

Assessing the progress made: an evaluation of forest management certification in the tropics

Marielos Peña-Claros, Stijn Blommerde & Frans Bongers



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2009

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The research was financially supported by Adessium Foundation

Design Ron Eijkman · de Vormgeverij

Photos L. Bakker, F. Bongers, R. Brienens, R. Eijkman, G. v.d. Heide, L. Markesteijn,
M. Peña-Claros, L. Poorter, D. Rozendaal, M. Toledo.

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Topical Resource Management Papers,
ISSN 0926 9495

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Wageningen University and Research Centre, Department of Environmental Sciences
Forest Ecology and Forest Management Group
P.O. Box 47, 6700 AA Wageningen,
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Documents sur la Gestion des Ressources Tropicales, ISSN 0926-9495
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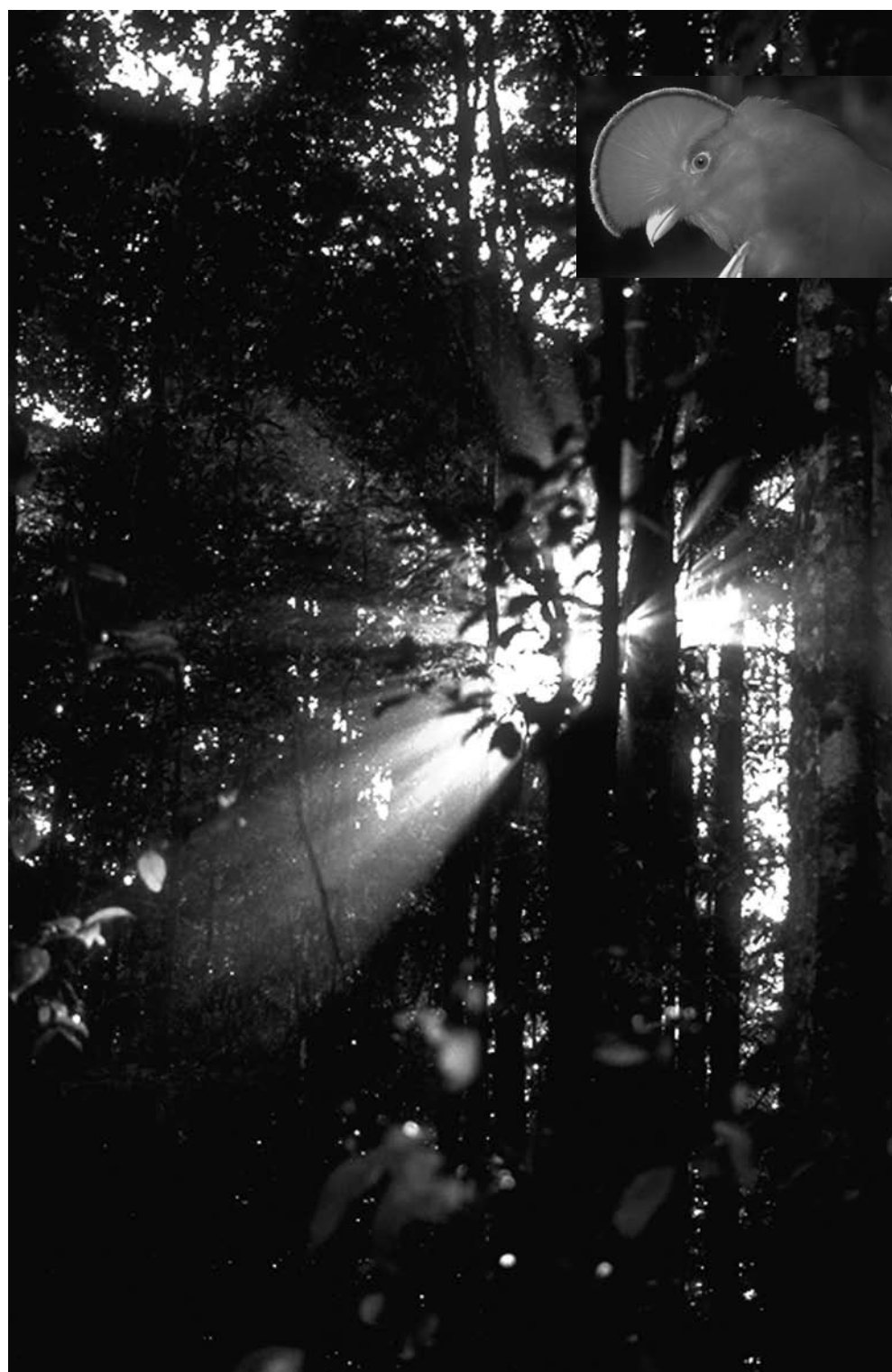
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Acknowledgments

We would like to acknowledge the role played by the Advisory Group of this project. This group was conformed by Chris van der Goot (FSC International), Arnold van Kreveld (Precious Woods), Dr. Sietze Vellema (Technology and Agrarian Development Group, Wageningen University and Research Centre), and Dr. Freerk Wiersum (Forest and Nature Policy Group, Wageningen University and Research Centre). We thank them for their suggestions, comments, guidance and interest.

