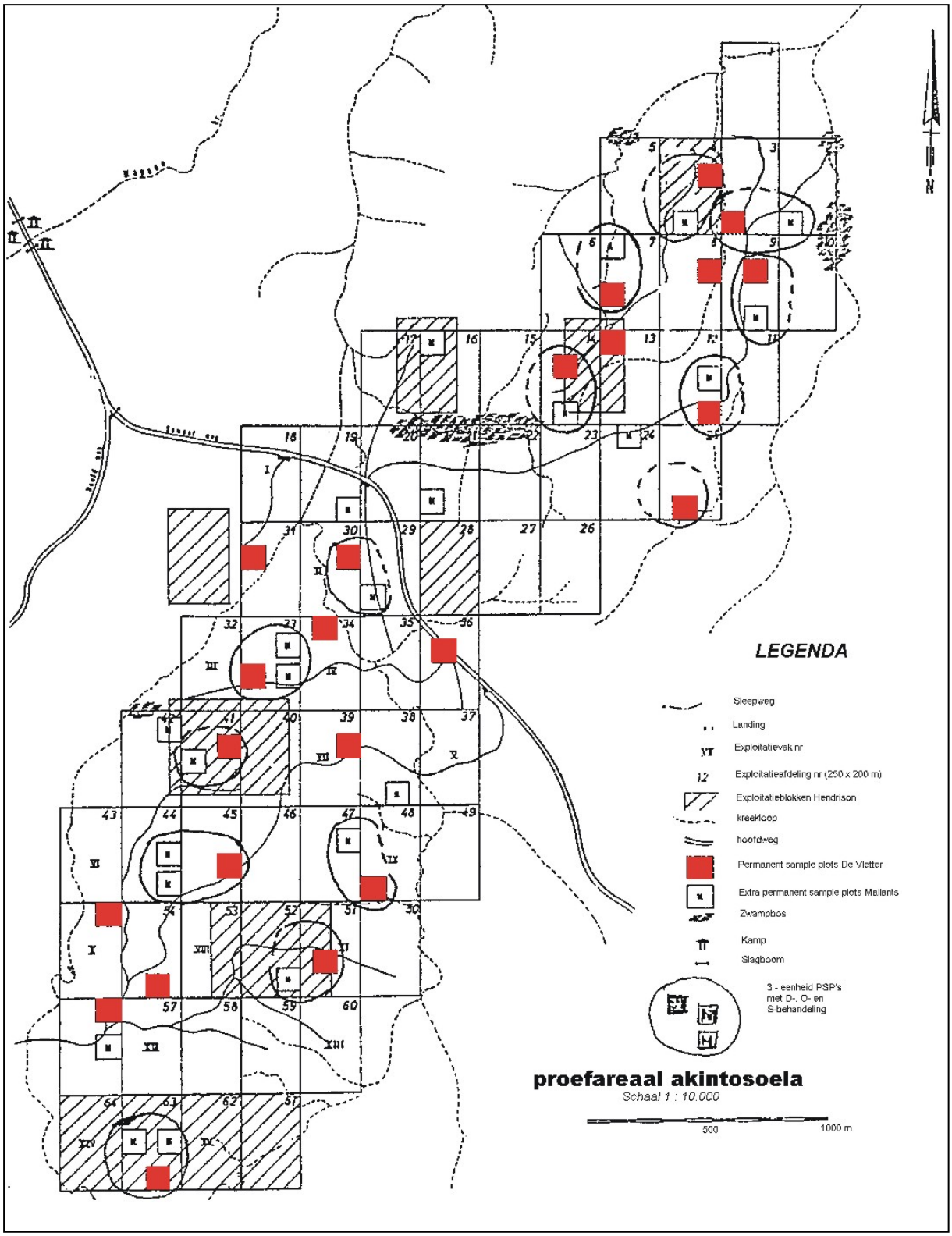

Figure 1: Location Experimental plots Mapane *(Legend top to bottom: logging road, landing, exploitation compartment nr, exploitation department nr (250x200m), exploitation patches of Hendrison, creek, main road, Permanent sample plots De Vletter, Extra permanent sample plots Mellants, Zwamp-forest, Camp, road barrier, inside the circle there is a three unity of PSP's with D-, 0- and S-treatment).*

This cleaning-rate is classified in the table with a 0-degree (not cleaned), and A-degree (very light cleaning) up to a G-degree (very heavy cleaning).

Every experimental plot is 1 ha in size, in a square of 100 x 100 m.
Every experimental plot is subdivided in 25 subplots of 20 x 20 m (see *Figure 2*).

Table 1: Experimental plot data Mapane

Plotnr	Location	Experiment Hendrison harvest	Cleaning	Minimal diameter cleaning (cm)	Cleaning-rate
3-7	North	0	Yes	40	D
4-4	North	C	Yes	30	F
7-6	North	0	Yes	65	A
8-4	North	0	Yes	25	G
9-4	North	0	Yes	65	A
12-8	North	0	Yes	40	D
13-2	North	C	Yes	35	E
14-3	North	½ C and ½ 0	Yes	30	F
25-7	North	0	Yes	35	E
30-4	South	0	Yes	45	C
31-3	South	0	No		0
33-6	South	0	Yes	45	C
34-2	South	0	No		0
36-3	½ North and ½ South	0	No		0
39-4	South	0	No		0
41-4	South	T	Yes	25	G
45-6	South	0	Yes	25	G
48-7	South	0	Yes	50	B
51-6	South	½ T and ½ 0	Yes	30	F
54-8	South	0	No		0
55-1	South	0	No		0
56-1	South	0	No		0
63-8	South	C	Yes	40	D

Measurements in the experimental plots
In the experimental plots the following data are recorded of all trees above 25 cm in diameter, either by measurement or otherwise determined:

- Plot- or experimental plot number
- Subplot number
- Tree number in 1981/82
- Tree number in 1997/98
- Timber species in 1981/82
- Timber species in 1997/98
- Celos-timber species code in 1997/98
- Girth in mm in 1997/98
- Height on which girth is measured in 1997/98
- Remarks on damage, death, logging, liana, not retrieving of a 1981-tree, girdling, stem quality, (stem) fork, etc

This series of data concerns the so-called PSP-series (Permanent Sample Plots).

Apart from these, on three random chosen subplots (random chosen out of the 9 central subplots) also trees of 5 to 25 cm were inventoried. This is the PCQ-series (Permanent Central Quadrant). The recorded data are in principle the same, with own PCQ tree-numbers, and often the PSP-tree numbers as well.

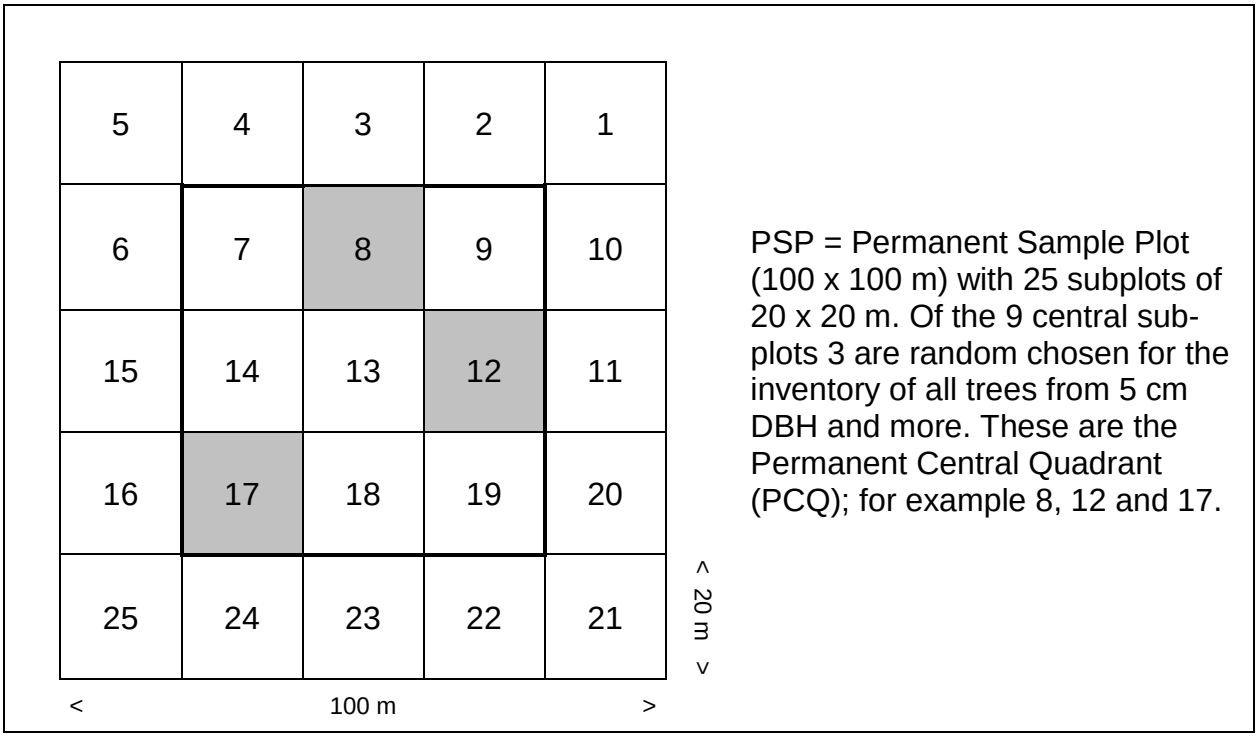

Figure 2: Experimental plot classification; 1 PSP, with 25 subplots and 3 PCQ's

Sometimes the original data file holds only the numbers of the PSP-trees, as sort of orientation point. In some cases the recorded data are also included. These are not always identical to the data of the tree with the same number in the PSP-file.
According to Bus and Laumans (1997b), the location of the subplots is not very accurately measured. Quotation of page 11 "*De afmetingen van de oude subplots wijken regelmatig af van de bedoelde 20x20 meter; het opnieuw uitzetten van de subplots zonder rekening te houden met de positie van de oude grenspalen zou in veel gevallen niet dezelfde subplots als in 1981 oplever*en." (English: The dimensions of the old subplots regularly differ from the meant 20x20 meters. Without considering the position of the old border poles, in many cases the placement of the new subplots would not give the same subplots as in 1981). To determine the data per area unit the (sub)-plot areas are presumed fixed and in accordance with the experimental plot design. This approach was necessary due to a lack of better information.

3. Problem definition and research questions

Originally, a series of treatments was foreseen in the forest with a CSS-treatment (Celos Silvicultural system), with the goal to produce a larger quantity of Commercial Timber Species (CTS) per timeframe and area in comparison to an untreated forest. An effect should be visible, even when only one-step in the CSS-treatment was carried out, at least when the CSS-system can meet its pretensions. In addition, on part of the experimental plots a "controlled harvest", "traditional harvest" or "not harvested" was performed according the CHS (Celos Harvesting System) standards. The idea behind the CHS is that this will lead to less damage, so less mortality, and thus more growth.
That is why the available material in the Mapane-experiment should proof a higher increment of CTS in the treated experimental plots versus the non-treated experimental plots. Possibly this increment varies per cleaning-rate and harvesting method, a reclassification of these cleaning-rates to a smaller number of classes could be necessary. An effect with 8 degrees of freedom, at only 23 cases, most likely will give problems for the possibility in distinction of several statistical tests.
No wood volumes were determined in the experimental plots and there are no distinguishing relationships between the measured variables and volume. We have to use a characteristic with a large correlation to the volume per ha. The most obvious characteristic is the basal area of the experimental plot per ha, this is the cumulative tree basal area. In short this will be called the basal area per ha. All results will also be presented with a volume-indication, based on an "out-place" estimator.

The research question can be split in several sub-questions:

1. Is the basal area ingrowth (recruitment over specified diameter) of Commercial Timber Species (CTS) in the PCQ's larger at the treated experimental plots than at the untreated experimental plots, for the diameter-limit of 5 cm?
2. Is the basal area ingrowth of Commercial Timber Species (CTS) in the PSP's larger at treated experimental plots than at untreated experimental plots, for the diameter-limit of 25 cm?
3. Is the basal area increment of Commercial Timber Species (CTS) in treated experimental plots larger than for the untreated experimental plots?
4. Is it possible to make a better classification of the treatments than "treated – untreated" or the classification in cleaning-rates? The possible development of this classification, in advance will be called the cleaning-class.

Some other aspects concerning the forest dynamics, which are not directly derived from the problem definition, are investigated.

5. Is mortality influenced by the treatment?
6. Is the damage to trees influenced by the treatment?

4. Methods

At first, the data is revised at tree level, after which the data is aggregated at experimental plot level. Using SPSS for Windows – Release 11.5.0 the experimental plot data is analysed to see whether the research questions could be answered with yes. Next to this, the diameter class distribution is mapped and some forest dynamics are described.

The modification of the data

Timber species

The names of the timber species are far from identical in the two inventories. The name of the last inventory was chosen in case of two different names. The names of 1981/82 were maintained for trees not occurring in 1997/98. In total 842 spelling-variations occurred of 267 timber species. In consultation with Reitze de Graaf an unambiguous species list is determined, slightly deviating from the conventional. For example "Hoogland baboen" is indicated as "Baboen hgl" and "Kleinbladige rode kabbes" as "Kabbes rode kl.bl.". When it was impossible to determine whether it were spelling-variations or different species both names were listed as separate species, that is why there is "Fijnbladige rode kabbes" next to "Kleinbladige rode kabbes", possibly these are the same tree species. This list is inserted as Appendix I, including the frequencies. The timber class (CTS or NCTS, Commercial- or Non Commercial Timber Species) was determined with the help of the CELOS-timber code list as well.

Diameter at Breast Height

The DBH is derived out of the girth measurement in the usual way, when the measurement height used to be 1.30 m:

$$DBH = \frac{Girth}{\pi * 10} \quad \text{(with } Girth \text{ in mm and } DBH \text{ in cm)}$$

At a measurement- or reference-height (Rh) above 1.30 m (for example in the case of buttresses), we worked with a rectilinear taper function derived from a hypothetical height of 30 m through the reference height (Rh):

$$DBH = \frac{Girth(Rh)}{\pi * 10} \times \frac{30 - 1.30}{30 - Rh} \quad \text{(with } Girth \text{ in mm, } Rh \text{ in m and } DBH \text{ in cm)}$$

Basal area of the trees

The basal area of the trees is calculated out of the diameter in the usual way:

$$g_{1,30} = 0.25 * \pi * DBH^2 \quad \text{(with } DBH \text{ in m and } g_{1.30} \text{ in m}^2\text{)}$$

Tree volume

The tree volume is estimated with the out-place estimator, namely the merchantable volume tariff of Jonkers (1987, Appendix VI) for the Kabo and Tonka district. The equation is as follows:

$$v = a + b * DBH^2 \quad \text{(with } DBH \text{ in } c\text{m and } v \text{ in m}^3\text{)}$$

Jonkers has general and species specific constant-values for 12 CTS, of which 10 occur in the Mapane-plots. The list of CTS of Jonkers is smaller than the CELOS-list nowadays. The decision was made to use the rate of the described tree species of Jonkers and his general CTS-rate for all the additional tree species, both for CTS and NCTS. See below for the constant-values.

Table 2: Volume tariff constants Jonkers

Tree species	a	B
CTS - general	-0.2335	0.001125
Goebaja	-0.0239	0.001040
Sali rode	-0.0836	0.000759
Tingimoni sali	-0.2013	0.000943
Kopi	-0.3153	0.001020
Basralokus	-0.3232	0.001208
Krapa	-0.1065	0.000812
Baboen hgl	-0.2169	0.001199
Riemhout zw	-0.3481	0.001189
Gronfolo hgl	-0.4308	0.001412
Gronfolo bergi	-0.1486	0.001213

Annual increment in diameter

The annual increment in diameter of the residuals (trees that lived in both inventories of 1982 and 1997) is determined as follows:

$$i_d = \frac{DBH97 - DBH81}{16} \quad in\ cm/yr$$

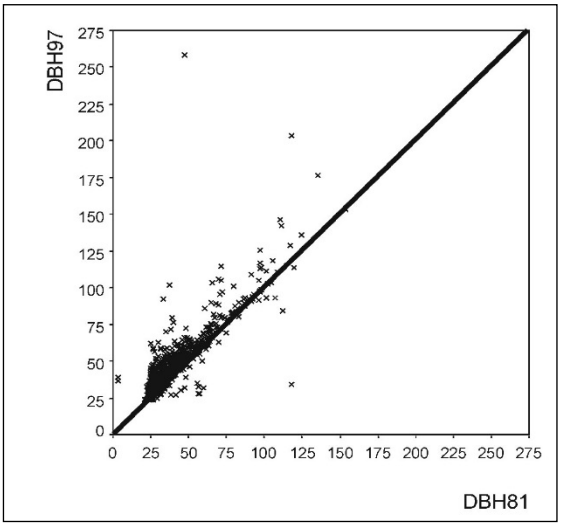

Figure 3: Relation DBH81 and DBH97

Sometimes this calculation leads to the question whether it is actually the same tree. In *Figure 3 DBH97* is plotted against *DBH81*. Due to "normal" measurement mistakes and real negative growth (a tree can shrink due to loss of fluids) values directly below the diagonal are likely. In the shown figure, however, there are many large peak-values, in which case you can evidently speak of either an incorrect *DBH81* or an incorrect *DBH97*. In those cases it was determined to treat these as two distinctive trees, one tree measured in 1981 statistically disappears (gone with unknown cause) and appears as a new, not previously measured tree in 1997.

Remarks

There appear many (1515) different remarks, which can be traced back to:

1 Mutations since previous inventory, for example:
   - niet gevonden = not found (29x)
   - niet gevoden = not fond (7x)
   - niet gevonden = not found (381x)
   - Niet gevonden = Not found (40x)
2 Experimental plot maintenance:
   - NB: new 115 could also be old 119! (1x)
   - NB: new 118 could also be old 119! (1x)
   - Long ladder measurement. White no. 28 (1x)
3 Damage or mortality
   - damaged and hollow (1x)

- damaged and many lianas (1x)
- E, trunk rotten (1x)
- E, trunk until 20 m on I site rotten (1x)
- half of twins, other half is dead (1x)

4 Other remarks
- liana in it (16x)
- liana on stem, termites nest (1x)

5 Combinations
- Old measurements limitedly usable. Hollow at 8-10 m, ants (1x)
- NB; old measurement tree! Crooked; old number looks like 129 (1x)
- NB; 2nd tree with old no 26 in subplot 5 death standing (1x)
- not found/ valuable wood: roots dugged out? (1x)
- without top, lianas in it, bees nest in it

These remarks are processed towards a type "tree mutation" and a type "damage class". Nothing was done with a number of remarks out of the category "experimental plot maintenance" and "others". For example the remark "not found/ valuable wood: roots dugged out?" was translated towards the conclusion that the tree was cut down. An option with "roots dugged out" could be that a Granmankapasi uprooted the tree looking for a bees nest in the roots; in this case the conclusion should be "death". However the combination with "not found/ valuable wood" and the fact that it was Snakewood (*Brosimum guianense*) pleads for "cut down (felled)" or better "cleared", but that is not a distinct separate category.

Tree mutations

The following classification was used for the mutations in the appearance of both inventories.