Elena Prieto provided great assistance during data collection: she revised a large number of public summaries in a short period of time. Elena was funded by the project 'Markets, Chains and Sustainable Development' executed by Wageningen UR under the policy research program Cluster International through a grant from the Netherlands Ministry of Agriculture, Nature and Food Quality (project leader Dr. Sietze Vellema).

We gratefully acknowledge the Adessium Foundation for funding this project. Special thanks to Pieter Stemerding, Rogier D. van Vliet and Jasmijn Melsen for their comments at different stages of this project.



Executive summary

Forest management certification is a market based conservation initiative that aims to promote the environmental appropriate, socially beneficial, and economical viable management of forests. The idea behind certification is straightforward. A logging company demonstrates to operate with high standards both in ecological and socioeconomic aspects related to forest management. Consequently, it obtains the approval of a third-party certifying agency and thereby gains access to markets willing to pay higher prices for sustainably harvested forest products.

Currently several forest management certification schemes are in place. All schemes have developed a set of Principle and Criteria dealing with legal, social, economical, and ecological aspects related to forest management and its chain of custody. This set of Principles and Criteria are used to evaluate the performance of forest management units (FMU) and to determine if the FMU should be certified or not. This evaluation is done by an interdisciplinary team that carries out a series of activities to assess the performance of the FMU. The main result of the evaluation process is a list of actions that the FMU needs to carry out to obtain and maintain its certification through time. FMU are then annually visited by a smaller evaluation team to assess if they are fulfilled the list of actions given.

In this study we have looked at the list of actions given to 123 FMU managing natural tropical forests, and have extracted from them a list of criteria mentioned as well as general information regarding the FMU (such as area certified, product harvested, type of certificate holder). We have also followed the list of actions given to 11 FMU by looking at the annual audits, and have compared the performance of 13 FMU by comparing the list of action given to them in the main evaluation and in the evaluation for recertification (5 years after obtaining the first certificate). These approaches allowed us to address the following objectives:

1. to assess the impact of certification on economical, social and ecological aspects of forest management using the public summaries of FSC certified companies;
2. to determine if issues raised in the list of actions are indeed solved by the FMU through time as it has been assumed in previous studies;
3. to evaluate factors that influence the impact of forest management certification at the country and the tropical region level.

For this study we focused on the certification scheme developed by the Forest Stewardship Council (FSC) for several reasons: (1) it is the oldest certification scheme (in place since 1993), (2) it is the main scheme being used for certifying tropical natural forests, (3) the FSC scheme is considered to be the most complete one, and (4) results of the evaluation process are

published on public summaries that are available online. Additionally in this study we focused on managed tropical natural forests because tropical forest are diverse, provide an array of services, and are crucial for the livelihood of several millions of rural people.

In the tropics there are 10.9 million ha certified under the FSC scheme, of which 74% correspond to managed tropical natural forests. There are 119 FSC certified FMU, most of them being located in the Americas. About 28% of the certified area is in Bolivia, 16% in Brazil, and another 22% is distributed over 16 different countries. The increase in certified area is faster among FMU that are owned by individuals than among certified areas that are owned by communities or the state. Certification is, however, being obtained equally by individual and communal FMU, with the difference that on average communities manage smaller areas than individual companies.

Strong incentives are needed to increase the total area certified in tropical forests. Although since 2003 the certified area and the number of certified FMU have increased more rapidly, this remains necessary if we want that certification helps promoting the conservation and better management of tropical forests. Stakeholders that need special attention are local communities or indigenous groups. In several countries they have been given legal access to the forests only in recent years. They need strong support not only on technical aspects but also on administrative, institutional, and financial aspects.

By revising the evaluation reports of 123 FMU we found that criteria were mentioned 3952 times. The first eight most common criteria made up 42% of the problems raised in the evaluation report, while 22 criteria made up 75% of the problems. Contrary to common belief, forest management certification problems in the tropics are not only focussed on social issues. All three pillars of sustainability are included in the list of the most common criteria with problems, indicating that through time an improvement in all aspects can be expected. Common problems may vary per country. For example, FMU in Brazil had more problems fulfilling the criteria “health and safety for employees and families”, probably because the labors law in Brazil is very demanding, while FMU in Mexico had more problems fulfilling the chain of custody standards.

Our results indicate strongly that forest management certification improves the working standards of FMU in the tropics. The improvement can be seen in the fact that fewer problems are identified in FMU getting currently certified than when the certification movement started. This trend indicates that forest management is improving even before the FMU are getting certified. The improvements are even more evident at the level of individual FMU: their performance is evaluated with a higher score when they undergo a second recertification process. Additionally we found that about 98% of

the problems raised are solved during the first five years of certification, while aspects that are permanently reviewed by the evaluation team are in 82% of the cases dealt satisfactorily.

Based on the frequency of criteria through time (from the main report to the recertification report 5 years later) it is possible to define four categories of criteria. These categories are criteria with low frequency through time (“silent criteria”), criteria that increase in frequency (“criteria sequences”), criteria that decrease in frequency (“easy to solve criteria”), and criteria with high frequency through time (“difficult to solve criteria”). An example of a “difficult to solve criteria” is the criterion related to health and safety of workers (criterion # 4.2) probably because it has a very broad scope and includes a variety of topics ranging from working conditions, contracts, insurances gender issues to safety related aspects.

Our results also indicate that certification is likely to have a large impact on the long-term sustainability of forest management mainly because FMU are requested to improve their monitoring system and to incorporate the results of the monitoring system into their management practices. The monitoring system should monitor among others forest productivity, impact of harvesting on forest diversity, and changes in species composition. The monitoring system is, however, also a substantial burden for the FMU because often managers are requested to carry out a series of research activities that are costly and for which they do not have the appropriate staff and financial means. Consequently, forest management will certainly benefit a lot from close partnerships between companies and research organisations because the latter can assist obtaining information required to guarantee sustainable yields of forest products (e.g., timber). The certification schemes should also more strongly incorporate new knowledge being generated by scientists. For example, it is urgent that the certification movement starts promoting the application of silvicultural treatments in certified forests, just the way it has promoted the implementation of reduced-impact logging techniques in the past.

Public summaries include a wealth of information that can be very useful for adjusting the certification schemes, for monitoring the progress made, and for extracting lessons learned that can then be applied elsewhere. For fulfilling that role the content and the quality of the public summaries need further improvement than the ones they have already undergone through time.



1. Introduction

For the last decades high deforestation rates and forest degradation due to poor forest management practices or illegal logging have been one of the greatest concerns of the international environmental community (Gullison, 2003; Rametsteiner and Simula, 2003). To change this situation environmental groups focused for many years their efforts mainly towards policymakers and the general public. As these efforts did not have the expected results, environmental groups started using market based conservation initiatives (e.g., Audl et al., 2008; Hain and Ahas, 2007; Leslie, 2004; Rametsteiner and Simula, 2003). One of these initiatives was forest management certification (e.g., Leslie, 2004). The idea behind forest management certification is straightforward. A logging company (individual or communal) demonstrates to operate with high standards both in ecological and socio-economical aspects related to forest management. Consequently, it obtains the approval of a third-party certifying agency and gains access to markets willing to pay higher prices for sustainably harvested forest products.

The first forest management certification scheme created was the one by the Forest Stewardship Council (FSC) in 1993. The FSC was created by a group of environmental NGOs, timber traders, groups of indigenous people, forest worker organizations, and other stakeholders. Its mission is to promote “environmentally appropriate, socially beneficial, and economically viable management of the world’s forests”, so that these forests can be used without compromising the rights and needs of the future generations (FSC, 2007). FSC is an independent, membership-based organization. FSC members come together in the FSC general assembly, which is the highest decision-making body in FSC. The general assembly is structured in three chambers (environmental, social and economic) to maintain the balance of voting power between different interests without having to limit the number of members¹. FSC does not carry out the certification evaluations itself; it only develops the rules and accreditation requirements. The actual evaluation of the forest management units is done by third-party certifying agencies (hereafter referred to as certification bodies). Certification bodies are constantly monitored by FSC, which warrants accreditation to the certification bodies that perform according to the standards. In that way FSC guarantees that certification bodies perform equally.

The certification scheme used by FSC is based on a set of Principles and Criteria (P&C) that can be regarded as an advanced version of the Forest Principles agreed at the United Nations Conference on Environment and

¹ <http://www.fsc.org/governance.html> as seen on March 18th, 2009.

Development 1992 meeting. The P&C or FSC standards are the result of intensive consultation with stakeholders and are open to discussion and improvement over time by means of public consultations. The standards deal with legal, social, economical, and ecological aspects related to forest management and its chain of custody. There are 10 principles, each principle having a set of criteria (56 in total, 3 to 10 depending on principle, Annex 1), and each criterion a set of indicators, which are used by the evaluators to assess the companies. This international standard is used as the basis for developing national or national or regional standards, which implies the modification the formulation of specific indicators to fit the local circumstances through a standard-setting process, which involves intensive public consultations. These national standards have to be approved by the FSC before they can be implemented in the field. The national standards are revised every 5 years by the national group proposing them. This last point means that national standards as well as the FSC international standards are in continuous revision, which allows including lessons learned in the process but also changes in opinions of different stakeholders.