Table 3: Tree mutation code

Mutation type		Explanation
0	Residual	Measured in both 1981 and 1997
1	Cut down	Measured in 1981, in 1997 remark: cut down
2	Dead	Measured in 1981, in 1997 remark: dead
3	Dead due to girdling	Measured in 1981, cleaned in 1984, dead in 1997
4	Not found	Measured in 1981, not in 1997, sometimes with remark: not found
5	Ingrower PSP	Not measured in 1981, measured in 1997 (in PSP-inventory)
6	Residual in PCQ/ ingrower PSP	Measured in 1981 in PCQ-inventory, in 1997 above measuring-limit of 25 cm in diameter
7	Other tree?	Measured in both inventories, however obviously not the same tree, mostly determined at the inventory
8	Ingrower PCQ	Not present in 1981, present and measured in 1997
9	Cleaned in 1984	Trees in the mutation types 1, 2, and 4 are later classified in type 9, if it concerns a non-commercial timber species from 1981 thicker than the cleaning-diameter for the specific experimental plot. Mutation type 3 is added completely to type 9.

Damage classes

A classification is made on the ground of the collection "remarks". The following damage categories have been chosen:

1. no damage
2. hollow or rotten
3. broken off
4. other damage
5. girdled, but still alive

5. Results

Basal area ingrowth

The effects of the cleaning-rate, Hendrison-research and the North-South factor on the ingrowth of the basal area (above 5 cm) of the CTS-species have been studied using ANOVA. The North-South effect is significant at a significance level of 10%, the harvest effect of Hendrison is very significant. The difference between the traditional and controlled harvest clearly is in the advantage of the controlled harvesting. The interactions cannot be estimated due to a lack of degrees of freedom. The effect of the cleaning-rates is very significant. Within the cleaning-rates, the untreated does not seem to differ from the A-, B-, and C-rates. In addition to this the D-, E-, F- and G-rates do not statistically differ from one another, but this group does differ significantly from the previous group.

In *Table 4*, *Table 5* and *Figure 4* the results of an ANOVA with the effects "Cleaning-rate" and "Hendrison-research" for the basal area ingrowth (above 5 cm) of the CTS-species are given.

Table 4: Effects in ANOVA with ingrowth CTS ($G_{ingrowth\text{-}CTS}$)

Effect		Explanation	Number
Cleaning-rate	0	No cleaning	7
	A	A-rate	2
	B	B-rate	1
	C	C-rate	2
	D	D-rate	3
	E	E-rate	2
	F	F-rate	3
	G	G-rate	3
Hendrison	0	No harvest	17
	C	Controlled harvest	2
	T	Traditional harvest	4
North-South	0	South	14
	1	North	9

Table 5: ANOVA Effect of cleaning-rates (CR) and Hendrison (HEN) on ingrowth CTS ($G_{ing\text{-}CTS}$)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	7.751	12	.646	20.794	.000
Intercept	9.154	1	9.154	294.697	.000
CR	1.829	7	.261	8.412	.002
HEN	.621	2	.311	9.997	.004
NS	.104	1	.104	3.362	.097
Error	.311	10	.031		
Total	19.065	23			
Corrected Total	8.061	22			

R^2 = .961 (Adjusted R^2 = .915)

It was determined to continue working with cleaning-classes. The group with an A-, B-, en C-rate are indicated by an N (= not or hardly cleaned). The D- up to G-rate is merged to a group H (heavily cleaned).

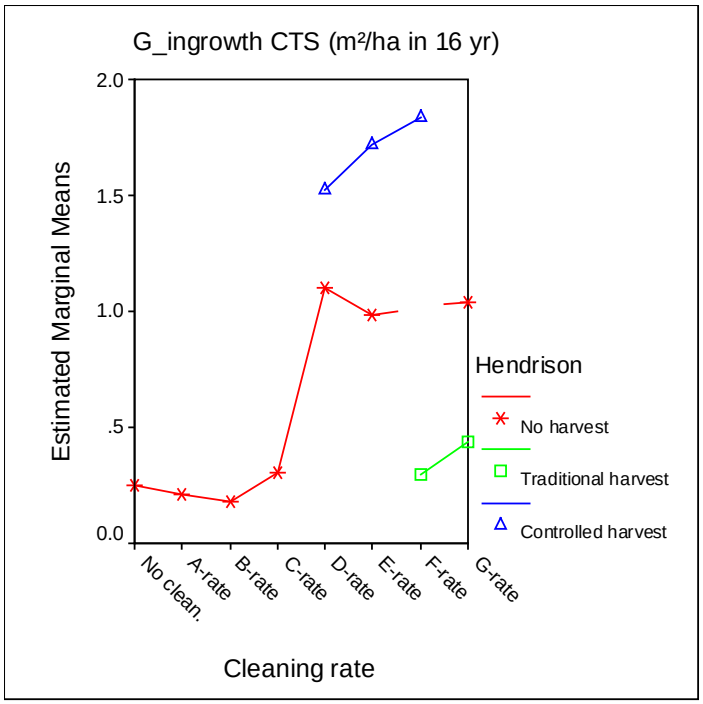

Figure 4: Effects of cleaning-rates on the basal area ingrowth above 5 cm (CTS)

After a number of comparable tests with other random samples, it was decided to use this classification (the effect "cleaning-class" with 2 levels) as the most distinctive, see *Table 4* for the revised effects per experimental plot.

Table 6: Revised experimental plot data Mapane

Plotnr.	Location	Hendrison	Cleaning-rate	G_{PSP} before cleaning (m^2/ha)	G_{PSP} after cleaning (m^2/ha)	Cleaning-classes
3-7	North	0	D	16.6	13.6	H
4-4	North	C	F	19.0	9.0	H
7-6	North	0	A	18.1	17.0	N
8-4	North	0	G	19.4	8.1	H
9-4	North	0	A	21.3	18.2	N
12-8	North	0	D	18.4	10.9	H
13-2	North	C	E	21.6	11.2	H
14-3	North	C + 0	F	16.5	7.5	H
25-7	North	0	E	23.3	12.8	H
30-4	South	0	C	20.1	11.2	N
31-3	South	0	0	22.3	22.3	N
33-6	South	0	C	15.5	10.8	N
34-2	South	0	0	17.5	17.5	N
36-3	N + S	0	0	17.1	17.1	N
39-4	South	0	0	15.6	15.6	N
41-4	South	T	G	23.6	8.9	H
45-6	South	0	G	17.8	7.8	H
48-7	South	0	B	13.0	10.4	N
51-6	South	T + 0	F	17.3	8.0	H
54-8	South	0	0	15.2	15.2	N
55-1	South	0	0	16.0	16.0	N
56-1	South	0	0	24.4	24.4	N
63-8	South	C	D	21.4	15.3	H

Figure 4 suggest an increase of the basal area ingrowth in CTS above 5 cm due to (middle) heavy cleaning, even though the evidence is paper-thin. This effect is quite enlarged when Hendrison's method of "controlled harvest" is applied. The effect seems completely eliminated when a "traditional harvest" is carried out. The ANOVA was repeated with the cleaning-class rather than the cleaning-rate as you can see in *Table 7*. The North-South effect no longer seems to be significant, but there obviously still is a intermingling between the Hendrison-effect and the North-South effect.

Table 7: ANOVA with the effects Cleaning-class (CC), North-South (NS) and Hendrison (HEN) at G-ingrowth CTS

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	7.667	6	1.278	51.865	.000
Intercept	9.043	1	9.043	367.023	.000
CC	1.761	1	1.761	71.495	.000
HEN	1.492	2	.746	30.275	.000
NS	.004	1	.004	.157	.697
CC * NS	.027	1	.027	1.103	.309
HEN * NS	.116	1	.116	4.715	.045
Error	.394	16	.025		
Total	19.065	23			
Corrected Total	8.061	22			

a $R^2 = .951$ (Adjusted $R^2 = .933$)

In *Table 8* the eventual ANOVA data is listed. Without the HEN-NS interaction the R^2 slightly decreases, but remains very high.

Table 8: ANOVA G-ingrowth CTS > 5cm with CC (cleaning-class)

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	7.547	3	2.516	92.961	.000
Intercept	8.402	1	8.402	310.455	.000
CC	2.289	1	2.289	84.596	.000
HEN (C + T)	2.617	2	1.308	48.349	.000
Error	.514	19	.027		
Total	19.065	23			
Corrected Total	8.061	22			

$R^2 = .936$ (Adjusted $R^2 = .926$)

Instead of representing this result as an ANOVA model, it can also be represented by a linear regression model, as follows:

$$G_{ing\text{–}WHS} = 0.248 + 0.805 * CC + 0.677 * C - 0.687 * T \quad (R^2 adj = 0.926)$$

There is a large significant effect of the cleaning-class at the basal area ingrowth of the CTS above 5 cm, this is almost 4 times as large (1.053 instead of 0.248 m^2/ha in the timeframe of 16 years). Under controlled harvest this is 1.731 and with traditional harvest 0.376 m^2/ha. For the values and significance of the remaining basal area ingrowth numbers see *Table 9*.

Table 9: Average basal area ingrowth (m^2/ha over 16 yr)

Cleaning-class/Harvest	CTS >5	CTS >25	NCTS > 5	NCTS > 25	Tot > 5	Tot > 25
N No harvest	0.25	0.95	2.47	3.18	2.32	4.08
H No harvest	1.05	0.95	2.47	4.36	4.14	5.06
Controlled harvest	1.73	1.69	4.94	4.36	6.67	6.64
Traditional harvest	0.37	0.95	4.75	4.36	4.14	5.06
R^2_{adj} (in LR-model)	0.93	0.35	0.35	0.24	0.52	0.38

Notice: if the values differ, these are significantly different (α =0.05).

The cleaning and the method of harvesting apparently largely and positively influence the basal area ingrowth of the Commercial Timber Species (CTS) in the lower diameter classes. We can interpret this as a high rejuvenation for the CTS within the timeframe of 16 years, due to the H(heavy)-cleaning treatment and the controlled harvest. For the NCTS this holds a lot less and solitary for the cleaning, there is no harvest effect. Without (or with light) cleaning and without harvest 11% of the rejuvenation ingrowth exists of CTS, with H-cleaning treatment this will be 20% and when we also perform a controlled harvest it will be 29%. In absolute values, it is a fourfold (from 0.25 to 1.05) in the case of heavy cleaning and a sevenfold (from 0.25 to 1.73) of the rejuvenination ingrowth when a controlled harvest is performed additionally. The rejuvenation ingrowth is measured in m^2/ha basal area ingrowth over the 5 cm measurement limit in 16 years.
The development speed in the diameter class 5-25 cm towards exceeding the 25 cm changes less spectacular due to the treatment. The cleaning itself does not influence the result. However, in combination with the controlled harvest the ingrowth above the 25 cm of CTS has increased with 78%, while the relative CTS-share increases slightly from 18% to 23%. This share would decrease slightly from 18% to 13% without controlled harvest.

Basal area increment
Another possibility to look at the experiment effects could be an analysis of the increment of the basal area on the existing trees. However, per definition the increment of the basal area depends on the existing basal area per class, after all it can only grow additionally when there was already something present. There are two possibilities to consider this in the model.

1. Use the relative basal area increment: $IG_{rel} = IG/G$
2. Use a MLR-model: $IG = a_0 + a_1 * G + a_2 * CC$

The differences in (relative) increment of the basal area seems not explained by the cleaning-class, there does seem to be a slight significant difference between North and South.
Found is the following:

$$IG_{WHS} = 0.137 + 0.048 * G_{81} + 0.252 * NS \quad (R^2 adj = 0.302) \quad (\text{in } m^2/\text{ha per } 16 \text{ yr})$$

However, this North-South effect was already assumed in the beginning of this experiment. This pre-assumption thus is validated, apart from the fact that under equal circumstances the CTS grow 0.015 m^2/ha/yr more in the north than in the south (app. 15% more).

Dynamics 1981-1997
In *Table 10*, *Table 11* and *Table 12* the dynamics are listed of respectively the average basal area, the average stem number and the average volume set up over the 23 remeasured experimental plots for the period 1981/82 until 1997/98. The significance in the stemnumber mutations has not been investigated, because this is not interesting in relation to the original research question. The significance of the volume set up cannot be determined due to the use of an outplace element with unknown purity and variance.

Table 10: Basal area dynamics in m^2/ha 1981 – 1997

Mapane 1981 - 1997	PCQ random sample d <25 cm						PSP - inventory: d >= 25 cm						Total					
	Cleaning						Cleaning						Cleaning					
	none/light			heavy			none/light			heavy			none/light			heavy		
	Timberclass			Timberclass			Timberclass			Timberclass			Timberclass			Timberclass		
	NCTS	CTS	Tot	NCTS	CTS	Tot	NCTS	CTS	Tot	NCTS	CTS	Tot	NCTS	CTS	Tot	NCTS	CTS	Tot
1981-82	6.9	1.6	8.5	4.8	1.3	6.1	12.8	5.2	18.0	13.4	6.2	19.5	19.7	6.8	26.5	18.2	7.5	25.6
Cleaning 1)							-1.7	0.0	-1.7	-9.3	0.0	-9.3	0.0	0.0	0.0	0.0	0.0	0.0
After cleaning 1)	6.9	1.6	8.5	4.8	1.3	6.1	11.1	5.2	16.3	4.1	6.2	10.3	18.0	6.8	24.8	8.9	7.5	16.4
Logging							-0.1	-0.5	-0.6	0.0	-0.6	-0.6	-0.1	-0.5	-0.6	0.0	-0.6	-0.6
Mortality	-0.7	-0.1	-0.8	-0.4	-0.1	-0.5	-2.2	-0.6	-2.7	-0.3	-0.9	-1.1	-2.9	-0.7	-3.6	-0.7	-1.0	-1.6
Disappeared	-2.1	-0.5	-2.6	-1.2	-0.4	-1.6	-2.1	-1.1	-3.2	-0.8	-2.2	-3.1	-4.2	-1.6	-5.8	-2.0	-2.6	-4.6
Ingrowth	2.0	0.2	2.2	4.3	1.2	5.5	3.2	0.9	4.1	4.4	-1.3	5.6	2.0	0.2	2.2	4.3	1.2	5.5
Passing threshold	-1.7	-0.4	-2.1	-1.1	-0.5	-1.6												
Increment	3.5	1.0	4.5	2.8	1.1	3.8	2.2	1.1	3.2	1.1	1.2	2.3	5.6	2.0	7.7	3.9	2.3	6.2
Statistical mutation							0.6	0.1	0.7	0.1	0.0	0.1	2.0	0.6	2.6	3.4	-1.7	1.6
1997-98	7.8	1.9	9.7	9.2	2.6	11.8	12.6	5.0	17.6	8.6	5.0	13.6	20.4	6.9	27.3	17.8	7.5	25.4

1) The cleaning has been performed in 1984, the situation after the cleaning has been calculated with the data of 1981/82.

From *Table 10* (and also *Table 11* and *Table 12*) it obviously shows that other activities took place in all plots outside the cleaning of 1984. In the category "logging CTS" as well as "disappeared" these are considerable amounts, in both basal area and stemnumber. In the category "disappeared" it concerns both CTS and NCTS, possibly that during the treatments also trees were girdled that did not meet the diameter demands. There also appeared to be 10 CTS samples with the mutationcode "death due to girdling". In total, it concerned 119 trees of which it was determined that they died due to girdling. This is not too bad given the difficulty of tree species recognition and the absence of a tree position map. The category "disappeared" however does give serious problems for the interpretation. These trees were not recovered in 1997 and thus it could not be determined whether they were cleaned, dead, or logged. In the case when the trees belonged to the category of the "to be cleaned trees" (so above the valid cleaning diameter for that plot) of the H-treatment, it was automatically assumed that the tree was cleaned. The amount of cleaning presumably is overestimated due to this assumption.

Table 11: Stem number dynamics in number/ha 1981-1997

Mapane 1981 – 1997	PCQ random sample d <25 cm						PSP - inventory: d >= 25 cm						Total					
	Cleaning						Cleaning						Cleaning					
	none/light			heavy			none/light			heavy			none/light			heavy		
	Timberclass			Timberclass			Timberclass			Timberclass			Timberclass			Timberclass		
	NCTS	CTS	Tot	NCTS	CTS	Tot	NCTS	CTS	Tot	NCTS	CTS	Tot	NCTS	CTS	Tot	NCTS	CTS	Tot
1981-82	643	162	805	554	144	698	88	37	124	92	39	132	731	198	929	646	183	829
Cleaning 1)							-4		-4	-48		-48	-4		-4	-48		-48
After cleaning 1)	643	162	805	554	144	698	84	37	120	45	39	84	727	198	925	599	183	782
Logging							-1	-2	-3	0	-2	-2	-1	-2	-3	0	-2	-2
Mortality	-39	-7	-46	-28	-8	-36	-13	-3	-16	-3	-5	-8	-52	-10	-62	-31	-13	-44
Disappeared	-147	-33	-180	-94	-28	-122	-15	-6	-21	-10	-11	-21	-162	-40	-201	-104	-39	-143
Ingrowth	358	60	418	579	174	753	40	12	51	55	16	71	358	60	418	579	174	753
Passing threshold	-24	-6	-30	-18	-6	-24												
Statistical mutation													16	6	22	37	10	47
1997-98	791	176	967	992	277	1269	95	37	132	86	38	124	886	213	1099	1078	314	1393

1) The cleaning has been performed in 1984, the situation after the cleaning has been calculated with the data of 1981/82.

This certainly seems reasonable if the CTS and NCTS values of the category "disappeared" are compared to the N- and Z- treatment, however this assumption cannot be quantified. Apart from that, a tree classified as "disappeared" could also have been measured and considered an in-grower. All these kinds of insecurities influence the consistency of the ingrowth and increment figures. Therefore, it is desirable to analyse the diameter increment of those trees that were clearly found again.

The discrepancy between the passing thresholds in the PCQ-inventories (measured at only 12% of the surface area) to the PSP-inventory over the 25 cm limit asks for a category "statistical mutation". Next to that, the trees that belong to the mutation category "other tree" add to the category "statistical mutation".

Table 12: Dynamics merchantable volume in m^3/ha 1981 - 1997

Mapane 1981 – 1997	PCQ random sample d <25 cm						PSP - inventory: d >= 25 cm						Total					
	Cleaning						Cleaning						Cleaning					
	none/light			heavy			none/light			heavy			none/light			heavy		
	Timberclass			Timberclass			Timberclass			Timberclass			Timberclass			Timberclass		
	NCTS	CTS	Tot	NCTS	CTS	Tot	NCTS	CTS	Tot	NCTS	CTS	Tot	NCTS	CTS	Tot	NCTS	CTS	Tot
1981-82	24	6	30	13	4	17	163	61	224	171	77	248	188	66	254	184	81	265
Cleaning 1)							-23	0	-23	-122	0	-122	-23	0	-23	-122	0	-122
After cleaning 1)	24	6	30	13	4	17	140	61	200	49	77	125	164	66	230	61	81	142
Logging							-1	-7	-8	0	-8	-8	-1	-7	-8	0	-8	-8
Mortality	-3	-1	-4	-2	0	-2	-28	-7	-35	-3	-10	-13	-31	-8	-39	-5	-11	-15
Disappeared	-10	-2	-12	-5	-2	-7	-27	-13	-40	-9	-29	-39	-37	-16	-52	-14	-31	-45
Ingrowth	3	0	3	11	3	14	36	9	45	50	14	64	3	0	3	11	3	14
Passing threshold	-19	-4	-23	-12	-5	-17												
Increment	30	8	38	20	8	28	31	13	44	16	16	32	61	21	82	36	25	60
Statiatical mutation							8	1	9	2	0	2	26	7	32	40	9	49
1997-98	25	8	33	26	8	34	159	57	216	104	59	163	184	65	249	130	67	197

1) The cleaning has been performed in 1984, the situation after the cleaning has been calculated with the data of 1981/82.

From *Table 12* the effect of the treatment on the volume-growth can be derived, which is listed in *Table 13*.