Since the inception of FSC several other schemes have been developed mainly by the forest industry and forest owners (Audl et al., 2008). These so-called producer-backed schemes developed their own sets of P&C, being the most important one the Program for the Endorsement of Forest Certification (PEFC). It represents the interests of international forest industry and trade organizations. It started as a European scheme but currently has become a global umbrella organization, covering national schemes worldwide, like the Canadian Standard Association (CSA) and the Sustainable Forestry Initiative (SFI), among others.

Forest management certification has been a very successful initiative. By May 2008 the total area of certified forest in the world was 320 million ha (UNECE, 2008). This area represents 25% of the total production forest (total area 1,281 million ha; FAO, 2005) and 8% of the total forest area in the world (in total 3,952 million ha; FAO, 2005). PEFC and FSC are the two certification schemes that operate worldwide and dominate the area certified. There are about 200 million ha certified under the PEFC scheme, of which 99% is located in temperate regions and 1% (2 million ha) in the tropics (PEFC, 2009). On the other hand, there are about 100 million ha certified under the FSC scheme, of which 90% is located in temperate regions and 10% (10 million ha) in the tropics (FSC, 2009).

Certification, how does it work?

Forest management units (FMU) interested in getting an FSC certificate contact a certification body. The certification body is an independent organization that assesses if the forest management (and chain of custody) of a FMU fulfills the standards or requirements defined by the FSC. After

the forest operation and the certification body have come to a working agreement, the certification body makes a public announcement regarding the evaluation it will undertake so that possible stakeholders become aware of it. The certification body assembles an evaluation team, mostly consisting of 3-4 people covering different areas related to forest management (such as ecology, sociology, forestry). This team is, therefore, interdisciplinary in scope and works closely together. The evaluation team assesses the performance of the FMU through a series of activities, such as field visit to the harvesting area, interviews with workers and neighboring communities, open meetings with stakeholders, and review of documents.

Based on the assessment the evaluation team writes an evaluation report. The evaluation report includes general information about the company, the procedure used by the evaluation team to assess if the company fulfilled all the criteria required for obtaining an FSC certification, the results of the consultation process, the results of the evaluation, the decision taken regarding certification, and a list of actions that the company needs to carry out to keep its certification through time.

The list of actions required is the result of the confrontation between the management practices of the FMU and the certification standards. The actions requested to the forest operation are called Corrective Action Request (CAR), and are classified as major and minor CAR. All major CAR need to be solved before getting certified, while minor CAR need to be fulfilled in the course of a time period given by the evaluator (between 6 months and 3 years). The evaluation report is reviewed by two independent reviewers, who are experts in their area and are familiar with the socioeconomic and ecological setting in which the FMU operates. Once the comments made by the reviewers are incorporated into the report and both the certification body and the FMU have agreed upon the content of the report, the certification body is granted an FSC certificate for 5 years. During that time the FMU can use the FSC logo to distinguish its products in the market from other non-certified products. Finally the certification body publishes online a public summary of the evaluation report.

After the certificate has been granted, the certification body carries out annual audits to evaluate the performance of the certified FMU during the duration of the certificate (5 years). Annual audits are carried out by a smaller evaluation team (mostly 1-2 experts) that focuses mostly on assessing the fulfillment of the CAR found during the main evaluation. New CAR may be issued, however, if the evaluation team judges it to be necessary. Once the certificate expires, the certification body conducts again a main evaluation to assess if the FMU should be granted again a FSC certification. This evaluation is done as described before for the main evaluation, taking into account all documents produced during the first certification period (main evaluation report and annual audit reports).

Measuring the impact of certification

The impact of forest management certification can be measured at different scales. Studies focusing at the FMU level have found that certification has resulted in the use of better management practices (Audl et al., 2008 and references therein). On the other hand, researchers focusing at the landscape level have argued that certification has not reduced the pressure on high conservation value forests and has not decreased the deforestation rates in tropical countries (e.g. Gullison, 2003). These seemingly contradictory results are probably due to the different scales being used in the studies (FMU level vs. landscape level). Additionally it has also been noted that when measuring the impact of certification it is necessary to assess the broader consequences that forest certification has had, which are mostly indirect, unintended, long-term and slow moving (Audl et al., 2008). Among these consequences are the pressure the FSC scheme had on producer-backed schemes to continuously raised their standard; the use of the forest management certification idea in other sectors like fisheries, sustainable tourism, and palm oil production; and the efforts to harmonize national certification schemes to obtain international recognition (Audl et al., 2008).

Although forest management certification is currently considered an important multi-stakeholder governance process and the most advance labeling initiative (Audl et al., 2008), its impact on the ground has yet to be fully evaluated. For example, there is little information available comparing areas before and after certification or certified areas with non-certified areas. Moreover there is little information on the impact of certification on biodiversity (Kuijk et al., 2009) or on the performance of community-owned FMU (but see Imaflora, 2008). This lack of on-the-ground studies may be related to the fact that such studies are costly, labor intensive and time consuming. One way that researchers have used to circumvent the need for such studies is to assess the impact of certification using the information available in the public summaries of the certification reports, most specifically the list of CAR given by the evaluation team to the FMU.