Table 13: Effect of the treatment on the volume-growth > 25 cm

	NCTS	CTS
Ingrowth - difference between treatment	13.5	4.8
Increment – difference between treatment	-15.2	3.2
Growth – difference between treatment in m^3/ha per 16 yr	-1.7	8.0
Annual growth – difference between treatment in m^3/ha^1/yr	-0.10	0.50
Average annual growth - untreated m^3/ha^1/yr	4.19	1.40
Growth change due to treatment	-2%	36%

In *Table 14*, *Table 15* and *Figure 5*, *Figure 6* insight is provided to see where the stemnumbers and the basal area are disappearing; this is in the higher diameters.

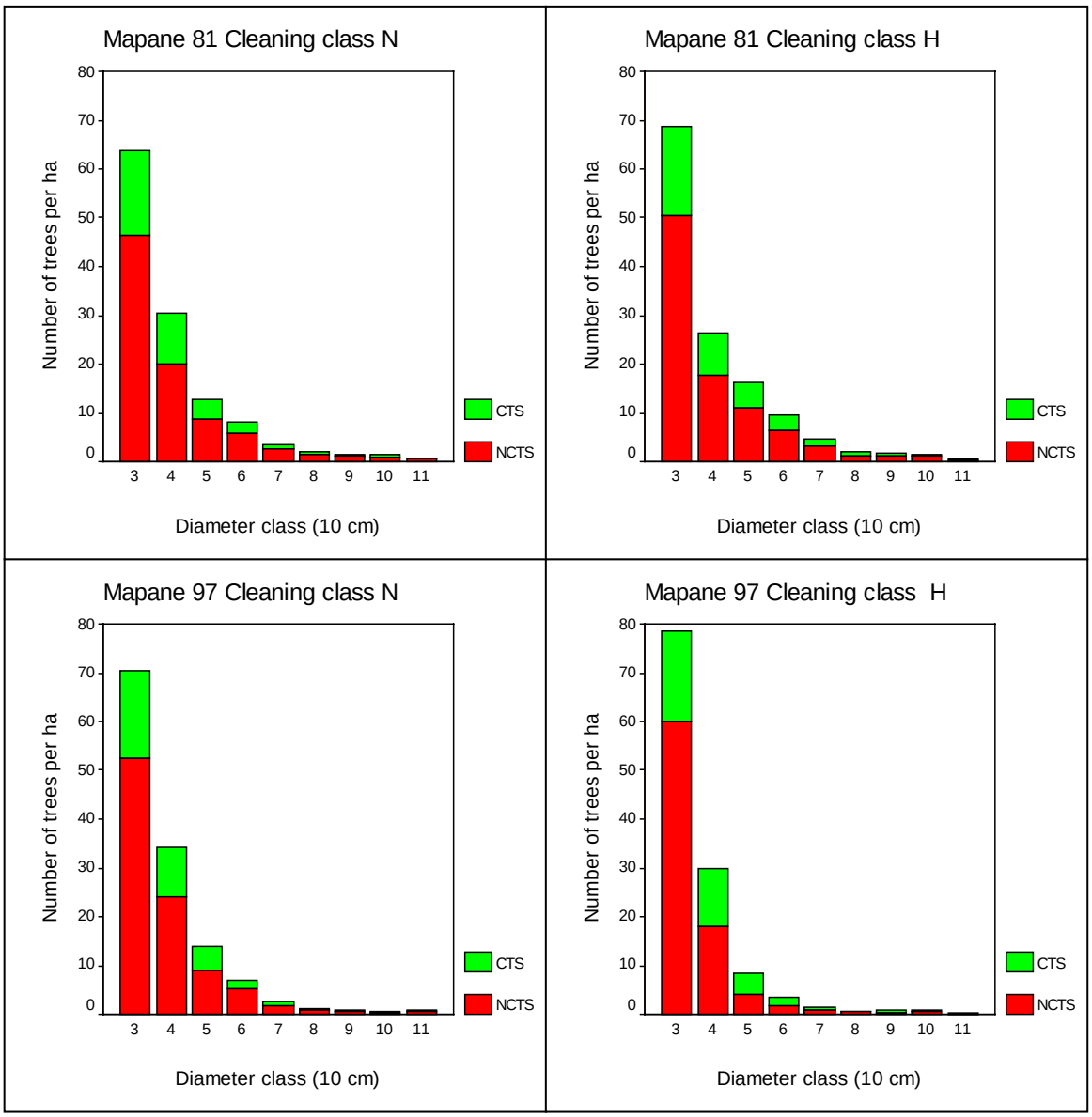

Figure 5: Changes in the diameter class division before and after the treatment

Table 14: Diameter-stemnumber-division (number per ha)

	Cleaning N				Cleaning H			
	1981		1997		1981		1997	
Diameter class	**NCTS**	**CTS**	**NCTS**	**CTS**	**NCTS**	**CTS**	**NCTS**	**CTS**
5-15 cm	510	135	647	144	479	127	838	238
15-25 cm	133	27	144	33	75	17	155	39
25-35 cm	46	17	53	18	50	18	60	19
35-45 cm	20	10	24	10	18	9	18	12
45-55 cm	9	4	9	5	11	5	4	4
55-65 cm	6	2	5	2	6	3	2	2
65-75 cm	3	1	2	1	3	1	1	0
75-85 cm	2	1	1	0	1	1	0	0
85-95 cm	1	0	1	0	1	1	0	1
95-105 cm	1	1	0	0	1	0	1	0
>105 cm	1	0	1	0	0	0	0	0
total	731	198	886	213	646	183	1078	314

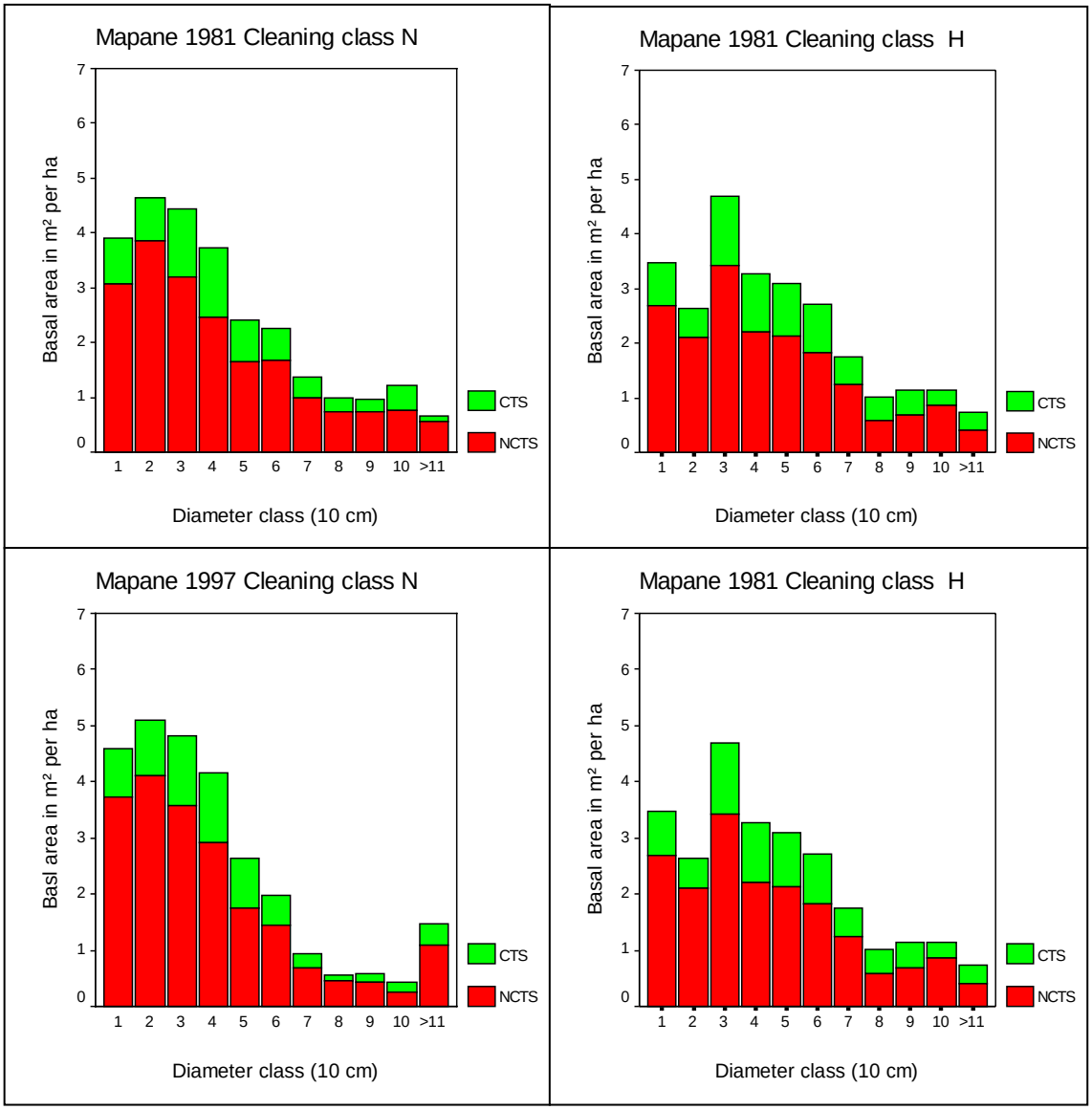

Figure 6: Changes in the basal area division per diameter class 1981 and 1997

Table 15: Diameter-Basal area-division (m^2 per ha)

Diameter-class	Cleaning N				Cleaning H			
	Gha 1981		Gha 1997		Gha 1981		Gha 1997	
	NCTS	CTS	NCTS	CTS	NCTS	CTS	NCTS	CTS
5-15 cm	3.06	0.85	3.73	0.87	2.68	0.79	4.90	1.53
15-25 cm	3.86	0.77	4.10	1.00	2.11	0.53	4.31	1.06
25-35 cm	3.20	1.24	3.59	1.24	3.43	1.26	4.05	1.29
35-45 cm	2.46	1.26	2.91	1.25	2.20	1.09	2.09	1.49
45-55 cm	1.64	0.77	1.75	0.89	2.12	0.97	0.81	0.80
55-65 cm	1.66	0.59	1.44	0.54	1.83	0.88	0.52	0.43
65-75 cm	0.99	0.37	0.69	0.25	1.24	0.51	0.39	0.17
75-85 cm	0.74	0.25	0.45	0.12	0.59	0.41	0.21	0.05
85-95 cm	0.74	0.22	0.43	0.16	0.69	0.45	0.11	0.39
95-105 cm	0.77	0.44	0.25	0.19	0.87	0.27	0.42	0.13
>105 cm	0.57	0.09	1.09	0.38	0.42	0.32	0.00	0.20
total	19.68	6.87	20.42	6.90	18.17	7.48	17.81	7.54

Diameter increment

The last option is to look at the diameter increment of the stems that have remained and try to find whether there is a difference between the treatments. Usually, the diameter increment is determined by the 2nd degree polynom, as function of the diameter per species. See below:

$$id = a_0 + a_1 * d + a_2 * d^2$$

In addition, the age can play a role in this uneven-aged forest. In Mapane quite a lot of species appear, that is why species-groups have been made with comparable diameter increment (see *Table 17* for the names, codes and numbers). Using an ANOVA-model, it was tested whether the cleaning-class had some effect, see *Table 16* and *Figure 7* for the results. The diameter increment function is taken into consideration by using covariates in the ANOVA-model. Only the "intercept" (a_0) was tested for the cleaning-class effect, not the a_1 or a_2 constants, because these describe the effect of the treatment the best.

If all species would have been used in the model instead of the species-groups an adjusted R^2 of 0.37 can be reached. Using the seven species groups a respectable part of this is explained, namely 0.28. Of course, a higher R^2 can be reached with a species-specific a_1 and a_2, however this barely makes a difference (0.29).

Table 16: ANOVA of id with the effects cleaning-class, species group, and covariates d(DBH) and d^2 (DBH^2).

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	65.246	9	7.250	133.420	.000
Intercept	34.079	1	34.079	627.190	.000
Tree species group	47.493	6	7.916	145.677	.000
Cleaning-class	1.065	1	1.065	19.592	.000
DBH	4.142	1	4.142	76.229	.000
DBH^2	3.030	1	3.030	55.764	.000
Error	164.694	3031	0.054		
Total	411.974	3041			
Corrected Total	229.940	3040			

R Squared = .284 (Adjusted R Squared = .282)

Figure 7: Diameter increment in cm/yr for each cleaning class (N and H) and tree species group (x-axis).

The values show that all effects are significant. In addition, the interactions between the Hendrison-effect and North-South have been taken into consideration, as well as the interactions

with the others. Nothing out of that group appeared to be significant. From ANOVA it cannot clearly be derived whether the cleaning-class effect is either positive or negative. The answer appears to be positive and *Figure 7* shows this. The positive effect of the cleaning class is on average 0.038 cm/yr higher. It seems not much; however, it concerns over 16% more diameter increment. According to Schneider's law, this comes down to 33% more volume increment. There are no significant differences between CTS and NCTS.

Table 17: Tree species (groups) in ANOVA-model id

Species	n	Species	n	Species	n	Species	n
1. Zw riemhout-group	403	***group 2 - continues***		**3. Rode sali-group**	804	***group 4 - continues***	349
Apra kwari	1	Foengoe zw	1	Baboen hgl	30	Pegrekoe-pisi	3
Batbati	2	Foman	45	Bebe hgl	3	Pepre oedoe	1
Bosknippa	8	Gandoe	10	Bergi-manbarklak	17	Pintolokus zwarte	1
Boszuurzak	12	Gawetri	7	Boskatoen	14	Pisi zw	2
Bradilifi	1	Groenhart	4	Bospapaja	6	Pisi zw gr.bl.	9
Ceder	2	Gronfolo bergi	3	Bruinhart	46	Prasara oedoe	2
Dede oedoe	3	Gronfolo hgl	8	Djindja oedoe	14	Swietiboontje	114
Foengoe rode	1	Hoepelhout	3	Doifisiri rode	38	Wana	5
Jakanta wb	6	Ijzerhart	10	Fokofoko oedoe	4		
Jarijari	30	Ingipipa	89	Goebaja	18	**5. Pikin-misiki-groep**	83
Kabbes rode fijnbl.	1	Ingipipa gr.bl.	1	Gomhout	7	Djedoe rode	6
Kaneri pisi	11	Jakanta	7	Gujavekwari	3	Foengoe kl.bl.	3
Kankan oedoe	7	Jakanta rb	53	Jamboka zw	5	Kandratiki	1
Konkoni oedoe hgl	16	Jamboka rode	11	Kokriki hgl	4	Kimboto	2
Manaritiki	15	Jarakopi	3	Kototiki	10	Kimboto hgl	1
Manbarklak	2	Jonge kabbes	6	Kraspisi	9	Kwaskwasi oedoe	2
Manpikapika	1	Kabbes gele	1	Kwasiba	7	Manpinja	1
Mawsikwari	1	Katoen oedoe	7	Man-sali	3	Pikin-misiki	55
Merkitiki	25	Knopo-tafrabon	14	Okro oedoe	21	Pintri baboen	3
Njamsi oedoe	33	Kokriki	1	Panga panga	7	Sinja oedoe	5
Oemanbarklak hgl	4	Krabasi oedoe	2	Pisi witte	12	Sopo oedoe	2
onbekend	2	Kwatabobi	4	Pisi zw kl.bl.	9	Watra-bebe	2
Pakira tiki	3	Kwepi hb	5	Raafnjang	2		
Panta lgl	1	Kwepi rode	5	Ravenjang	7	**6. Kopi-groep**	44
Parelhout wit	5	Leletiki	7	Riemhout w	14	Boskasjoe	1
Parelhout zw	2	Letterhout	12	Sali rode	268	Hevea	2
Redi oedoe	1	Manbarklak hgl	330	Santi oedoe	4	Kaaiman oedoe	3
Riemhout zw	21	Manletterhout	47	Sawari hgl	3	Kabbes rode kl.bl.	2
Sorosali	4	Mantakina	1	Soemaroeba	2	Kaw-oedoe	6
Spikri oedoe	8	Marmadosoe	1	Sopo oedoe hgl	1	Kopi	11
Taja oedoe	122	Marmadosoe gr.bl.	3	Tingimoni sali	18	Kromanti kopi	4
Tingimoni getand	1	Mataki	3	Walaba	189	Poeroema	12
Tingimoni gr.bl.	18	Melisali	19	Wana pisi	6	Prokoni rode	3
Tite oedoe gb	26	Nekoe oedoe	12	Wiswiskwari	3		
Tite oedoe wb	7	Oemanbarklak	109			**7. Agrobigi-groep**	44
		Olie oedoe	3	**4. Krapa-groep**	349	Agrobigi	7
2. Hb Tingimoni-groep	1314	Pakoeli hgl	7	Ajo ajo	2	Djedoe zw	5
Ajawa tingimoni	29	Panga panga gr.bl.	1	Alanja oedoe	1	Kabbes zw kl.bl.	2
Anaura hgl	34	Panta hgl	22	Alata oedoe	9	Kasaba oedoe	2
Anaura lgl	3	Pera	2	Awara oedoe	1	Kwatapatoe	5
Apra oedoe	4	Pikin kwepi	2	Basralokus	37	Lika oedoe	2
Bergi-bebe	12	Pintolocus zwarte	14	Bergi-bita	9	Manbospapaja	5
Bitabon	1	Pintolokus witte	13	Dagoe ati	1	Mispel	2
Blaka oema	8	Redi oedoe kl	2	Djadidja	21	Pakoeli lgl	1
Bosamandel	1	Sali witte	1	Ficus	1	Pegrekoe-pisi w	1
Bosgujave	5	Sowtmeti oedoe	4	Granboesi weti oedoe	7	Pikintiki	1
Boskoeswe	18	Tafrabon	1	Granboesi-papaja	10	Pintobolletri	2
Boskoffie	13	Tafrabon hgl	38	Jakanta gb	3	Pinto-kopi	2
Bosmangro	3	Tamaren-prokoni	1	Kabbes rode	4	Prokoni	2
Botro oedoe	1	Tingimoni	1	Kabbes zw	2	Sali	1
Broedoe oedoe	21	Tingimoni hb	85	Koenatepi	4	Satijnhout	1
Djoe bolletrie	1	Tingimoni kl.bl.	10	Krapa	69	Sawari	1
Doifisiri	3	Tingimoni rb	3	Makakabbes	2	Takini	1
Doifisiri zw	63	Tonka	5	Mataki hgl	28	Wanakwari	1
Foengoe w	35			Mataki lgl	1		

Damage and mortality

The mortality (see *Table 18*) appears to be significant depending on the cleaning-class even though the R^2adj is low. After an N-cleaning the basal area decreased with 2.74 m^2/ha in 16 years, after a Z-cleaning this is 1.15 m^2/ha. In comparison to the original basal area, it concerns a mortality of 1.09% and 0.39% per year respectively. The tree mortality furthermore seems to be independent of the tree diameter.

Table 18: ANOVA of G_{mor} with the effect cleaning-class (CC)

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	14.603(a)	1	14.603	7.530	0.012
Intercept	87.025	1	87.025	44.872	0.000
CC	14.603	1	14.603	7.530	0.012
Error	40.727	21	1.939		
Total	145.654	23			
Corrected Total	55.330	22			

a R Squared = .264 (Adjusted R Squared = .229)

Damage to the trees seems to be mainly diameter dependent and next to this, less in the case of an N-cleaning

Table 19: Damage per cleaning-class

Damage class	Cleaning-class N	Cleaning-class H	Total
Non	1895	2022	3917
Hollow or rotten	37	27	64
Broken off	44	24	68
Other damage	125	138	263
Girdled	5	21	26
Total	2106	2232	4338

6. Discussion

The Celos Silvicultural System treatment in Mapane can be classified in the classes “not or lightly cleaned” (N) and “heavily cleaned” (H).
The ingrowth above the measurment-limit of 5 cm (PCQ-inventories) and 25 cm (PSP-inventories) in terms of basal area per ha is considerably (4x) higher in the class “Z” compared to “N”. The Celos Harvesting System with controlled harvest increases this effect even more (7 times higher than the N-treatment without harvest).
The increment in basal area per ha does not seem to differ significantly per treatment, this can be explained by the other mutations in the experimental plots than the originally planned measures, namely logging. The individual diameter increment appeared to be significantly higher in the “H”-class by almost half a millimetre a year. The increase is not very species specific, so the CTS as well as the NCTS groups gain equal profit out of the treatment. Given that the species composition is regulated by the treatments, there is a shift towards more CTS-species. There also were no differences between NCTS and CTS-species for the ingrowth. Since there were no interventions in the class below 25 cm, the composition will again shift to the situation before the treatment on the long term. Continuance cleaning will eventually give a forest with a higher share of CTS-species. This research, however, does not provide a quantitative support, except a strong suggestion.

The inventories are of average quality. After 16 years, it appeared to be very difficult to find the marked trees again. Harvest took also place in the same period, which made it even more difficult. Crucial for this kind of permanent experimental plots (PSP) is the existence of a tree position map and permanent marks on the corner of the subplots. This appeared not to be the case. Another crucial aspect is to determine the classes of change, damage, etc in advance. Peculiar enough all these kind of issues were registered in detail for the inventory protocol. It is unclear whether it was actually used, in any case the information was absent in the original database.

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Appendix I. Frequency division timber species and diameter increment (PCQ + PSP)

Timber species*	CELOS-timber code		total nr	Number observations (n) of id			Average diameter increment (id) in cm/yr			
	Code	Class	obser	all	With 0+L treatment	With M+Z treatment	id (all)	id (0+L)	id (M+Z)	Difference of treatments
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Abrasa			2							
Agrobigi	11350301	CTS	16	7	4	3	1,06	1,30		
Ajawa tingimoni	11120401	CTS	63	29	13	16	0,23	0,24	0,23	-0,02
Ajo ajo	04251001	NCTS	5	2		2				
Alanja oedoe	00353601	NCTS	1	1		1				
Alata oedoe	04480201	NCTS	33	9	5	4	0,38	0,45	0,28	-0,17
Anaura hgl	02540101	NCTS	79	35	23	12	0,21	0,18	0,27	0,09
Anaura lgl	05540308	NCTS	6	3		3				
Anaura zwamp	05540308	NCTS	3							
Apra kwari	00680301	NCTS	1	1		1				
Apra oedoe	04580503	NCTS	6	4	2	2	0,14			
Awara oedoe	05150201	NCTS	9	1	1					
Baboen hgl	11430201	CTS	88	30	10	20	0,32	0,32	0,32	0,00
Baboen lgl	11430201	CTS	1							
Barklak hgl	11430201	CTS	1							
Basralokus	11351601	CTS	98	40	10	30	0,49	0,46	0,50	0,04
Batbati	04040101	NCTS	6	2	2					
Bebe	05353402	NCTS	2							
Bebe hgl	05353402	NCTS	4	3	3					
Bebe lgl	05353402	NCTS	1							
Bergi-bebe	02353603	NCTS	30	12	3	9	0,17		0,21	
Bergi-bita	04040501	NCTS	12	10	4	6	0,39	0,31	0,45	0,14
Bergi-manbarklak	02340404	NCTS	34	18		18	0,22		0,22	
Bitabon	00260201	NCTS	1	1	1					
Blaka oema	05220101	NCTS	36	9	4	5	0,19	0,17	0,21	0,04
Bofroe oedoe	05220101	NCTS	2							
Boromang	05220101	NCTS	7							
Bosamandel	04190303	NCTS	4	1		1				
Bosgujave	00450702	NCTS	8	5	4	1	0,13	0,16		
Boskasjoe	04020103	NCTS	2	1	1					
Boskatoen	04100102	NCTS	23	14	10	4	0,33	0,27	0,47	0,20
Boskers	04450401	NCTS	3							
Bosknippa	04570501	NCTS	16	8	1	7	0,00		-0,01	
Boskoeswe	00090101	NCTS	44	18	14	4	0,11	0,08	0,24	0,16
Boskoffie	00550401	NCTS	22	14	8	6	0,17	0,11	0,24	0,13
Bosmangro	04270701	NCTS	6	3		3				
Bospapaja	04420301	NCTS	111	6	5	1	0,27	0,28		
Boszuurzak	04030101	NCTS	20	12	8	4	0,08	0,04	0,15	0,11
Boszuurzak zwamp	04030101	NCTS	1							
Botro oedoe	04030101	NCTS	4	1		1				
Bradilifi	05500101	NCTS	1	1		1				
Broedoe oedoe	04430103	NCTS	53	21	12	9	0,24	0,22	0,28	0,07
Bruinhart	11354201	CTS	77	47	14	33	0,29	0,22	0,31	0,10
Ceder	11400201	CTS	3	2	2					
Dagoe ati	04251101	NCTS	1	1		1				
Dede oedoe	05550201	NCTS	3	3	2	1				
Djadidja	02353503	NCTS	83	21	14	7	0,41	0,49	0,26	-0,22
Djedoe rode	02353501	NCTS	35	6	4	2	0,80	1,04		
Djedoe w	00353505	NCTS	2							
Djedoe zw	02353504	NCTS	9	5		5	1,15		1,15	
Djindja oedoe	03190101	NCTS	21	14	11	3	0,35	0,39		
Djoe bolletrie	03190101	NCTS	3	1		1				
Doifisiri	04400301	NCTS	6	4	3	1	0,25			
Doifisiri rode	04400301	NCTS	80	39	35	4	0,35	0,35	0,36	0,01

Timber species*	CELOS-timber code		total nr	Number observations (n) of id			Average diameter increment (id) in cm/yr			
	Code	Class	obser	all	With 0+L treatment	With M+Z treatment	id (all)	id (0+L)	id (M+Z)	Difference of treatments
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Doifisiri wb	04400301	NCTS	2							
Doifisiri zw	04400302	NCTS	128	63	27	36	0,14	0,13	0,15	0,02
Ficus	00420401	NCTS	2	1	1					
Foengoe kl.bl.	03540313	NCTS	5	4	1	3	0,41			
Foengoe rode	03540401	NCTS	5	1		1				
Foengoe w	03250701	NCTS	85	36	20	16	0,25	0,25	0,26	0,01
Foengoe zw	03540309	NCTS	6	1		1				
Foengoe zw kl.bl.	03540309	NCTS	1							
Fokofoko oedoe	04640101	NCTS	8	4	3	1	0,26			
Foman	03250401	NCTS	101	46	20	26	0,20	0,17	0,22	0,04
Gandoe	04353607	NCTS	22	10	5	5	0,09	0,08	0,10	0,03
Gandoe zw	04353607	NCTS	1							
Gawetri	04570201	NCTS	16	7	4	3	0,14	0,08		
Gawetri witte	04570201	NCTS	1							
Goebaja	11080101	CTS	65	18	7	11	0,32	0,22	0,38	0,16
Gomhout	04251601	NCTS	29	7	6	1	0,36	0,30		
Granboesi-papaja	04420801	NCTS	138	10	9	1	0,59	0,64		
Granboesi weti oe-doe	04020402	NCTS	32	7	3	4	0,45		0,21	
Groenhart	11080204	CTS	8	4	3	1	0,12			
Gronfolo	11680204	CTS	2							
Gronfolo bergi	11680204	CTS	16	4		4	0,14		0,14	
Gronfolo hgl	11680201	CTS	21	8	4	4	0,27	0,18	0,37	0,20
Gujavekwari	04680203	NCTS	10	3	3					
Hevea	04250801	NCTS	2	2	1	1				
Hoepelhout	04351201	NCTS	5	3	2	1				
IJzerhart	02353905	NCTS	30	12	2	10	0,14		0,16	
Ingipipa	03340201	NCTS	208	89	72	17	0,27	0,23	0,43	0,20
Ingipipa gr.bl.	03340201	NCTS	1	1	1					
Jakanta	00310101	NCTS	37	8	1	7	0,28		0,31	
Jakanta gb	05360101	NCTS	7	3		3				
Jakanta gr.bl.	00310101	NCTS	1							
Jakanta hgl	00310101	NCTS	1							
Jakanta rb	00310101	NCTS	121	54	32	22	0,17	0,11	0,26	0,15
Jakanta wb	03310301	NCTS	25	6	2	4	0,09		0,04	
Jamboka	03580504	NCTS	1							
Jamboka rode	03580504	NCTS	33	12	8	4	0,11	0,11	0,09	-0,02
Jamboka zw	04580501	NCTS	22	5	2	3	0,24			
Jarakopi	00630101	NCTS	16	3	1	2				
Jarijari	00030401	NCTS	82	30	19	11	0,10	0,10	0,10	0,00
Jonge kabbes	04354101	NCTS	11	6	4	2	0,19	0,17		
Kaaiman oedoe	01040201	NCTS	13	3	2	1				
Kabbes gele	04354001	NCTS	1	1	1					
Kabbes rode	11351001	CTS	5	4	3	1	0,27			
Kabbes rode fijnbl.	01350607	NCTS	1	1	1					
Kabbes rode kl.bl.	01350607	NCTS	2	2	1	1				
Kabbes zw	11351801	CTS	3	2	1	1				
Kabbes zw kl.bl.	11351801	CTS	4	2	1	1				
Kandra oedoe	11351801	CTS	1							
Kandratiki	00550801	NCTS	1	1	1					
Kaneri pisi	11330302	CTS	34	11	4	7	0,07	0,09	0,06	-0,03
Kankan oedoe	04640101	NCTS	14	7	6	1	0,14	0,12		
Kankantri	05100301	NCTS	1							
Kasaba oedoe	13060101	CTS	9	2	1	1				
Katoen oedoe	04640201	NCTS	15	7	5	2	0,22	0,21		
Kaw-oedoe	05420101	NCTS	7	6	6		0,57	0,57		
Kimboto	04580506	NCTS	2	2	2					
Kimboto berg	04580506	NCTS	1							

Timber species*	CELOS-timber code		total nr	Number observations (n) of id			Average diameter increment (id) in cm/yr			
	Code	Class	obser	all	With 0+L treatment	With M+Z treatment	id (all)	id (0+L)	id (M+Z)	Difference of treatments
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Kimboto hgl	04580506	NCTS	1	1	1					
Knopo-tafrabon	00110102	NCTS	38	14	8	6	0,10	0,11	0,09	-0,02
Koenatepi	11353201	CTS	6	4	3	1	0,19			
Kokriki	04353004	NCTS	1	1	1					
Kokriki hgl	04353004	NCTS	6	4	2	2	0,22			
Konkoni oedoe	05340502	NCTS	3							
Konkoni oedoe hgl	05340502	NCTS	29	17	8	9	0,08	0,07	0,09	0,03
Kopi	11170101	CTS	36	12	3	9	0,45		0,55	
kototiki	11170101	CTS	3							
Kototiki	00251801	NCTS	34	11	10	1	0,24	0,25		
Krabasi oedoe	04190301	NCTS	4	2	2					
Krapa	11400102	CTS	151	70	39	31	0,45	0,42	0,49	0,07
Kraspisi	00330508	NCTS	27	9	4	5	0,29	0,45	0,17	-0,28
Kromanti kopi	01040201	NCTS	18	4	3	1	0,37			
Kwari rode	00680303	NCTS	1							
Kwasiba	04580513	NCTS	20	7	5	2	0,29	0,26		
Kwaskwasi oedoe	04650101	NCTS	10	2	2					
Kwatabobi	00580201	NCTS	9	4	3	1	0,16			
Kwatakama	04350302	NCTS	3							
Kwatapatoe	11340601	CTS	10	5	2	3	0,78			
Kwepi	04540301	NCTS	3							
Kwepi hb	00540704	NCTS	18	5	1	4	0,15		0,16	
Kwepi rode	00540601	NCTS	13	5	3	2	0,22			
Laksiri hgl	00540601	NCTS	1							
Laurierkers	00581001	NCTS	1							
Leletiki	00670201	NCTS	11	7	2	5	0,11		0,09	
Letterhout	11420701	CTS	22	13	4	9	0,26	0,10	0,34	0,25
Lika oedoe	05370101	NCTS	5	2		2				
Makakabbes	04352401	NCTS	3	2	1	1				
Man-bebe berg	04352401	NCTS	1							
Man-sali	00250501	NCTS	11	3	2	1				
Manaritiki	00670202	NCTS	22	15	2	13	0,09		0,08	
Manbarklak	02340408	NCTS	17	2	1	1				
Manbarklak hgl	02340405	NCTS	608	360	211	149	0,13	0,12	0,14	0,01
Manbebe	00250201	NCTS	3	1		1				
Manbospapaja	04420302	NCTS	137	5	4	1	0,68	0,52		
Mangandoe berg	04420302	NCTS	1							
Manletterhout	01420601	NCTS	123	48	24	24	0,22	0,15	0,28	0,13
Manpikapika	09999999	NCTS	1	1		1				
Manpinja	00270801	NCTS	3	1		1				
Mantakina	00270801	NCTS	1	1	1					
Mapa	03040401	NCTS	1							
Marmadosoe	05550101	NCTS	7	1		1				
Marmadosoe gr.bl.	05550101	NCTS	4	3	2	1				
Marmadosoe kl.	05550101	NCTS	1							
Mataki	11270601	CTS	5	3	3					
Mataki hgl	11270601	CTS	68	29	14	15	0,35	0,31	0,38	0,07
Mataki lgl	11270601	CTS	2	1		1				
Mawsikwari	00680101	NCTS	8	1	1					
Melisali	00400403	NCTS	48	19	10	9	0,12	0,12	0,11	-0,01
Merki oedoe	00400403	NCTS	1							
Merkitiki	00041001	NCTS	69	25	13	12	0,08	0,06	0,10	0,04
Miera oedoe	02500202	NCTS	1							
Mispel	00390101	NCTS	32	2	1	1				
Mispel gr.bl.	00390101	NCTS	1							
Moetene	00390101	NCTS	1							
Nekoe oedoe	04350901	NCTS	25	13	9	4	0,25	0,31	0,12	-0,19
Njamsi oedoe	05460101	NCTS	66	33	26	7	0,05	0,04	0,10	0,05

Timber species*	CELOS-timber code		total nr obser	Number observations (n) of id			Average diameter increment (id) in cm/yr			
	Code	Class		all	With 0+L treatment	With M+Z treatment	id (all)	id (0+L)	id (M+Z)	Difference of treatments
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Njamsi oedoe kl	05460101	NCTS	1							
Oema oedoe	05260102	NCTS	2							
Oemanbarklak	02340403	NCTS	179	116	65	51	0,16	0,14	0,19	0,05
Oemanbarklak hgl	02340403	NCTS	11	5	4	1	0,05	0,05		
Oeproe olie	02340403	NCTS	1							
Okro oedoe	11600101	CTS	60	21	12	9	0,57	0,66	0,47	-0,19
Olie oedoe	00421001	NCTS	27	3	2	1				
Onbekend(unknow)			14	2	1	1				
Pakira tiki	00200101	NCTS	11	3	3					
Pakoeli hgl	01270503	NCTS	14	7	3	4	0,10		0,11	
Pakoeli lgl	11270401	NCTS	1	1	1					
Panga panga	00550901	NCTS	27	7	4	3	0,30	0,48		
Panga panga gr.bl.	00550901	NCTS	1	1	1					
Panga panga hgl	00550901	NCTS	1							
Panga panga kl.bl.	00550901	NCTS	1							
Panta hgl	00250501	NCTS	53	23	14	9	0,15	0,15	0,14	-0,01
Panta lgl	00250501	NCTS	2	1	1					
Panta wb	00250501	NCTS	2							
Parelhout	06040203	NCTS	2							
Parelhout wit	06040203	NCTS	11	5	2	3	0,17			
Parelhout zw	00040202	NCTS	7	2		2				
Pegrekoe-pisi	11030301	CTS	12	3		3				
Pegrekoe-pisi rood	01030302	NCTS	4	1		1				
Pegrekoe-pisi w	11030301	CTS	7	1	1					
Pepre oedoe	04251201	NCTS	1	1		1				
Pera	03040401	NCTS	7	2	1	1				
Pikin-misiki	03350501	NCTS	155	56	45	11	0,54	0,54	0,55	0,02
Pikin kwepi	00540313	NCTS	5	2		2				
Pikintiki	04251101	NCTS	1	1	1					
Pinja oedoe	00270802	NCTS	5							
Pinto-kopi	04260301	NCTS	7	2	1	1				
Pinto-kopi hg	04260301	NCTS	2							
Pintobolletri	00580514	NCTS	3	2		2				
Pintolocus zwarte	00570502	NCTS	30	15	8	7	0,14	0,11	0,17	0,06
Pintolokus witte	00355101	NCTS	22	13	8	5	0,21	0,23	0,17	-0,05
Pintolokus zwarte	00355101	NCTS	13	1	1					
Pintri baboen	01430202	NCTS	8	3	1	2				
Pisi spp.	01430202	NCTS	1							
Pisi witte	11330506	CTS	42	12	7	5	0,38	0,42	0,33	-0,08
Pisi zw	00330403	NCTS	2	2	1	1				
Pisi zw gr.bl.	11330401	CTS	17	9	8	1	0,37	0,38		
Pisi zw kl.bl.	11330503	CTS	22	9	5	4	0,31	0,26	0,39	0,13
Poeroema	04420304	NCTS	101	12	7	5	0,68	0,73	0,60	-0,13
Prasara oedoe	05460102	NCTS	4	2	2					
Prokoni	00350201	NCTS	5	2	2					
Prokoni rode	00350201	NCTS	25	3	3					
Raafnjang	05230101	NCTS	3	2		2				
Ravenjang	00230101	NCTS	40	8	4	4	0,36	0,47	0,24	-0,23
Redi oedoe	05260101	NCTS	6	1		1				
Redi oedoe kl	05260101	NCTS	3	2	1	1				
Riemhout	02560101	NCTS	1							
Riemhout w	11580401	CTS	37	15	10	5	0,28	0,25	0,35	0,11
Riemhout zw	11580402	CTS	65	21	18	3	0,13	0,13		
Rode lokus	11352301	CTS	1							
Sali	11120301	CTS	2	1		1				
Sali hb	11120301	CTS	1							
Sali rode	11120301	CTS	516	276	203	73	0,25	0,24	0,27	0,04
Sali witte	11120207	CTS	1	1	1					

Timber species*	CELOS-timber code		total nr	Number observations (n) of id			Average diameter increment (id) in cm/yr			
	Code	Class	obser	all	With 0+L treatment	With M+Z treatment	id (all)	id (0+L)	id (M+Z)	Difference of treatments
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Santi oedoe	04540310	NCTS	13	5	1	4	0,29		0,29	
Satijnhout	11420201	CTS	1	1		1				
Sawari	05160103	NCTS	2	1		1				
Sawari hgl	05160104	NCTS	16	5	3	2	0,36			
Sinja oedoe	00550301	NCTS	16	5	3	2	0,48			
Soemaroeba	11590401	CTS	17	2		2				
Sokosoko mapa	11590401	CTS	3							
Sopo oedoe	00160101	NCTS	8	2	1	1				
Sopo oedoe hgl	00160101	NCTS	2	1	1					
Sorosali	05400401	NCTS	7	4	3	1	0,12			
Sowtmeti oedoe	04170201	NCTS	6	4	3	1	0,29			
Spikri oedoe	04390201	NCTS	14	8	6	2	0,08	0,09		
Swa oedoe	04390201	NCTS	1							
Swietiboontje	04350202	NCTS	739	116	75	41	0,49	0,45	0,55	0,10
Tabakabron	04250601	NCTS	8							
Tafrabon	00110107	NCTS	2	1	1					
Tafrabon hgl	00110107	NCTS	98	38	17	21	0,17	0,19	0,16	-0,03
Taja oedoe	00670102	NCTS	238	122	66	56	0,06	0,05	0,07	0,02
Takini	00670102	NCTS	2	1		1				
Tamaren-prokoni	03350101	NCTS	6	1	1					
Tamarinde hgl	03350101	NCTS	1							
Tingimoni	02120202	NCTS	1	1		1				
Tingimoni getand	02120101	NCTS	8	1	1					
Tingimoni gr.bl.	11120206	CTS	64	20	12	8	0,10	0,11	0,09	-0,03
Tingimoni hb	11120207	CTS	158	86	55	31	0,24	0,17	0,36	0,19
Tingimoni kl.bl.	02120204	NCTS	38	11	1	10	0,21		0,19	
Tingimoni rb	02120208	NCTS	17	3	2	1				
Tingimoni sali	11120401	CTS	43	20		20	0,23		0,23	
Tite oedoe	11120401	CTS	1							
Tite oedoe gb	04340406	NCTS	41	27	22	5	0,13	0,11	0,19	0,08
Tite oedoe wb	04340407	NCTS	17	8	5	3	0,17	0,05		
Tonka	11351901	CTS	5	5	2	3	0,13			
Walaba	02352101	NCTS	397	204	125	79	0,27	0,24	0,31	0,06
Wana	11330509	CTS	10	5	2	3	0,56			
Wana pisi	11330502	CTS	11	6	2	4	0,38		0,30	
Wanakwari	11680305	CTS	3	1		1				
Watra-bebe	02353401	NCTS	5	2	1	1				
Weti oedoe	02353401	NCTS	3							
Wiswiskwari	11680302	CTS	7	3		3				

Notice to Appendix I:

Column 4: number of observations per species in 1981, 1997, or both; uncorrected for PCQ subsampling.
Column 5: number of paired observations in 1981 and 1997 of which diameter increment could be derived.
Column 6: as column 5, concerning plots with no or light cleaning ("0+L"-ttreatment).
Column 7: as column 5, concerning plots with (middle) heavy cleaning ("M+Z"-treatment).
Column 8-10: average diameter increment in cm/yr based on n observations of respectively column 5-7, presented when $n \geq 4$.
Column 11: difference between column 10 – column 9. NB: the difference for the CTS-species should be positive.