The list of CAR included in the evaluation reports demand changes or improvements in specific topics related to the list of FSC Principles and Criteria (see Annex 1). Therefore, by assessing the CAR it is possible to obtain a list of topics that needs improvement. Given that FMU have to fulfill with the CAR received to maintain their certification, the evaluation of the CAR has been considered an indirect way of measuring the impact of certification at the level of the FMU (Newson et al., 2006). The CAR analysis has been mostly used to assess the impact of certification on temperate forests management (e.g., Hirschberger, 2005; Newson et al., 2006). Studies using it in the tropics were restricted to one country (Nebel et al., 2005), did not separate between plantations and natural forests (Newsom & Hewitt, 2005), or included a relatively small sample size (Newson & Hewitt, 2005). In the present study we use the CAR analysis to identify the

major problems found at the FMU level throughout the tropics. As we also collected general information regarding each certified FMU (Table 1), we were able to relate this information to the results of the CAR analysis. In that way we could identify general trends at two other scales than the FMU scale: at the country level and at the tropical region level. Consequently, we assessed if factors such as certified area, number of certified FMU in the country, year of certification, product harvested, certificate holder, and forest type had an influence on the number and type of problems found at the country and regional level.

The basic assumption of the CAR analysis is that problems identified in the list of CAR are indeed solved through time (e.g. Newson et al., 2006). This assumption is based on the fact that if the FMU does not solve the issues raised, then it will lose its FSC certificate. This assumption has rarely been tested (but see Hirschberger, 2005) although several forest operations have been certified for more than 5 years. In the present study we have specifically observed at this aspect by following the performance of certified FMU through time and by comparing the results of the first and second main evaluation reports. These analyses allow us to evaluate the actual changes that FMU have undergone because of certification.

We restricted our analyses to FMU managing natural tropical forests because these forests contain the largest biodiversity in the world, deliver most ecosystem services, provide goods (such as timber and non-timber products), have the highest priority for conservation, generate income for the poorest segment of society but are still under severe threat of unsustainable use. Additionally we restricted our analysis to the FSC scheme. Several studies comparing different certification schemes have indicated that the FSC scheme is the most complete one (e.g. Audl et al., 2008). FSC is also the certification scheme with the largest area of certified forests in the tropical region (Auld et al., 2008; Wenban-Smith, 2007; Leslie, 2004), and with the longest history as it does exist since 1993. Finally, the assessment of FSC certified areas is relatively easy because of the scheme transparency. Public summaries of the certification reports are published online and include information regarding the certification process through which the company has gone to become certified, and most importantly it includes the list of CAR given to the FMU. This transparency is very important because it allows measuring the impact of the FSC scheme using available information without the need of developing a separate impact assessment program.

Objectives of the study

We have the following objectives:

- 1 to assess the impact of certification on economical, social and ecological aspects of forest management using the public summaries of FSC certified companies;
- 2 to determine if issues raised in the list of CAR are indeed solved by the FMU through time as it has been assumed in previous studies;
- 3 to evaluate factors that influence the impact of forest management certification at the country and the tropical region level.





2. Methodology

For our study we relied on the public summaries of certified forest management units (FMU) available on the webpages of the certification bodies until October 20th, 2008 (see Annex 2 for list of certification bodies). As we focused on the tropics, we included in our sample 213 certified FMU located in the tropical region [defined as the area between the Tropic of Cancer and the Tropic of Capricorn (23°3'N-23°3'S)]. Only in the case of Mexico we included some FMU that were located outside this region because they contained tropical forests as defined by the evaluators. For all 213 FMU we obtained basic information (Table 1A) that allowed us among other things to distinguish between FMU managing plantations and FMU managing natural tropical forests.

For the 123 FMU managing natural tropical forests we obtained additional general data (Table 1B) and extracted the criteria mentioned in the list of Corrective Action Request (CAR) given to the FMU by the evaluation team. When evaluators had not linked the CAR to specific criteria, we assigned them ourselves to the criteria indicated in the FSC International Standards (FSC 1996). This situation was more common in earlier public summaries (until around 2000). When standards used by the evaluators included more criteria than the FSC International Standards, we reassigned the CAR to the closest criterion possible in the FSC International Standards. In very few cases criteria could not be reassigned; therefore, these cases were not included in the analyses (0.3 % of all mentioned criteria). This situation was more common in the public summaries of FMU in Brazil as the Brazilian standards include a higher number of criteria than the international FSC standards (FSC Brazil 2002). Finally, when CAR were linked to specific criteria of the FSC Chain of Custody standards (FSC 2004) or referred to the Guidelines for the Group Certification (FSC 1998), they were classified under criterion 8.3 (dealing with the chain of custody) and “Group”, respectively.