* See Appendix III for the scientific names of the above timber species.

Appendix II. Stem number mutations per tree species and treatment in number per ha for the period 1981 – 1997

			Stem number mutation over time period 1981 - 1997																	
			No or light treatment									(Middle) heavy treatment								
Timber species	Code	TC	1981	Clea	1984*	Harv	Mort	Disa	Ingr	Stat	1997	1981	Clea	1984*	Harv	Mort	Disa	Ingr	Stat	1997
Abrasa		NC	0.00	0.00	0.00	0.00	0.00	0.00	0.69	0.00	0.69	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.09
Agrobigi	11350301	Com	0.42	0.00	0.42	0.00	0.00	-0.08	1.56	0.00	1.89	0.94	0.00	0.94	0.00	0.00	0.00	2.36	0.00	3.30
Ajawa tingimoni	11120401	Com	9.36	0.00	9.36	0.00	-0.69	-0.86	1.39	0.00	9.19	10.48	0.00	10.48	0.00	0.00	-0.36	14.94	-0.76	24.30
Ajo ajo	04251001	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.85	0.00	0.85	0.00	0.00	0.00	2.27	0.00	3.12
Alanja oedoe	00353601	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.76	0.00	0.76	0.00	0.00	0.00	0.09	-0.76	0.09
Alata oedoe	04480201	NC	1.86	-0.25	1.61	0.00	-0.42	-0.78	0.69	0.00	1.11	3.27	-0.73	2.55	0.00	0.00	-0.85	1.03	-0.76	1.97
Anaura hgl	02540101	NC	16.08	0.00	16.08	0.00	-3.28	-3.56	5.11	-1.39	12.97	6.18	-0.82	5.36	0.00	-0.85	-0.18	1.88	0.00	6.21
Anaura lgl	05540308	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.27	0.00	2.27	0.00	0.00	0.00	2.27	0.00	4.55
Anaura zwamp	05540308	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.61	-0.09	1.52	0.00	0.00	-1.52	0.00	0.00	0.00
Apra kwari	00680301	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.76	0.00	0.76	0.00	0.00	0.00	0.00	0.00	0.76
Apra oedoe	04580503	NC	0.78	0.00	0.78	0.00	0.00	0.00	1.39	0.00	2.17	0.85	0.00	0.85	0.00	0.00	0.00	0.00	0.00	0.85
Awara oedoe	05150201	NC	1.56	0.00	1.56	0.00	0.00	-1.47	0.86	0.00	0.94	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.00	0.18
Baboen hgl	11430201	Com	7.25	0.00	7.25	0.00	-0.08	-2.67	4.06	-0.69	7.86	15.18	0.00	15.18	0.00	-0.27	-3.67	9.91	0.00	21.15
Baboen lgl	11430201	Com	0.08	0.00	0.08	0.00	0.00	-0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Barklak hgl	11430201	Com	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.09	0.00	0.00	-0.09	0.00	0.00	0.00
Basralokus	11351601	Com	2.31	0.00	2.31	-0.08	0.00	-0.17	1.03	0.00	3.08	7.21	0.00	7.21	-0.18	-0.45	-1.27	11.39	0.00	16.70
Batbati	04040101	NC	2.08	0.00	2.08	0.00	0.00	-0.69	0.00	0.00	1.39	0.00	0.00	0.00	0.00	0.00	0.00	2.27	0.00	2.27
Bebe	05353402	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.00	0.18
Bebe hgl	05353402	NC	0.86	0.00	0.86	0.00	0.00	0.00	0.00	0.00	0.86	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.09
Bebe lgl	05353402	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bergi-bebe	02353603	NC	1.64	0.00	1.64	0.00	0.00	-1.39	0.00	0.00	0.25	3.73	-0.82	2.91	0.00	0.00	-0.09	2.55	0.00	5.36
Bergi-bita	04040501	NC	0.33	0.00	0.33	0.00	-0.08	0.00	0.17	0.00	0.42	0.55	0.00	0.55	0.00	0.00	0.00	0.00	0.00	0.55
Bergi-manbarklak	02340404	NC	0.08	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.08	9.03	-0.27	8.76	0.00	-0.18	-0.36	2.06	-0.76	9.52
Bitabon	00260201	NC	0.69	0.00	0.69	0.00	0.00	0.00	0.00	0.00	0.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Blaka oema	05220101	NC	3.19	0.00	3.19	0.00	-0.17	-2.17	0.08	0.00	0.94	6.39	-0.55	5.85	0.00	-0.94	-2.45	1.70	0.00	4.15
Bofroe oedoe	05220101	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	-0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boromang	05220101	NC	1.03	0.00	1.03	0.00	-0.25	-0.78	0.00	0.00	0.00	0.18	-0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bosamandel	04190303	NC	0.00	0.00	0.00	0.00	0.00	0.00	1.39	0.00	1.39	0.18	-0.09	0.09	0.00	0.00	0.00	0.00	0.00	0.09
Bosgujave	00450702	NC	2.94	0.00	2.94	0.00	-0.08	-0.08	0.69	0.00	3.47	0.76	0.00	0.76	0.00	0.00	0.00	0.00	0.00	0.76
Boskasjoe	04020103	NC	0.08	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.08	0.09	-0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boskatoen	04100102	NC	3.53	0.00	3.53	0.00	-0.08	-0.08	1.39	0.00	4.75	1.97	-0.27	1.70	0.00	0.00	0.00	0.85	-0.76	1.79
Boskers	04450401	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	-0.09	0.00	0.00	0.00	0.00	0.85	0.00	0.85
Bosknippa	04570501	NC	1.39	0.00	1.39	0.00	0.00	-0.69	1.39	0.00	2.08	5.30	0.00	5.30	0.00	0.00	0.00	3.79	0.00	9.09
Boskoeswe	00090101	NC	7.58	0.00	7.58	0.00	-0.33	-3.03	4.25	0.00	8.47	1.39	-0.27	1.12	0.00	-0.76	0.00	0.94	0.00	1.30

Timber species	Code	TC	Stem number mutation over time period 1981 - 1997																	
			No or light treatment									(Middle) heavy treatment								
			1981	Clea	1984*	Harv	Mort	Disa	Ingr	Stat	1997	1981	Clea	1984*	Harv	Mort	Disa	Ingr	Stat	1997
Boskoffie	00550401	NC	5.11	0.00	5.11	0.00	-0.69	-0.78	0.78	0.00	4.42	4.73	0.00	4.73	0.00	-0.09	-0.09	0.76	0.00	5.30
Bosmangro	04270701	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.03	0.00	3.03	0.00	0.00	-0.76	0.85	0.00	3.12
Bospapaja	04420301	NC	4.39	0.00	4.39	0.00	-0.33	-2.42	9.67	-0.69	10.61	2.82	-0.09	2.73	0.00	-0.76	-1.88	9.27	0.00	9.36
Boszuurzak	04030101	NC	5.56	0.00	5.56	0.00	0.00	0.00	3.47	0.00	9.03	2.45	0.00	2.45	0.00	0.00	-0.09	1.52	0.00	3.88
Boszuurzak zwamp	04030101	NC	0.69	0.00	0.69	0.00	0.00	-0.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Botro oedoe	04030101	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.03	0.00	3.03	0.00	-0.76	-1.52	0.00	0.00	0.76
Bradilifi	05500101	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.09
Broedoe oedoe	04430103	NC	4.31	0.00	4.31	0.00	-0.08	-0.17	2.42	-0.69	5.78	3.24	-0.55	2.70	0.00	-0.09	-0.45	4.91	0.00	7.06
Bruinhart	11354201	Com	1.17	0.00	1.17	-0.08	0.00	0.00	0.17	0.00	1.25	7.94	0.00	7.94	-0.73	-0.64	-0.91	0.94	0.00	6.61
Ceder	11400201	Com	0.17	0.00	0.17	0.00	0.00	0.00	0.08	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dagoe ati	04251101	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.76	0.00	0.76	0.00	0.00	0.00	0.00	0.00	0.76
Dede oedoe	05550201	NC	1.39	0.00	1.39	0.00	0.00	0.00	0.00	0.00	1.39	0.76	0.00	0.76	0.00	0.00	0.00	0.00	0.00	0.76
Djadidja	02353503	NC	4.89	0.00	4.89	0.00	-0.25	-0.86	0.58	0.00	4.36	4.36	-1.00	3.36	0.00	0.00	-1.21	8.45	0.00	10.61
Djedoe rode	02353501	NC	1.81	0.00	1.81	0.00	-0.17	-0.08	0.42	-0.69	1.28	1.58	-0.27	1.30	0.00	0.00	-0.94	3.27	0.00	3.64
Djedoe w	00353505	NC	0.08	0.00	0.08	0.00	-0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.09
Djedoe zw	02353504	NC	0.08	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.08	0.73	-0.18	0.55	0.00	0.00	-0.09	0.00	0.00	0.45
Djindja oedoe	03190101	NC	2.92	0.00	2.92	0.00	0.00	-0.08	0.17	0.00	3.00	1.12	-0.18	0.94	0.00	0.00	0.00	0.09	0.00	1.03
Djoe bolletrie	03190101	NC	0.69	0.00	0.69	0.00	0.00	-0.69	0.00	0.00	0.00	0.18	0.00	0.18	0.00	0.00	-0.09	0.00	0.00	0.09
Doifisiri	04400301	NC	0.25	0.00	0.25	0.00	0.00	-0.08	0.17	0.00	0.33	0.76	0.00	0.76	0.00	0.00	0.00	0.00	0.00	0.76
Doifisiri rode	04400301	NC	9.78	-0.25	9.53	0.00	-0.69	-1.72	8.28	-0.69	14.69	1.03	0.00	1.03	0.00	0.00	0.00	1.88	0.00	2.91
Doifisiri wb	04400301	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.52	0.00	1.52
Doifisiri zw	04400302	NC	23.75	-0.17	23.58	-0.08	-0.86	-4.94	10.06	0.00	27.75	27.73	-0.27	27.45	0.00	0.00	-1.52	19.03	0.00	44.97
Ficus	00420401	NC	0.69	0.00	0.69	0.00	0.00	0.00	0.69	0.00	1.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Foengoe kl.bl.	03540313	NC	0.08	0.00	0.08	0.00	0.00	0.00	0.08	0.00	0.17	0.27	0.00	0.27	0.00	0.00	0.00	0.00	0.00	0.27
Foengoe rode	03540401	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.70	-0.18	1.52	0.00	-0.76	0.00	0.00	0.00	0.76
Foengoe w	03250701	NC	10.97	0.00	10.97	0.00	-0.17	-2.42	3.72	0.00	12.11	9.97	-1.09	8.88	0.00	-0.09	-0.09	11.73	0.00	20.42
Foengoe zw	03540309	NC	0.00	0.00	0.00	0.00	0.00	0.00	1.39	0.00	1.39	0.18	-0.09	0.09	0.00	0.00	0.00	0.85	0.00	0.94
Foengoe zw kl.bl.	03540309	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.76	0.00	0.76	0.00	-0.76	0.00	0.00	0.00	0.00
Fokofoko oedoe	04640101	NC	1.56	0.00	1.56	0.00	0.00	-0.69	0.86	0.00	1.72	0.76	0.00	0.76	0.00	0.00	0.00	0.00	0.00	0.76
Foman	03250401	NC	6.00	0.00	6.00	0.00	-0.42	-0.25	0.00	0.00	5.33	12.21	-3.00	9.21	0.00	-0.09	-0.09	4.42	-0.76	12.70
Gandoe	04353607	NC	2.58	0.00	2.58	0.00	-0.08	-0.69	0.69	0.00	2.50	2.06	-0.18	1.88	0.00	0.00	-0.09	0.36	0.00	2.15
Gandoe zw	04353607	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.09
Gawetri	04570201	NC	2.78	0.00	2.78	0.00	0.00	0.00	3.47	0.00	6.25	3.03	0.00	3.03	0.00	0.00	-0.76	2.27	0.00	4.55
Gawetri witte	04570201	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.76	0.00	0.76

			Stem number mutation over time period 1981 - 1997																
			No or light treatment								(Middle) heavy treatment								
Timber species	**Code**	**TC**	**1981**	**Clea**	**1984***	**Harv**	**Mort**	**Disa**	**Ingr**	**Stat**	**1997**	**1981**	**Clea**	**1984***	**Harv**	**Mort**	**Disa**	**Ingr**	**Stat**	**1997**
Goebaja	11080101	Com	1.86	0.00	1.86	-0.08	-0.08	-0.50	5.64	0.00	6.83	5.45	0.00	5.45	0.00	0.00	-0.45	13.61	0.00	18.61
Gomhout	04251601	NC	5.97	0.00	5.97	0.00	-0.08	-3.56	1.53	-0.69	3.17	0.18	0.00	0.18	0.00	0.00	-0.09	0.36	0.00	0.45
Granboesi-papaja	04420801	NC	14.75	0.00	14.75	0.00	-1.36	-8.11	24.22	-1.39	28.11	5.18	-0.64	4.55	0.00	0.00	-3.79	12.36	0.00	13.12
Granboesi weti oedoe	04020402	NC	0.25	0.00	0.25	0.00	0.00	0.00	5.89	0.00	6.14	1.70	0.00	1.70	0.00	0.00	0.00	6.52	0.00	8.21
Groenhart	11080204	Com	1.11	0.00	1.11	-0.25	0.00	0.00	0.00	0.00	0.86	0.18	0.00	0.18	0.00	0.00	-0.09	0.00	0.00	0.09
Gronfolo	11680204	Com	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.09	-0.09	0.00	0.00	0.76	0.00	0.76
Gronfolo bergi	11680204	Com	0.17	0.00	0.17	-0.08	0.00	-0.08	0.08	0.00	0.08	1.21	0.00	1.21	-0.09	0.00	-0.85	1.30	0.00	1.58
Gronfolo hgl	11680201	Com	2.86	0.00	2.86	-0.08	0.00	0.00	0.17	0.00	2.94	2.73	0.00	2.73	-0.09	0.00	-0.94	3.88	0.00	5.58
Gujavekwari	04680203	NC	1.81	-0.08	1.72	0.00	0.00	-0.86	0.69	0.00	1.56	0.09	-0.09	0.00	0.00	0.00	0.00	0.09	0.00	0.09
Hevea	04250801	NC	0.69	0.00	0.69	0.00	0.00	0.00	0.00	0.00	0.69	0.09	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.09
Hoepelhout	04351201	NC	0.25	0.00	0.25	0.00	0.00	-0.08	0.69	0.00	0.86	0.76	0.00	0.76	0.00	0.00	0.00	0.00	0.00	0.76
IJzerhart	02353905	NC	0.17	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.17	4.58	-0.27	4.30	0.00	-0.55	-1.03	0.45	0.00	3.18
Ingipipa	03340201	NC	30.06	-1.00	29.06	0.00	-1.44	-3.81	9.03	0.00	32.83	13.73	-3.91	9.82	0.00	0.00	-1.61	15.97	-0.76	23.42
Ingipipa gr.bl.	03340201	NC	0.69	0.00	0.69	0.00	0.00	0.00	0.00	0.00	0.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Jakanta	00310101	NC	3.11	0.00	3.11	0.00	-0.86	-1.47	2.25	0.00	3.03	3.09	-0.36	2.73	0.00	0.00	-0.18	3.48	0.00	6.03
Jakanta gb	05360101	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.08	1.03	0.00	1.03	0.00	0.00	-0.09	0.85	0.00	1.79
Jakanta gr.bl.	00310101	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.76	0.00	0.76
Jakanta hgl	00310101	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.76	0.00	0.76
Jakanta rb	00310101	NC	14.33	0.00	14.33	0.00	-0.86	-2.25	3.44	0.00	14.67	15.48	-0.64	14.85	0.00	0.00	-1.61	24.12	0.00	37.36
Jakanta wb	03310301	NC	2.08	0.00	2.08	0.00	0.00	-0.69	0.08	-0.69	0.78	3.03	0.00	3.03	0.00	0.00	0.00	11.64	0.00	14.67
Jamboka	03580504	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.69	0.00	0.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Jamboka rode	03580504	NC	3.11	0.00	3.11	0.00	-0.08	0.00	1.47	0.00	4.50	3.55	-0.82	2.73	0.00	0.00	-1.70	1.52	0.00	2.55
Jamboka zw	04580501	NC	0.42	-0.17	0.25	0.00	0.00	-0.08	0.08	0.00	0.25	2.15	-0.55	1.61	0.00	0.00	0.00	1.88	0.00	3.48
Jarakopi	00630101	NC	1.39	0.00	1.39	0.00	0.00	-0.69	2.08	0.00	2.78	1.52	0.00	1.52	0.00	0.00	0.00	6.82	0.00	8.33
Jarijari	00030401	NC	18.75	0.00	18.75	0.00	-0.69	-4.86	9.72	0.00	22.92	11.36	0.00	11.36	0.00	0.00	-3.03	19.70	0.00	28.03
Jonge kabbes	04354101	NC	0.94	0.00	0.94	0.00	0.00	0.00	0.00	0.00	0.94	1.52	0.00	1.52	0.00	0.00	0.00	3.79	0.00	5.30
Kaaiman oedoe	01040201	NC	0.86	0.00	0.86	0.00	0.00	-0.69	1.28	0.00	1.44	0.76	0.00	0.76	0.00	0.00	0.00	0.09	0.00	0.85
Kabbes gele	04354001	NC	0.69	0.00	0.69	0.00	0.00	0.00	0.00	0.00	0.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kabbes rode	11351001	Com	0.86	0.00	0.86	0.00	0.00	0.00	0.08	0.00	0.94	0.09	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.09
Kabbes rode fijnbl.	01350607	NC	0.08	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kabbes rode kl.bl.	01350607	NC	0.08	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.08	0.09	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.09
Kabbes zw	11351801	Com	0.08	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.08	0.09	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.09
Kabbes zw kl.bl.	11351801	Com	0.08	0.00	0.08	0.00	0.00	0.00	0.69	0.00	0.78	0.09	0.00	0.09	0.00	0.00	0.00	0.76	0.00	0.85
Kandra oedoe	11351801	Com	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.76	0.00	0.76	0.00	0.00	-0.76	0.00	0.00	0.00