Each CAR is linked to one or more specific criteria of the FSC International Standards. Some criteria of the FSC International Standards are very specific in their scope, while other criteria are much broader by nature. For example, criterion 9.1 refers specifically to the definition of high conservation value forests inside the FMU, while criterion 7.1 refers to several aspects related to forest management plans, ranging from the requirement of having proper maps to the requirement of defining appropriate silvicultural systems. For this reason and given that several national or regional FSC standards (mainly at the level of indicators) are used, several studies have actually categorized CAR to a predetermined set of “thematic areas” (e.g. Newson et al. 2006). We decided not to do so because we realized that the categorization of CAR to the thematic areas was very subjective, as different people assigned the same criterion to different thematic areas.

Finally we believe that although the international Principles and Criteria (P&C) are certainly not a perfect categorization of all problems related to forest management, the criteria are a shared reference point, which makes communication easier. Consequently, we have used the topic in each criterion directly in our analysis.

We extracted the criteria mentioned in the CAR list of 138 reports, belonging to the 123 FMU mentioned before. There were more reports than FMU because some FMU had gone through a certification process already. Consequently, we extracted the CAR from 104 main reports, 31 first recertification reports, and 3 second recertification reports. In total we extracted from the reports 547 major CAR and 2664 minor CAR, referring to the FSC criteria 3952 times (on average 1.2 criteria mentioned per CAR).

Table 1. General information obtained from public summaries of certified forest operations located inside the geographical tropical region.

| A. Information collected from public summaries of all certified forest operations found in the tropical region | |
|--|---|
| Variables | Categories |
| Region | Africa, America, Asia, Oceania |
| Certification body | name of certification body |
| Country | name of country in which forest operation is located |
| Company | name of the company |
| Forest biome | tropical, subtropical, temperate |
| Forest type | natural forest, plantation, mixed |
| Forest type being harvested | natural forest, plantation, mixed |
| Total area certified | in ha |
| Area certified per use | area in natural forest, plantation, protected areas, other uses |
| Date of first certification | year |
| B. Information collected from public summaries of all certified forest operations managing natural tropical forests | |
| Variables | Categories |
| Product harvested | timber, non-timber forest product, services |
| Certificate holder | individual, group, state |
| Type of group | Small Low Impact Forest (SLIMF) or not |
| Reports available | main report, recertification reports, yearly audits |

Data analysis

General trends of certification in the tropics

We first summarized our data to provide basic information on certification in the tropics. For certified tropical natural forests we have also analyzed how the total certified area have increased through time. As it has been argued that the certification movement has mostly benefited private individually-owned FMU rather than local or indigenous groups, we also looked at how the total certified area and the number of certificates issued increased through time for each type of certificate holder (i.e. individual, group, state). This comparison also allowed us to assess if the measurements undertaken by the FSC (such as Small Low Impact Managed Forests, SLMF) to increase the representation of communities and smallholders among certificate holders have already produced the desired effect (i.e. increase the adoption of certification among these stakeholders).

Common problems in managed tropical natural forests

We counted how many times a given criteria was mentioned in the 104 main reports available to us, so that we could define the most common and the least common criteria in the first evaluation of a FMU. Additionally we assessed the number of FMU that had problems with a given criterion (i.e. a given criterion was mentioned at least once in the public summary) to determine the distribution of commonly mentioned criteria among FMU. Finally, we determined if the type of issues raised varied with the country considered. For doing this we compared the frequency of criteria in the general sample with the frequency of criteria in the country sample (using a Chi square test). We carried out this analysis only for Bolivia, Brazil and Mexico as they have more than 20 certified FMU.

Changes over time

The main assumption of our study and similar studies is that the FMU deal satisfactorily with the issues raised in the list of CAR through time in order to maintain their certification (e.g., Newson et al., 2006). This assumption has rarely been tested (but see Hirschberger, 2005) although several forest operations have been certified for more than 5 years. We tested for this assumption in several ways (see Table 2 for a summary):

- 1 We selected 6 criteria covering legal, socioeconomic, and ecological aspects and followed them through time by reviewing the annual audits of 11 certified FMU. These criteria were the most commonly mentioned criteria in the main reports (Table 2) or were related to economical aspects (criterion 5.1, occupying the 8th position in number of times being mentioned in the main reports; Table 2). In that way we could determine the number of issues that were solved during the five years the certificate was valid. We were able to do this only for 11 certified FMU because we had access to both their main reports and annual audits;
- 2 We compared the number of months given by the evaluation team to solve a specific issue related to one or more criteria with the number

of months actually needed by the FMU to solve it, and tested if these timeframes differed from each other (using a paired t-test). For this analysis we used the same 11 certified FMU as previously, and included only issues related to the six criteria mentioned before. In some cases some issues were revised annually by the audit team (i.e. permanent issues), and therefore, were not included in our analysis;

- 3 We determined if the time required to solve an issue differed among criteria (using an ANOVA with time required for solving the issue as dependent variable and criteria as factor). We expected that issues related to legal aspects and social aspects would be closed in a shorter period of time than ecological and management related issues because the last ones require higher technical improvements and higher financial investments;
- 4 Every 5 years FMU undergo a main evaluation. Therefore, we have also assessed for 13 FMU if the number of times a criterion was mentioned declined from the first main evaluation to the second one, and if criteria mentioned during the first main evaluation were still being mentioned in the second one (i.e. the issue dealt in the criterion was not closed). We expected that the number of issues would decrease from the first to the second evaluation because FMU would have gone through a learning process during the first five years of being certified and because otherwise they should not have kept their certificate. Moreover we expected that issues raised in the first evaluation would be less common in the second evaluation. We tested for differences between the first and second main report using paired t-tests;
- 5 We compared the number of times criteria were mentioned in the first main and second main (re-certification) reports using all main (104) and all recertification (31) reports available in our sample (using a Chi-square test). This analysis allowed us to assess if in general there have been criteria that have increased or decreased in frequency through time.

Factors influencing the number of times criteria were mentioned

We identified what characteristics of the FMU determined the number of changes forest operations were required to make. First we analyzed if the area of the forest operation (in ha, log transformed), year of obtaining certification, and number of already certified forest operations in the country were determining the number of times criteria were mentioned in the main report. We selected these variables because several authors have suggested that larger companies have less issues raised as they have more economic means to solve problems before opting for certification (e.g., Newson et al. 2006) and because we expected that a learning process had taken place since the start of certification at international and national level. We tested these relationships using forward multiple regression analyses at the general and at the country level. Furthermore we grouped forest operations in 3 size classes: small (< 10,000 ha), medium (10,000 – 100,000 ha) and large (> 100,000 ha) to assess if the relationship between number of times

criteria were mentioned and the variables mentioned before varied among size classes of forest operations. Finally we looked at the effect of certificate holder, product harvested, and forest biome on number of times criteria were mentioned using ANOVAs, with area of forest operation as covariable.

Table 2. Summary of questions addressed for determining the changes made by the forest management units (FMU) over time. Number of criteria, sample size and statistical tests used are also given.

| Question addressed with | Sample size (statistic) | Criteria used |
|---|---|--|
| Audit report | | |
| 1. Are problems found in the main evaluation solved through time? | 11 FMU | 6 criteria followed through time (from main report to 5 th audit) |
| 2. Do FMU need more time to solve a problem than the time given by the evaluation team? | 11 FMU (t-test) | |
| 3. Does the time required to solve a problem differ among criteria? | 11 FMU (ANOVA) | |
| First and second main evaluations | | |
| 4. Is there a decrease in number of times a criterion is mentioned through time (from the first to the second main evaluation)? | 13 FMU with 1 st & 2 nd evaluation report (paired t-test) | All criteria |
| 5. Are issues raised in the first evaluation still open in the second evaluation? | | |
| 6. Does the frequency of criteria change over time? | 104 first & 31 second evaluation reports (Chi square) | |

We also determined if area of forest operation, year of obtaining certification, and the number of already certified forest operations in the country had an effect on the frequency of the most common criteria. We analyzed this at the general and at the country level using multiple forward regressions. The criteria tested in this analysis were the same six criteria used to assess changes through time using the annual audits.

Given that we were restricted for our analyses to the data available and the approach taken, certain topics are not analyzed. For example, topics such as the impact of certification on tropical forest deforestation (Gullison 2003), market premiums for certified products (Leslie 2004), improvements made by the forest operations before getting certified are not included. Additionally we could not assess other direct and indirect impacts of certification that are not included in the public summaries, such as a decrease in taxes paid to the government (as it is the case in Bolivia), and facilitation of community level processes.



3. General trends of certification in the tropics

Until mid October 2008 213 forest management units (FMU) were included in the databases of the various certification bodies as having received FSC certification within the tropical region. These 213 certificates cover an area of 10.9 million hectares (ha).

Years certified

On average these companies have been certified for 4 years, with a maximum of 13 years. About 66% of the FMU have been certified for less than 4 years, while about 28% of them have already gone through the first re-certification process, which means that they have been certified for 5-9 years. Only 4% of the FMU have gone through the second re-certification process; they are certified for 10 – 13 years. For 2% of the FMU we could not find this information.