Timber species	Code	TC	Stem number mutation over time period 1981 - 1997																	
			No or light treatment									(Middle) heavy treatment								
			1981	Clea	1984*	Harv	Mort	Disa	Ingr	Stat	1997	1981	Clea	1984*	Harv	Mort	Disa	Ingr	Stat	1997
Kandratiki	00550801	NC	0.69	0.00	0.69	0.00	0.00	0.00	0.00	0.00	0.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kaneri pisi	11330302	Com	4.17	0.00	4.17	0.00	0.00	-1.39	2.78	0.00	5.56	7.58	0.00	7.58	0.00	0.00	-2.27	10.61	0.00	15.91
Kankan oedoe	04640101	NC	2.33	0.00	2.33	0.00	0.00	0.00	0.78	-0.69	2.42	0.55	-0.45	0.09	0.00	0.00	0.00	0.09	0.00	0.18
Kankantri	05100301	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.09
Kasaba oedoe	13060101	Com	0.08	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.08	0.36	0.00	0.36	0.00	-0.09	-0.18	2.36	0.00	2.45
Katoen oedoe	04640201	NC	1.81	0.00	1.81	0.00	-0.08	-0.08	0.00	0.00	1.64	0.36	-0.18	0.18	0.00	0.00	0.00	1.03	0.00	1.21
Kaw-oedoe	05420101	NC	1.72	0.00	1.72	0.00	0.00	0.00	0.17	-1.39	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.09
Kimboto	04580506	NC	0.17	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kimboto berg	04580506	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	-0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kimboto hgl	04580506	NC	0.08	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Knopo-tafrabon	00110102	NC	6.25	0.00	6.25	0.00	0.00	-0.69	4.17	0.00	9.72	6.82	0.00	6.82	0.00	-0.76	-1.52	10.61	0.00	15.15
Koenatepi	11353201	Com	0.25	0.00	0.25	0.00	0.00	0.00	0.08	0.00	0.33	0.76	0.00	0.76	0.00	0.00	0.00	0.76	0.00	1.52
Kokriki	04353004	NC	0.08	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kokriki hgl	04353004	NC	0.17	0.00	0.17	0.00	0.00	0.00	0.08	0.00	0.25	0.27	-0.09	0.18	0.00	0.00	0.00	0.00	0.00	0.18
Konkoni oedoe	05340502	NC	0.00	0.00	0.00	0.00	0.00	0.00	1.39	0.00	1.39	0.00	0.00	0.00	0.00	0.00	0.00	0.76	0.00	0.76
Konkoni oedoe hgl	05340502	NC	6.25	0.00	6.25	0.00	0.00	-1.39	4.25	0.00	9.11	7.58	0.00	7.58	0.00	0.00	-0.76	2.27	0.00	9.09
Kopi	11170101	Com	1.19	0.00	1.19	-0.08	0.00	-0.69	0.25	0.00	0.67	1.76	0.00	1.76	-0.18	0.00	-0.18	8.61	0.00	10.00
kototiki	11170101	Com	0.25	0.00	0.25	0.00	0.00	-0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kototiki	00251801	NC	9.11	0.00	9.11	0.00	-0.08	-2.78	7.81	0.00	14.06	2.36	-0.09	2.27	0.00	0.00	-1.52	1.61	0.00	2.36
Krabasi oedoe	04190301	NC	0.25	-0.08	0.17	0.00	0.00	0.00	0.00	0.00	0.17	0.09	-0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Krapa	11400102	Com	13.22	0.00	13.22	-0.33	-0.94	-1.44	3.86	-1.39	12.97	12.79	0.00	12.79	-0.18	-1.67	-2.79	7.15	-1.52	13.79
Kraspisi	00330508	NC	2.17	0.00	2.17	0.00	0.00	0.00	1.39	0.00	3.56	4.06	0.00	4.06	0.00	-0.76	-0.85	6.42	0.00	8.88
Kromanti kopi	01040201	NC	0.25	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.25	0.94	-0.09	0.85	0.00	0.00	-0.09	5.09	0.00	5.85
Kwari rode	00680303	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.76	0.00	0.76
Kwasiba	04580513	NC	0.50	0.00	0.50	0.00	0.00	-0.08	0.00	0.00	0.42	1.27	-0.91	0.36	0.00	0.00	-0.18	0.00	0.00	0.18
Kwaskwasi oedoe	04650101	NC	1.03	-0.08	0.94	0.00	0.00	-0.78	0.86	0.00	1.03	0.76	0.00	0.76	0.00	0.00	-0.76	0.09	0.00	0.09
Kwatabobi	00580201	NC	2.08	0.00	2.08	0.00	0.00	0.00	1.39	0.00	3.47	0.76	0.00	0.76	0.00	0.00	0.00	2.27	0.00	3.03
Kwatakama	04350302	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.69	0.00	0.69	0.18	-0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kwatapatoe	11340601	Com	0.78	0.00	0.78	0.00	0.00	0.00	0.00	0.00	0.78	0.73	0.00	0.73	0.00	-0.09	-0.36	0.00	0.00	0.27
Kwepi	04540301	NC	0.08	0.00	0.08	0.00	0.00	-0.08	0.69	0.00	0.69	0.09	-0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kwepi hb	00540704	NC	0.08	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.08	2.03	-0.82	1.21	0.00	-0.76	-0.09	0.18	0.00	0.55
Kwepi rode	00540601	NC	2.25	0.00	2.25	0.00	-0.08	-0.08	0.69	0.00	2.78	1.12	-0.27	0.85	0.00	0.00	0.00	0.85	-0.76	0.94
Laksiri hgl	00540601	NC	0.08	-0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Laurierkers	00581001	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.09	0.00	0.00	-0.09	0.00	0.00	0.00

Timber species	Code	TC	Stem number mutation over time period 1981 - 1997																
			No or light treatment									(Middle) heavy treatment							
			1981	Clea	1984*	Harv	Mort	Disa	Ingr	Stat	1997	1981	Clea	1984*	Harv	Mort	Disa	Ingr	Stat	1997
Leletiki	00670201	NC	1.39	0.00	1.39	0.00	0.00	0.00	1.39	0.00	2.78	3.79	0.00	3.79	0.00	0.00	0.00	1.52	0.00	5.30
Letterhout	11420701	Com	2.25	0.00	2.25	-0.08	0.00	-0.08	0.17	0.00	2.25	4.33	0.00	4.33	0.00	0.00	-1.52	2.36	0.00	5.18
Lika oedoe	05370101	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.08	0.27	-0.09	0.18	0.00	0.00	0.00	0.76	0.00	0.94
Makakabbes	04352401	NC	0.78	0.00	0.78	0.00	0.00	-0.08	0.00	0.00	0.69	0.76	0.00	0.76	0.00	0.00	0.00	0.00	0.00	0.76
Man-bebe berg	04352401	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	-0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Man-sali	00250501	NC	0.17	0.00	0.17	0.00	0.00	0.00	0.69	0.00	0.86	0.76	0.00	0.76	0.00	0.00	0.00	4.64	0.00	5.39
Manaritiki	00670202	NC	2.78	0.00	2.78	0.00	-0.69	-0.69	0.69	0.00	2.08	10.61	0.00	10.61	0.00	-0.76	0.00	2.27	0.00	12.12
Manbarklak	02340408	NC	0.92	0.00	0.92	-0.17	-0.25	-0.42	0.00	0.00	0.08	0.09	0.00	0.09	0.00	0.00	0.00	1.70	0.00	1.79
Manbarklak hgl	02340405	NC	89.69	0.00	89.69	0.00	-6.47	-7.17	24.08	-2.08	98.06	76.61	-4.09	72.52	0.00	-1.30	-7.42	36.73	-3.79	96.73
Manbebe	00250201	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.85	-0.09	0.76	0.00	0.00	-0.76	0.09	0.00	0.09
Manbospapaja	04420302	NC	8.25	0.00	8.25	0.00	-1.97	-5.86	12.94	0.00	13.36	3.58	-0.36	3.21	0.00	-1.52	-1.61	10.33	0.00	10.42
Manletterhout	01420601	NC	19.33	0.00	19.33	0.00	-0.78	-4.94	12.83	0.00	26.44	13.09	-0.27	12.82	0.00	-0.94	-3.79	16.82	0.00	24.91
Manpikapika	09999999	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.76	0.00	0.76	0.00	0.00	0.00	0.00	0.00	0.76
Manpinja	00270801	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.85	0.00	0.85	0.00	0.00	-0.09	0.76	0.00	1.52
Mantakina	00270801	NC	0.08	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mapa	03040401	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.09
Marmadosoe	05550101	NC	0.00	0.00	0.00	0.00	0.00	0.00	1.39	0.00	1.39	1.79	-0.09	1.70	0.00	-0.09	-0.85	0.00	0.00	0.76
Marmadosoe gr.bl.	05550101	NC	1.39	0.00	1.39	0.00	0.00	0.00	0.69	0.00	2.08	0.76	0.00	0.76	0.00	0.00	0.00	0.00	0.00	0.76
Marmadosoe kl.	05550101	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.76	0.00	0.76
Mataki	11270601	Com	0.94	0.00	0.94	0.00	-0.08	0.00	0.00	0.00	0.86	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.09
Mataki hgl	11270601	Com	8.81	0.00	8.81	-0.08	-1.03	-2.33	0.25	-0.69	4.92	8.94	0.00	8.94	0.00	-0.94	-1.97	5.45	-0.76	10.73
Mataki lgl	11270601	Com	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.09	0.00	0.00	0.00	0.09	0.00	0.18
Mawsikwari	00680101	NC	0.42	-0.08	0.33	-0.08	-0.08	0.00	0.00	0.00	0.17	0.27	-0.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Melisali	00400403	NC	7.64	0.00	7.64	0.00	-0.69	0.00	5.64	0.00	12.58	9.85	0.00	9.85	0.00	0.00	-3.03	11.36	0.00	18.18
Merkitiki	00041001	NC	13.89	0.00	13.89	0.00	0.00	-4.86	11.81	0.00	20.83	13.64	0.00	13.64	0.00	0.00	-4.55	10.61	0.00	19.70
Miera oedoe	02500202	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.69	0.00	0.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mispel	00390101	NC	5.56	0.00	5.56	0.00	-0.69	-4.17	1.03	0.00	1.72	0.94	-0.09	0.85	0.00	0.00	-0.09	6.12	0.00	6.88
Mispel gr.bl.	00390101	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.76	0.00	0.76
Moetene	00390101	NC	0.08	0.00	0.08	0.00	-0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nekoe oedoe	04350901	NC	3.72	0.00	3.72	0.00	0.00	0.00	4.33	0.00	8.06	3.12	-0.09	3.03	0.00	0.00	0.00	1.70	0.00	4.73
Njamsi oedoe	05460101	NC	20.83	0.00	20.83	0.00	-0.69	-2.08	9.81	0.00	27.86	8.33	0.00	8.33	0.00	0.00	-3.03	7.58	0.00	12.88
Njamsi oedoe kl	05460101	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.76	0.00	0.76	0.00	0.00	-0.76	0.00	0.00	0.00
Oema oedoe	05260102	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.76	0.00	0.76	0.00	-0.76	0.00	0.76	0.00	0.76
Oemanbarklak	02340403	NC	19.69	0.00	19.69	0.00	-0.25	-3.28	6.19	-2.08	20.28	21.27	-0.45	20.82	0.00	-0.09	-1.61	11.03	0.00	30.15

Timber species	Code	TC	Stem number mutation over time period 1981 - 1997																	
			No or light treatment									(Middle) heavy treatment								
			1981	Clea	1984*	Harv	Mort	Disa	Ingr	Stat	1997	1981	Clea	1984*	Harv	Mort	Disa	Ingr	Stat	1997
Oemanbarklak hgl	02340403	NC	0.42	0.00	0.42	0.00	0.00	-0.08	0.08	0.00	0.42	0.18	-0.18	0.00	0.00	0.00	0.00	0.18	0.00	0.18
Oeproe olie	02340403	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	-0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Okro oedoe	11600101	Com	4.14	0.00	4.14	0.00	0.00	-0.69	5.64	0.00	9.08	3.58	0.00	3.58	0.00	0.00	-0.09	15.21	0.00	18.70
Olie oedoe	00421001	NC	4.14	-0.08	4.06	-0.08	-1.64	-0.94	0.00	0.00	1.39	2.61	-1.00	1.61	0.00	0.00	-1.52	0.00	0.00	0.09
Onbekend	99999999	NC	0.69	0.00	0.69	0.00	0.00	0.00	3.72	0.00	4.42	1.52	0.00	1.52	0.00	0.00	-0.76	1.61	0.00	2.36
Pakira tiki	00200101	NC	2.08	0.00	2.08	0.00	0.00	0.00	0.69	0.00	2.78	0.76	0.00	0.76	0.00	-0.76	0.00	4.55	0.00	4.55
Pakoeli hgl	01270503	NC	2.86	0.00	2.86	0.00	0.00	-1.39	0.78	0.00	2.25	3.79	0.00	3.79	0.00	0.00	-0.76	1.52	0.00	4.55
Pakoeli lgl	11270401	Com	0.08	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Panga panga	00550901	NC	5.56	0.00	5.56	0.00	-0.69	-2.08	0.78	0.00	3.56	3.03	0.00	3.03	0.00	-0.76	0.00	9.18	0.00	11.45
Panga panga gr.bl.	00550901	NC	0.69	0.00	0.69	0.00	0.00	0.00	0.00	0.00	0.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Panga panga hgl	00550901	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.09
Panga panga kl.bl.	00550901	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.09	0.00	0.00	-0.09	0.00	0.00	0.00
Panta hgl	00250501	NC	8.67	0.00	8.67	0.00	-0.69	-1.39	3.11	0.00	9.69	7.00	0.00	7.00	0.00	0.00	-0.18	10.79	0.00	17.61
Panta lgl	00250501	NC	0.08	0.00	0.08	0.00	0.00	0.00	0.08	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Panta wb	00250501	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.52	0.00	1.52
Parelhout	06040203	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Parelhout wit	06040203	NC	1.39	0.00	1.39	0.00	0.00	0.00	0.08	0.00	1.47	2.45	-0.09	2.36	0.00	0.00	-0.76	2.27	0.00	3.88
Parelhout zw	00040202	NC	0.08	-0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.94	0.00	0.94	0.00	0.00	-0.76	1.61	0.00	1.79
Pegrekoe-pisi	11030301	Com	0.69	0.00	0.69	0.00	0.00	-0.69	0.00	0.00	0.00	1.61	0.00	1.61	0.00	0.00	0.00	3.39	0.00	5.00
Pegrekoe-pisi rood	01030302	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.69	0.00	0.69	0.00	0.00	0.00	0.00	0.00	0.00	0.27	0.00	0.27
Pegrekoe-pisi w	11030301	Com	0.08	0.00	0.08	0.00	0.00	0.00	0.94	0.00	1.03	0.00	0.00	0.00	0.00	0.00	0.00	1.52	0.00	1.52
Pepre oedoe	04251201	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.09
Pera	03040401	NC	0.17	0.00	0.17	0.00	0.00	-0.08	1.47	0.00	1.56	0.09	0.00	0.09	0.00	0.00	0.00	0.76	0.00	0.85
Pikin-misiki	03350501	NC	7.25	-0.50	6.75	0.00	-0.67	-0.25	7.56	-1.39	12.00	6.39	-2.36	4.03	0.00	0.00	-0.18	7.73	-0.76	10.82
Pikin kwepi	00540313	NC	0.00	0.00	0.00	0.00	0.00	0.00	1.39	0.00	1.39	0.85	0.00	0.85	0.00	0.00	0.00	0.76	0.00	1.61
Pikinmisiki	00540313	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.76	0.00	0.76	0.00	-0.76	0.00	0.00	0.00	0.00
Pikintiki	04251101	NC	0.08	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pinja oedoe	00270802	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	-0.09	0.00	0.00	0.00	0.00	0.36	0.00	0.36
Pinto-kopi	04260301	NC	0.25	0.00	0.25	0.00	0.00	-0.08	0.00	0.00	0.17	0.27	-0.18	0.09	0.00	0.00	0.00	0.09	0.00	0.18
Pinto-kopi hg	04260301	NC	0.08	0.00	0.08	0.00	0.00	-0.08	0.00	0.00	0.00	0.76	0.00	0.76	0.00	-0.76	0.00	0.00	0.00	0.00
Pintobolletri	00580514	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.27	-0.09	0.18	0.00	0.00	0.00	0.00	0.00	0.18
Pintolocus zwarte	00570502	NC	4.86	0.00	4.86	0.00	0.00	0.00	2.86	0.00	7.72	5.30	0.00	5.30	0.00	0.00	0.00	7.67	0.00	12.97
Pintolokus witte	00355101	NC	3.19	-0.08	3.11	0.00	0.00	0.00	0.94	0.00	4.06	3.30	-0.09	3.21	0.00	0.00	-0.76	1.52	0.00	3.97
Pintolokus zwarte	00355101	NC	2.94	0.00	2.94	0.00	-1.47	-1.39	0.00	0.00	0.08	1.88	-0.27	1.61	0.00	0.00	-1.61	0.00	0.00	0.00

Timber species	Code	TC	Stem number mutation over time period 1981 - 1997																
			No or light treatment									(Middle) heavy treatment							
			1981	Clea	1984*	Harv	Mort	Disa	Ingr	Stat	1997	1981	Clea	1984*	Harv	Mort	Disa	Ingr	Stat	1997
Pintri baboen	01430202	NC	1.39	0.00	1.39	0.00	-0.69	0.00	0.08	0.00	0.78	0.27	0.00	0.27	0.00	0.00	-0.09	0.18	0.00	0.36
Pisi spp.	01430202	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.09
Pisi witte	11330506	Com	4.31	0.00	4.31	-0.08	-0.17	-0.94	1.72	-0.69	4.14	1.48	0.00	1.48	0.00	-0.18	-0.18	5.67	0.00	6.79
Pisi zw	00330403	NC	0.69	0.00	0.69	0.00	0.00	0.00	0.08	-0.69	0.08	0.76	0.00	0.76	0.00	0.00	0.00	0.00	0.00	0.76
Pisi zw gr.bl.	11330401	Com	2.83	0.00	2.83	-0.08	-0.78	-0.08	0.08	0.00	1.97	0.18	0.00	0.18	0.00	-0.09	0.00	1.52	0.00	1.61
Pisi zw kl.bl.	11330503	Com	3.72	0.00	3.72	0.00	-0.17	-0.69	1.56	0.00	4.42	1.88	0.00	1.88	0.00	-0.18	0.00	2.36	0.00	4.06
Poeroema	04420304	NC	7.11	0.00	7.11	0.00	0.00	-3.47	7.00	-1.39	9.25	4.15	-0.09	4.06	0.00	-0.76	-0.85	9.91	-0.76	11.61
Prasara oedoe	05460102	NC	0.86	0.00	0.86	0.00	-0.69	0.00	0.00	0.00	0.17	0.09	-0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Prokoni	00350201	NC	0.17	0.00	0.17	0.00	0.00	0.00	0.25	0.00	0.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Prokoni rode	00350201	NC	1.17	-0.25	0.92	0.00	-0.33	-0.33	0.00	0.00	0.25	0.45	-0.36	0.09	0.00	0.00	-0.09	0.55	0.00	0.55
Raafnjang	05230101	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.85	0.00	0.85	0.00	0.00	0.00	0.09	0.00	0.94
Ravenjang	00230101	NC	3.58	0.00	3.58	-0.08	-0.42	-0.92	2.78	0.00	4.94	2.61	-0.82	1.79	0.00	0.00	-0.85	0.09	0.00	1.03
Redi oedoe	05260101	NC	0.69	0.00	0.69	0.00	0.00	-0.69	0.78	0.00	0.78	0.76	0.00	0.76	0.00	0.00	0.00	1.52	0.00	2.27
Redi oedoe kl	05260101	NC	0.69	0.00	0.69	0.00	0.00	0.00	0.69	0.00	1.39	0.76	0.00	0.76	0.00	0.00	0.00	0.00	0.00	0.76
Riemhout	02560101	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	-0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Riemhout w	11580401	Com	4.06	0.00	4.06	0.00	-0.08	-1.39	0.25	0.00	2.83	3.00	0.00	3.00	0.00	0.00	-1.88	2.24	0.00	3.36
Riemhout zw	11580402	Com	8.89	0.00	8.89	0.00	-0.86	-1.64	3.72	0.00	10.11	4.30	0.00	4.30	0.00	-0.94	-2.42	6.52	0.00	7.45
Rode lokus	11352301	Com	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sali	11120301	Com	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.09	0.00	0.00	0.00	0.09	0.00	0.18
Sali hb	11120301	Com	0.08	0.00	0.08	0.00	0.00	-0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sali rode	11120301	Com	75.19	0.00	75.19	-0.42	-2.22	-16.25	19.22	-2.08	73.44	37.12	0.00	37.12	-0.09	-4.88	-11.51	18.03	-0.76	37.91
Sali witte	11120207	Com	0.69	0.00	0.69	0.00	0.00	0.00	0.00	0.00	0.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Santi oedoe	04540310	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.17	1.00	-0.36	0.64	0.00	-0.09	-0.18	0.00	0.00	0.36
Satijnhout	11420201	Com	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.09
Sawari	05160103	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.09	0.00	0.00	0.00	0.76	0.00	0.85
Sawari hgl	05160104	NC	0.86	0.00	0.86	0.00	0.00	-0.69	0.08	0.00	0.25	1.39	-0.45	0.94	0.00	0.00	-0.18	0.36	0.00	1.12
Sinja oedoe	00550301	NC	0.25	0.00	0.25	0.00	0.00	0.00	0.08	0.00	0.33	0.64	-0.45	0.18	0.00	0.00	0.00	2.45	0.00	2.64
Soemaroeba	11590401	Com	0.33	0.00	0.33	-0.08	0.00	-0.17	1.03	0.00	1.11	1.79	0.00	1.79	0.00	0.00	-0.27	0.94	0.00	2.45
Sokosoko mapa	11590401	Com	0.69	0.00	0.69	0.00	0.00	-0.69	0.00	0.00	0.00	0.18	0.00	0.18	0.00	0.00	-0.18	0.00	0.00	0.00
Sopo oedoe	00160101	NC	0.33	-0.17	0.17	0.00	0.00	-0.08	0.00	0.00	0.08	0.27	-0.09	0.18	0.00	0.00	-0.09	0.09	0.00	0.18
Sopo oedoe hgl	00160101	NC	0.08	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.08	0.09	-0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sorosali	05400401	NC	1.03	0.00	1.03	0.00	0.00	-0.17	0.08	0.00	0.94	0.76	0.00	0.76	0.00	0.00	0.00	0.00	0.00	0.76
Sowtmeti oedoe	04170201	NC	1.03	0.00	1.03	0.00	-0.08	-0.69	0.00	0.00	0.25	0.76	0.00	0.76	0.00	0.00	0.00	0.00	0.00	0.76
Spikri oedoe	04390201	NC	1.72	0.00	1.72	0.00	0.00	0.00	0.00	0.00	1.72	1.79	-0.09	1.70	0.00	0.00	-0.18	2.27	0.00	3.79

Timber species	Code	TC	Stem number mutation over time period 1981 - 1997																
			No or light treatment									(Middle) heavy treatment							
			1981	Clea	1984*	Harv	Mort	Disa	Ingr	Stat	1997	1981	Clea	1984*	Harv	Mort	Disa	Ingr	Stat	1997
Swa oedoe	04390201	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	-0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Swietiboontje	04350202	NC	62.08	-0.25	61.83	0.00	-9.56	-22.89	73.06	-4.17	98.28	37.64	-1.36	36.27	0.00	-3.97	-7.91	126.85	-4.55	146.70
Tabakabron	04250601	NC	0.33	0.00	0.33	0.00	-0.08	-0.25	0.78	0.00	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.00	0.18
Tafrabon	00110107	NC	0.08	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.08	0.76	0.00	0.76	0.00	0.00	-0.76	0.00	0.00	0.00
Tafrabon hgl	00110107	NC	14.56	0.00	14.56	0.00	-0.69	-4.50	8.42	0.00	17.78	21.58	-0.27	21.30	0.00	0.00	-6.06	17.52	0.00	32.76
Taja oedoe	00670102	NC	65.97	0.00	65.97	0.00	-3.47	-16.67	23.61	0.00	69.44	50.00	0.00	50.00	0.00	-2.27	-5.30	32.58	0.00	75.00
Takini	00670102	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.85	0.00	0.85	0.00	0.00	-0.76	0.00	0.00	0.09
Tamaren-prokoni	03350101	NC	0.17	-0.08	0.08	0.00	0.00	0.00	0.00	0.00	0.08	0.36	-0.27	0.09	0.00	0.00	-0.09	0.00	0.00	0.00
Tamarinde hgl	03350101	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.76	0.00	0.76
Tingimoni	02120202	NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.76	0.00	0.76	0.00	0.00	0.00	0.00	0.00	0.76
Tingimoni getand	02120101	NC	1.39	0.00	1.39	0.00	0.00	-0.69	0.00	0.00	0.69	3.03	0.00	3.03	0.00	-0.76	-2.27	1.52	0.00	1.52
Tingimoni gr.bl.	11120206	Com	9.97	0.00	9.97	0.00	-0.78	-2.25	9.44	0.00	16.39	7.00	0.00	7.00	0.00	-0.09	-1.52	12.30	0.00	17.70
Tingimoni hb	11120207	Com	20.67	0.00	20.67	0.00	-1.36	-3.19	5.11	0.00	21.22	12.36	0.00	12.36	0.00	-0.55	-1.67	11.39	-1.52	20.03
Tingimoni kl.bl.	02120204	NC	2.17	0.00	2.17	0.00	-0.69	-0.78	1.47	0.00	2.17	15.91	0.00	15.91	0.00	-3.03	-6.06	6.24	0.00	13.06
Tingimoni rb	02120208	NC	3.03	0.00	3.03	0.00	-1.39	-0.86	0.69	0.00	1.47	2.15	-0.36	1.79	0.00	-0.09	-0.94	0.00	0.00	0.76
Tingimoni sali	11120401	Com	0.78	0.00	0.78	0.00	-0.69	-0.08	0.08	0.00	0.08	12.36	0.00	12.36	0.00	-1.70	-0.36	7.94	0.00	18.24
Tite oedoe	11120401	Com	0.08	0.00	0.08	0.00	-0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tite oedoe gb	04340406	NC	10.39	0.00	10.39	0.00	-0.08	0.00	1.03	-0.69	10.64	5.85	-0.45	5.39	0.00	-0.76	-1.52	0.18	0.00	3.30
Tite oedoe wb	04340407	NC	2.25	0.00	2.25	0.00	0.00	0.00	0.69	0.00	2.94	1.30	-0.45	0.85	0.00	0.00	0.00	1.12	-0.76	1.21
Tonka	11351901	Com	0.17	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.17	1.61	0.00	1.61	0.00	0.00	0.00	0.00	0.00	1.61
Walaba	02352101	NC	30.17	-0.33	29.83	-0.08	-1.53	-2.42	4.19	-2.08	27.92	37.00	-8.73	28.27	0.00	-2.15	-0.91	10.82	-2.27	33.76
Wana	11330509	Com	0.25	0.00	0.25	0.00	-0.08	0.00	0.08	0.00	0.25	1.03	0.00	1.03	0.00	0.00	-0.09	0.18	0.00	1.12
Wana pisi	11330502	Com	0.78	0.00	0.78	0.00	0.00	0.00	0.00	0.00	0.78	2.45	0.00	2.45	0.00	0.00	0.00	1.79	-0.76	3.48
Wanakwari	11680305	Com	0.00	0.00	0.00	0.00	0.00	0.00	0.69	0.00	0.69	0.09	0.00	0.09	0.00	0.00	0.00	0.76	0.00	0.85
Watra-bebe	02353401	NC	0.08	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.08	0.27	-0.18	0.09	0.00	0.00	0.00	0.09	0.00	0.18
Weti oedoe	02353401	NC	0.17	0.00	0.17	0.00	-0.17	0.00	0.00	0.00	0.00	0.09	0.00	0.09	0.00	0.00	-0.09	0.00	0.00	0.00
Wiswiskwari	11680302	Com	0.08	0.00	0.08	0.00	-0.08	0.00	0.00	0.00	0.00	1.03	0.00	1.03	0.00	0.00	-0.09	1.52	0.00	2.45
Totaal			929	-4	925	-3	-62	-201	469	-29	1099	829	-48	782	-2	-44	-143	824	-24	1393

Explanation abbreviations

TC Timber class (Commercial and non-commercial)
Clea Cleaning
Harv Harvest
Mort Mortality
Disa Disappeared
Ingr Ingrowth
Stat Statistical mutation

Appendix III. Species list with vernacular name and scientific name

Vernacular name	Scientific name	Source*
Abrasa	*Clusia grandiflora*	Den Outer (2001)
Agrobigi	*Parkia nitida*	Jonkers (2005), FAO
Ajawa tingimoni	*Trattinickia burserifolia; T. rhoifolia; Hemicrepidospermum rhoifolium*	Jonkers (2005), FAO, Den Outer (2001)
Ajo ajo	*Hyeronima laxiflora; H. alchoneoides*	Jonkers (2005), Den Outer (2001)
Alanja oedoe	*Swartzia arborescens*	Jonkers (2005), Den Outer (2001)
Alata oedoe	*Minquartia guianensis*	Jonkers (2005), Den Outer (2001)
Anaura hgl	*Licania hostmanni*	FAO, Den Outer (2001)
Anaura lgl	*Licania macrophylla*	Jonkers (pers. communication)
Anaura zwamp	*Licania heteromorpha*	Jonkers (pers. communication)
Apra kwari	*Vochysia densiflora*	FAO, Den Outer (2001)
Apra oedoe	*Pouteria gonggrijpii; P. sagotiana; Eremoluma sagotiana*	Jonkers (2005), Den Outer (2001)
Awara oedoe	*Jacaratia spinosa*	Jonkers (2005), Den Outer (2001)
Baboen hgl	*Virola michelli, V. melinonii, sebifera*	Jonkers (2005), FAO, Den Outer (2001)
Baboen lgl	*Virola surinamensis*	Jonkers (2005), FAO
Barklak hgl	*Probably: Eschweilera odora*	Jonkers (pers. communication)
Basralokus	*Dicorynia guianensis*	Jonkers (2005), FAO
Batbati	*Ambelania acida; A. sagotii*	Jonkers (2005), Den Outer (2001)
Bebe	*Pterocarpus officinalis*	DeFilipps et al., Den Outer (2001)
Bebe hgl	*Pterocarpus rohrii*	Jonkers (2005), Den Outer (2001)
Bebe lgl	*Pterocarpus sp.*	
Bergi-bebe	*Swartzia benthamiana*	Jonkers (2005), FAO, Den Outer (2001)
Bergi-bita	*Geissospermum sericeum*	Jonkers (2005), Den Outer (2001)
Bergi-manbarklak	*Eschweilera longipes; E.pedicellata*	Jonkers (2005), FAO, Den Outer (2001)
Bitabon	*unknown*	
Blaka oema	*Diospyrus guianensis; D. akaraiensis; D. melinonii; Cordia macrostachya*	Jonkers (2005), Den Outer (2001)
Bofroe oedoe	*Sacoglottis guianensis, S. cyonioides*	Jonkers (2005), FAO, Den Outer (2001)
Boromang	*(Boroma) Cecropia peltata*	Jonkers (2005)
Bosamandel	*Terminalia dichotoma; T. lucida*	Jonkers (2005), Den Outer (2001)
Bosgujave	*Calycorectes bergii*	Jonkers (2005)
Boskasjoe	*Anacardium spruceanum; A. giganteum; A. occidentalis*	Jonkers (2005), Den Outer (2001)
Boskatoen	*Bombax crassum; B. globosum; B. nervosum; B. surinamensis; Thespesia populnea*	Jonkers (2005), Den Outer (2001)
Boskers	*Eugenia coffeifolia; E. patrisii*	Jonkers (2005), Den Outer (2001)
Bosknippa	*Talisia pedicullaris; T. megaphylla*	Jonkers (2005); Den Outer (2001)
Boskoeswe	*Bixa orellana*	Jonkers (2005)
Boskoffie	*Coussarea paniculata; Casearia pitumba; C. macrophylla; C. auratum*	Jonkers (2005), Den Outer (2001)
Bosmangro	*Tovomita choisyana; T. grata; T. secunda; T. schomburgkii*	Jonkers (2005), Den Outer (2001)
Bospapaja	*Cecropia obtusa; C. palmata; C. surinamensis*	Jonkers (2005), Den Outer (2001)
Boszuurzak	*Annona montana; A. hypoglauca; Duguetia calycina; D. pycnastera*	Jonkers (2005), Den Outer (2001)
Boszuurzak zwamp	*Annona glabra*	Den Outer (2001)
Botro oedoe	*Gustavia hexapetala*	Den Outer (2001)
Bradilifi	*Coccoloba latifolia; C. moliis*	Jonkers (2005), Den Outer (2001)
Broedoe oedoe	*Iryanthera sagotiana; I. hostmanni; Couepia guianensis*	Jonkers (2005), Den Outer (2001)
Bruinhart	*Vouacapoua americana*	FAO, Den Outer (2001)
Ceder	*Cedrela odorata; C. guianensis*	Jonkers (2005), FAO, Den Outer (2001)
Dagoe ati	*unknown*	
Dede oedoe	*Capirona surinamensis*	Jonkers (2005), Den Outer (2001)
Djadidja	*Sclerolobium melinonii*	Jonkers (2005), FAO
Djedoe rode	*Sclerolobium albiflorum*	Jonkers (2005), FAO, Den Outer (2001)
Djedoe w	*Sclerolobium paniculatom; S. guianense*	Jonkers (2005), Den Outer (2001)
Djedoe zw	*Sclerolobium micropetalum*	Jonkers (2005), Den Outer (2001)

Vernacular name	Scientific name	Source*
Djindja oedoe	*Buchenavia capitata; Terminalia amazonia*	FAO, Den Outer (2001)
Djoe bolletrie	*Chrysophyllum pomiferum; C. prieuril; Ecclinusa prieurii*	Jonkers (2005), Den Outer (2001)
Doifisiri	*Guarea guarea; G. guidonia; G. trichilioides*	Jonkers (2005), Den Outer (2001)
Doifisiri rode	*Guarea guarea*	Jonkers (pers. communication)
Doifisiri wb	*Guerea sp.*	Jonkers (pers. communication)
Doifisiri zw	*Guarea kunthiana*	Jonkers (2005)
Ficus	*Ficus spp.*	DeFilipps et al
Foengoe kl.bl.	*Licania hupoleuca*	FAO
Foengoe rode	*Parinari campestris*	Jonkers (2005), FAO
Foengoe w	*Licania eliptica; Drypetes variabilis*	FAO, Den Outer (2001)
Foengoe zw	*Licania micrantha*	Jonkers (2005), Den Outer (2001)
Foengoe zw kl.bl.	*Licania stricta*	Jonkers (2005)
Fokofoko oedoe	*Apeiba tibourbou*	Jonkers (2005), Den Outer (2001)
Foman	(fomang) *Chaetocarpus schomburgkianus*	Jonkers (2005), FAO, Den Outer (2001)
Gandoe	*Swartzia prouacensis*	Den Outer (2001)
Gandoe zw	*Schwartzia benthamiana var benthamiana*	Den Outer (2001)
Gawetri	*Cupania hirsuta; C. scrobiculata; Matayba arborescens*	Jonkers (2005), Den Outer (2001)
Gawetri witte	*Cupania sp.*	Jonkers (pers. communication)
Goebaja	*Jacaranda copaia*	Jonkers (2005), FAO, Den Outer (2001)
Gomhout	*Sapium aubletianum*	Jonkers (2005)
Granboesi-papaja	*Pourouma aspera; P. laevis; P. mollis*	Jonkers (2005), Den Outer (2001)
Granboesi weti oedoe	*Tapirira guianensis*	Jonkers (pers. communication)
Groenhart	*Tabebuia serratifolia; T. leucoxylon*	Jonkers (2005), FAO, Den Outer (2001)
Gronfolo	*Qualea coerulea*	Jonkers (2005) (Laagland)
Gronfolo bergi	*Qualea rosea*	Den Outer (2001)
Gronfolo hgl	*Qualea albiflora; Ruizterania albiflora*	Jonkers (2005), FAO, Den Outer (2001)
Gujavekwari	*Qualea dinizii*	Jonkers (2005)
Hevea	*Hevea guianensis*	Jonkers (2005), Den Outer (2001)
Hoepelhout	*Copaifera guianensis*	Jonkers (2005), Den Outer (2001)
IJzerhart	*Swartzia benthamiana; S. prouacensis; S. bidentata*	DeFilipps et al., Den Outer (2001)
Ingipipa	*Couratari stellata*	Jonkers (2005), FAO, Den Outer (2001)
Ingipipa gr.bl.	*Couratari gloriosa*	Jonkers (pers. communication)
Jakanta	*Lacistema grandifolium; Discophora guianensis*	FAO, Den Outer (2001)
Jakanta gb	*Hebepetalum humiriifolium*	FAO
Jakanta gr.bl.	*Unknown*	
Jakanta hgl	*Unknown*	
Jakanta rb	*Dendrobangia boliviana*	Jonkers (2005), FAO
Jakanta wb	*Poraqueiba guianensis*	Jonkers (2005), FAO
Jamboka	*Pouteria guianensis*	Jonkers (2005), FAO, Den Outer (2001)
Jamboka rode	*Pouteria guianensis*	Jonkers (pers. communication)
Jamboka zw	*Pouteria cladantha*	Jonkers (2005)
Jarakopi	*Siparuna guianensis; S. surinamensis*	Jonkers (2005), Den Outer (2001)
Jarijari	*Anaxogorea mutica; A. dolichocarpa*	Jonkers (2005), Den Outer (2001)
Jonge kabbes	*Vataireopsis speciosa*	Jonkers (2005)
Kaaiman oedoe	*Laetia procera*	Jonkers (pers. communication)
Kabbes gele	*Vatairea guianensis; V. surinamensis; Hymenolobium flavum*	Jonkers (2005), FAO, Den Outer (2001)
Kabbes rode	*Andira inermis; A. surinamensis; A. coriacea*	Jonkers (2005), FAO
Kabbes rode fijnbl.	*Pithecellobium racemosum*	Jonkers (2005)
Kabbes rode kl.bl.	*Andira* spp.	FAO
Kabbes zw	*Diplotropics purpurea*	Jonkers (2005), FAO
Kabbes zw kl.bl.	*Probably: Diplotropis purpurea*	Jonkers (pers. communication)
Kandra oedoe	*Isertia coccinea*	Jonkers (2005), Den Outer (2001)
Kandratiki	*Isertia coccinea*	Jonkers (pers. communication)
Kaneri pisi	*Licaria guianensis; Mezilaurus itauba*	Den Outer (2001)

Vernacular name	Scientific name	Source*
Kankan oedoe	*Apeiba echinata; A. petouma*	Jonkers (2005), Den Outer (2001)
Kankantri	*Ceiba pentandra; Bombax pentrandum*	FAO, Den Outer (2001)
Kasaba oedoe	*Alchornea triplinervia*	Den Outer (2001)
Katoen oedoe	*Lueheopsis flavescens; L. rugosa*	Jonkers (2005), FAO, Den Outer (2001)
Kaw-oedoe	*Bagassa guianensis*	Jonkers (2005), Den Outer (2001)
Kimboto	*Pouteria ptychandra; Neopometia ptychandra*	Jonkers (2005), Den Outer (2001)
Kimboto berg	*Probably: Pouteria ptychandra*	Jonkers (pers. communication)
Kimboto hgl	*Probably: Pouteria ptychandra*	Jonkers (pers. communication)
Knopo-tafrabon	*Cordia nodosa*	
Koenatepi	*Platymiscium ulei, P. trinitatis*	Jonkers (2005), FAO, Den Outer (2001)
Kokriki	*Ormosia paraensis; O. fastigiata; O. melanocarpa*	Jonkers (2005), Den Outer (2001)
Kokriki hgl	*Ormosia coccinea*	Jonkers (2005), Den Outer (2001)
Konkoni oedoe	*Gustavia augusta*	Jonkers (pers. communication)
Konkoni oedoe hgl	*Gustavia hexapetala*	Jonkers (2005)
Kopi	*Goupia glabra; G. tomentosa*	Jonkers (2005), FAO, Den Outer (2001)
kototiki	*Mabea piriri*	Jonkers (2005)
Kototiki	*Mabea piriri*	Jonkers (2005)
Krabasi oedoe	*Terminalia amazonia; T. obovata*	Den Outer (2001)
Krapa	*Carapa guianensis; C. procera*	FAO
Kraspisi	*Ocotea glomerata; O. caudata*	FAO, Den Outer (2001)
Kromanti kopi	*Aspidosperma cruentum, A. sandwichianum*	Jonkers (2005), FAO, Den Outer (2001)
Kwari rode	*Vochysia guianensis; V. melinnonii; V. neglectum*	Den Outer (2001), Jonkers (pers. communication)
Kwasiba	*(Akwasiba) Pouteria cuspidata*	Den Outer (2001)
Kwaskwasi oedoe	*Ampelocera edentula*	Jonkers (2005) (without oedoe)
Kwatabobi	*Ecclinusa cuneifolium*	Jonkers (2005)
Kwatakama	*Parkia pendula; Inga pendula*	Jonkers (2005), Den Outer (2001)
Kwatapatoe	*Lecythis davisii*	FAO
Kwepi	*Licania apetala*	Jonkers (2005), Den Outer (2001)
Kwepi hb	*Probably: Licania apetala*	Jonkers (pers. communication)
Kwepi rode	*Excellodendron barbatum*	Jonkers (2005)
Laksiri hgl	*Caraipa sp.*	Jonkers (pers. communication)
Laurierkers	*Ecclinusa cuneifolia; Chrysophyllum cuneifolium*	Den Outer (2001)
Leletiki	*Rinorea* spp.	Jonkers (2005)
Letterhout	*Brosimum guianense; B. rotundatum; Piratinera scabridula; P. guianensis*	Jonkers (2005), FAO, Den Outer (2001)
Lika oedoe	*Antonia ovata*	Jonkers (2005), Den Outer (2001)
Makakabbes	*Hymenolobium flavum; Enterolobium schomburgkii*	Jonkers (2005), Den Outer (2001)
Man-bebe berg	*Alchorneopsis trimera*	Jonkers (2005), Den Outer (2001), Jonkers (pers. communication)
Man-sali	*Conceveiba guianensis*	Den Outer (2001)
Manaritiki	*Rinorea passoura*	Jonkers (2005)
Manbarklak	*Eschweilera subglandulosa; E. orrugata; Lecythis idatimon; L. corrugata*	Jonkers (2005), FAO
Manbarklak hgl	*Eschweilera odora; E. coriacea*	Jonkers (2005), FAO, Den Outer (2001)
Manbebe	*Alchorneopsis trimera*	Den Outer (2001)
Manbospapaja	*Cecropia sciadophylla; C. sciadophylla*	Jonkers (2005), Den Outer (2001)
Manletterhout	*Perebea laurifolia; Brosimum guianense*	Jonkers (2005), Den Outer (2001)
Manpikapika	*Unknown*	
Manpinja	*Vismia angusta*	Jonkers (2005)
Mantakina	*Unknown*	
Mapa	*Ambelania acida; A. sagotii; Couma guianensis; Macoubea guianensis*	Den Outer (2001), FAO
Marmadosoe	*Amaioua guianensis; Amajoua guianensis*	Den Outer (2001)
Marmadosoe gr.bl.	*Duroia sp.*	Jonkers (pers. communication)
Marmadosoe kl.	*Duroia sp.*	Jonkers (pers. communication)
Mataki	*Symphonia globulifera; Caraipa densiflora*	Jonkers (2005), FAO
Mataki hgl	*Symphonia gabonensis*	FAO

Vernacular name	Scientific name	Source*
Mataki lgl	*Unknown*	
Mawsikwari	*Vochysia guianensis*	FAO
Melisali	*Trichilia propingue*	Jonkers (2005), FAO
Merkitiki	*Bonafousia undulata*	Jonkers (2005)
Miera oedoe	*Symmeria paniculata*	Den Outer (2001)
Mispel	*Miconia longifolia; M. mucranata, a.o. (Bosmispel)Bellucia grossularioides*	Jonkers (2005), Den Outer (2001)
Mispel gr.bl.	*Miconia sp.*	Jonkers (pers. communication)
Moetene	*Capirona decorticans*	
Nekoe oedoe	*Alexa wachenheimii; Lonchocarpus latifolius*	Jonkers (2005), FAO, Den Outer (2001)
Njamsi oedoe	*Guapiri olfersiana; Torrubia olfersiana*	Jonkers (2005), Den Outer (2001)
Njamsi oedoe kl	*Torrubia olfersiana*	Den Outer (2001)
Oema oedoe	*Casearea javitensis*	Jonkers (2005), Den Outer (2001)
Oemanbarklak	*Eschweilera amara; Arrabidaea inaequalis*	FAO, Den Outer (2001)
Oemanbarklak hgl	*Lecythis corrugata; Eschweilera corrugata*	Jonkers (2005), FAO, Den Outer (2001)
Oeproe olie	*Copaifera guianensis*	Den Outer (2001)
Okro oedoe	*Sterculia pruriens; S. excelsa*	Jonkers (2005), Den Outer (2001)
Olie oedoe	*Trynatococcus amazonicus*	Jonkers (2005)
Onbekend	*Unknown*	
Pakira tiki	*Tapura guianensis*	Jonkers (2005)
Pakoeli hgl	*Rheedia macrophylla*	Jonkers (2005), FAO
Pakoeli lgl	*Unknown*	
Panga panga	*Palicourea guianensis, Milettia stuhlmannii (from east africa)*	Jonkers (2005), Den Outer (2001)
Panga panga gr.bl.	*Palicourea guianensis*	Jonkers (pers. communication)
Panga panga hgl	*Palicourea guianensis*	Jonkers (pers. communication)
Panga panga kl.bl.	*unknown*	
Panta hgl	*Conceveiba guianensis*	Jonkers (2005)
Panta lgl	*Unknown*	
Panta wb	*Unknown*	
Parelhout	*Aspidosperma sp.*	Jonkers (pers. communication)
Parelhout wit	*Aspidosperma marcgravianum*	Jonkers (2005), Den Outer (2001)
Parelhout zw	*Aspidosperma exelsum*	Jonkers (2005), Den Outer (2001)
Pegrekoe-pisi	*Xylopia aromatica, X. nitida*	Jonkers (2005), FAO, Den Outer (2001)
Pegrekoe-pisi rood	*Xylopia spec.*	Jonkers (pers. communication)
Pegrekoe-pisi w	*Probably: Xylopia aromatica*	Jonkers (pers. communication)
Pepre oedoe	*Pera bicolor*	Jonkers (2005), Den Outer (2001)
Pera	*Couma guianensis*	Jonkers (2005), Den Outer (2001)
Pikin-misiki	*Piptadenia suaveolens; Newtonia suaveolens*	FAO
Pikin kwepi	*Probably: Licania obidensis*	Jonkers (pers. communication)
Pikinmisiki	*Piptadenia suaveolens*	Jonkers (2005)
Pikintiki	*Maprounea guianensis*	Jonkers (2005)
Pinja oedoe	*Vismia sp.*	Jonkers (2005), Den Outer (2001)
Pinto-kopi	*Laetia procera*	Jonkers (2005), Den Outer (2001)
Pinto-kopi hg	*Laetia spec.*	Jonkers (2005)
Pintobolletri	*Pouteria cuspidate; P. robusta*	Jonkers (2005), Den Outer (2001)
Pintolocus zwarte	*Unknown*	
Pintolokus witte	*Martiodendron parviflorum, Martiusisa parviflora*	Jonkers (2005), FAO
Pintolokus zwarte	*Unknown*	
Pintri baboen	*Virola sebifera*	Jonkers (2005), FAO
Pisi spp.	*Aniba taubertiana (pisi), Nectandra ambigua; a.o.*	Den Outer (2001)
Pisi witte	*Ocotea canaliculata; O. petalanthera*	Jonkers (2005), FAO, Den Outer (2001)
Pisi zw	*Nectandra pisi; N. grandis, Ocotea glomerata*	Jonkers (2005), FAO, Den Outer (2001)
Pisi zw gr.bl.	*Nectandra grandis*	FAO, Den Outer (2001)
Pisi zw kl.bl.	*Nectandra cf Ocotea wachenheimii*	FAO
Poeroema	*Pourouma digitata*	Den Outer (2001), Den Outer (2001)
Prasara oedoe	*Guapira* spp.	Jonkers (2005)

Vernacular name	Scientific name	Source*
Prokoni	*Inga alba*	Jonkers (2005)
Prokoni rode	*Inga aff. Alba*	FAO
Raafnjang	*Sloanea trichosticha*	Jonkers (2005)
Ravenjang	*Sloanea trichosticha*	Jonkers (2005)
Redi oedoe	*Casearea arborea*	Jonkers (2005), Den Outer (2001)
Redi oedoe kl	*Unknown*	
Riemhout	*Chrysophyllum argenteum; Microphyllus venulosa*	Den Outer (2001)
Riemhout w	*Micropholis guyanensis var. guyanensis; Sideroxylon guianensis*	Jonkers (2005), FAO, Den Outer (2001)
Riemhout zw	*Micropholis guyanensis var commixta*	Jonkers (2005), FAO, Den Outer (2001)
Rode lokus	*Hymenaea courbaril*	DeFilipps et al., Den Outer (2001)
Sali	*Tetragastris spp.; Guerea kunthiana; Hemicrepidospermum rhoifolium; Protium alstonii*	FAO, DeFilipps et al., Den Outer (2001)
Sali hb	*Unknown*	
Sali rode	*Tetragastris altissima*	Jonkers (2005), FAO, Den Outer (2001)
Sali witte	*Protium polybotryum; P. glabrescens*	Den Outer (2001)
Santi oedoe	*Licania ovalifolia*	Jonkers (2005), FAO, Den Outer (2001)
Satijnhout	*Brosimum paraënse*	Jonkers (2005), FAO
Sawari	*Caryocar nuciferum*	FAO, Den Outer (2001)
Sawari hgl	*Caryocar glabrum*	Jonkers (pers. communication)
Sinja oedoe	*Chimarrhis turbinata*	Jonkers (2005), Den Outer (2001)
Soemaroeba	*Simarouba amara; Quassia amara*	Jonkers (2005), FAO, Den Outer (2001)
Sokosoko mapa	*Macoubea guianensis*	Jonkers (2005)
Sopo oedoe	*Endlicheria multiflora*	FAO, Den Outer (2001)
Sopo oedoe hgl	*Carycar spec.*	Jonkers (pers. communication)
Sorosali	*Trichilia roraimana; T. surinamensis*	Jonkers (2005), Den Outer (2001)
Sowtmeti oedoe	*Maytenus myrsinoides*	Den Outer (2001)
Spikri oedoe	*Mouriri acutiflora*	Jonkers (2005), Den Outer (2001)
Swa oedoe	*Laplacea fructicosa*	Jonkers (2005)
Swietiboontje	*Inga* spp.	Jonkers (2005)
Tabakabron	*Croton matourensis*	Jonkers (2005), Den Outer (2001)
Tafrabon	*Cordia tetrandra*	Den Outer (2001)
Tafrabon hgl	*Cordia laevifrons*	Jonkers (pers. communication)
Taja oedoe	*Paypayrola guianensis*	Jonkers (2005), Den Outer (2001)
Takini	*Brosimum acutifolium; Helicostylis tomentosa*	DeFilipps et al.
Tamaren-prokoni	*Macrosamanea pedicellaris; Balizia pedicellaris; Enterolobium schomburgkii*	FAO, Den Outer (2001)
Tamarinde hgl	*Probably: Pithecellobium corymbosum*	Jonkers (pers. communication)
Tingimoni	*Protium arachouchini* a.o.	Jonkers (2005)
Tingimoni getand	*Hemicrepidospermum rhoifolium*	Jonkers (2005), FAO, Den Outer (2001)
Tingimoni gr.bl.	*Protium* spp.	FAO
Tingimoni hb	*Protium sagotianum*	FAO
Tingimoni kl.bl.	*Protium heptaphyllum*	Jonkers (2005)
Tingimoni rb	*Protium polybotryum*	Jonkers (2005), FAO
Tingimoni sali	*Tetragastris hostmannii, T. panamensis*	Jonkers (2005), FAO
Tite oedoe	*Lecythis sp.*	Jonkers (pers. communication)
Tite oedoe gb	*Eschweilera chartacea; E. poiteaui*	Jonkers (2005), Den Outer (2001)
Tite oedoe wb	*Lecythis simiorum; L. chartacea*	Jonkers (2005), Den Outer (2001)
Tonka	*Dipterix odorata; T. cayennensis; Dipteryse oderata; D. puntata*	Jonkers (2005), FAO
Walaba	*Eperua falcata*	Jonkers (2005), FAO
Wana	*Ocotea rubra; Nectandra rubra*	Jonkers (2005), FAO, Den Outer (2001)
Wana pisi	*Ocotea globifera; O. puberula; O. schomburgkiana*	Jonkers (2005), FAO, Den Outer (2001)
Wanakwari	*Vochysia tomentosa*	Jonkers (2005), FAO
Watra-bebe	*Pterocarpus officinalis*	FAO, Den Outer (2001)
Weti oedoe	*Tapirira guianensis*	Jonkers (2005), Den Outer (2001)
Wiswiskwari	*Vochysia guianensis; V, surinamensis*	Jonkers (2005), FAO, Den Outer (2001)

Notice: it was not clear for all species, which one was actually meant. Many different specifiers are used and thus for some no scientific name could be given.

* **References**

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Appendix IV. Terms of Reference: Statistical Analysis of Forest Research Data (Mapane-Experiment)

1. Background

In 1980 a semi-practical scale experiment (640 ha) on natural forest regeneration was started by the Suriname Forest Service (LBB) in the Mapane Area. The by then most promising CMS variant (gecontroleerde oogst followed by elimination of non-commercial tree species retaining a total basal area of 15 m2 per ha) would be carried out in a 640 ha forest area at Akintosoela. Due to financial constraints however, the planned silvicultural treatment could only be applied to 23 Permanent Sample Plots (PSP's) of 1 ha, randomly distributed over the selectively logged experimental area.

In 1981 these PSP's were assessed for the first time. AII trees within these PSP's with dbh > 15 cm were identified up to the local name level, their diameter and height were measured and the stem- and crown form were assessed. Regeneration (saplings and young trees) of commercial species between 2 and 15 cm dbh were recorded in 3 randomly selected central quadrants of 20 x 20 m2 within these PSP's. The local species name and the diameter and height were recorded.

In 1983/1984 non-commercial tree species were eliminated in these PSP's, leaving a total basal area of 12.5 to 15 m2 per ha.

In 1995 CELOS restarted its Forestry Research Programme and adopted this experiment. In 1997/1998 a re-assessment of these PSP's was carried out by CELOS. The same parameters were assessed as in 1981.

There are now two complete data sets filed at CELOS, which need to be analyzed to determine the effects of the applied CMS treatment (gecontroleerde oogst followed by one refinement only) after 20 years.

2. Objectives.

- Statistical analysis of the data sets (1981-1998) provided by the CMS treatment of the plots in the Mapane-region.
- Production of a procedure (manual) for computer analysis of forest tree data.

3. Terms of Reference.

Following is a TOR for a forest statistician / biometrist for the analysis of these two datasets.

A. Under the supervision of CELOS' Forestry Department and based on these two data sets (assessments of 1981 and 1997/1998) the statistician will undertake the following activities:

- Determine the increment in terms of number of trees per ha, basal area per ha and volume per ha of commercial and non-commercial species, taking into account the expansion of the list of commercial species since 1980.
- Determine the annual diameter/girth increment of commercial, non-commercial and 10 to 15 most common species as a group and individually, within the PSP's.
- Determine the total and annual mortality in terms of number of trees per ha, basal area per ha and volume per ha of commercial and non-commercial species within the PSP's.

- Determine the total and annual ingrowth/recruitment in terms of number of trees per ha, basal area per ha and volume per ha of commercial and non-commercial species, within the PSP's.
- Determine changes in species composition of the PSP's, if any.
- Determine changes in frequency per diameter-class (diameter-class frequency) for commercial and non-commercial species within the PSP's, if any.

B. Procedure of analysis

- The statistician will prepare a "Procedure" for the computer analysis of the data sets, listing the most appropriate/used software programs and the step-by-step procedures for the above listed determinations. This "Procedure" will have such a format that it can be used independently by CELOS technicians as a manual for forest/tree data analysis.

C. Qualifications

- The statistician should be a professional forest statistician or biometrist with experience in Tropical Silviculture or Tropical Forest Research Programs.

D. Reporting

- The statistician will prepare a technical report of the results of the statistical analysis of the two data sets with recommendations for possible follow-up research.