Biome

Most certificates in the tropical zone have been issued to FMU that have forests classified as part of the tropical biome (135 certificates, 7.7 million ha). The rest of the certificates include forests classified as part of the subtropical biome (44 certificates, 2.6 million ha), temperate biome (13 certificates, 0.2 million ha), or contain a mix of forest biomes because of the altitude range found in the FMU (5 certificates, 0.3 million ha). Temperate forests can be found inside the tropics in mountainous areas at higher altitudes. For 16 certificates (0.2 million ha) it was impossible to find information regarding the forest biome.

Type of forest being managed

Certified forests are mostly production forests (98%). These production forests can be divided into managed natural forests (74% of the area, 119 certificates), plantations (22% of the area, 84 certificates), or a combination of the two (2% of the area, 4 certificates) (Figure 1). Interestingly two national parks are also certified, although no commercial harvesting takes place inside their areas (2% of the area, 2 certificates).

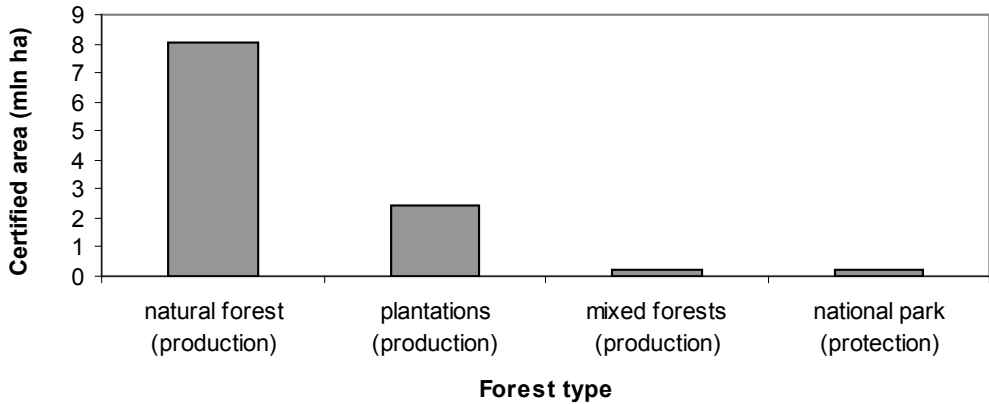


Figure 1. Certified forest area in the tropics classified by type of forest managed and management purpose (in parenthesis). FSC certified total area is 10.9 million ha.

FSC certified natural tropical forests

There are 119 FMU that have received FSC certification and that are exclusively managing tropical natural forest. Most of these certificates are located in the Americas (99 certificates, 5.8 million ha), followed by Asia (10 certificates, 1.3 million ha), Africa (8 certificates, 1.2 million ha) and Oceania (2 certificates, 0.04 million ha).

Country

Most certificates are issued to FMU in Brazil (26 certificates), followed by Mexico (22 certificates), Bolivia (20 certificates), and other 19 countries (51 certificates). About 28% of the certified area is in Bolivia, 16% is in Brazil, and another 22% is distributed over 16 different countries (Figure 2).

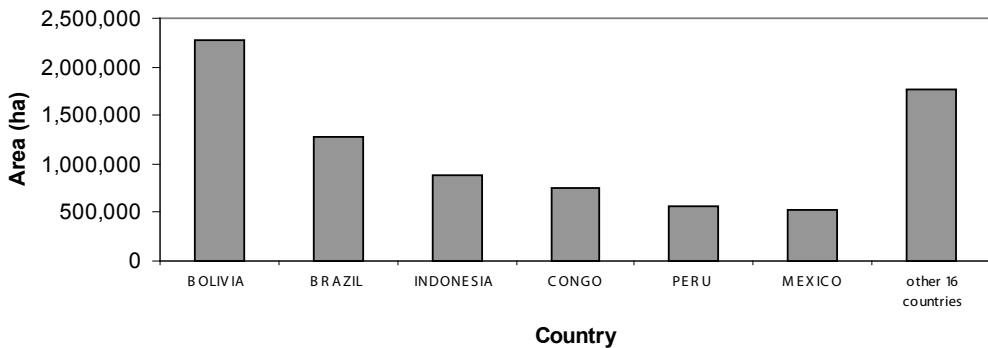


Figure 2. Area of natural tropical forest certified under the FSC scheme per country.

Area certified through time

The area of certified natural forest has increased steadily through time. However, since 2003 the increase in certified area is much larger than expected based on the previous years (Figure 3). This higher increase has

several possible explanations. One of them is that FSC certification is better known and recognized as a useful marketing label. Another possibility is that FMU take less time in getting certified as the certification requirements are better known; therefore, FMU improve their working practices before getting certified. Another explanation is that legal changes in certain countries have accelerated the certification process (e.g., Peru).

Certificate holder

Most of the certified tropical natural forests are managed by individuals (6.3 million ha, 78%), followed by groups (1.5 million ha, 19%), and the state (0.3 million ha, 3%). The largest number of certificates was handed out to individual owned FMU (64 certificates), followed by communities (55 certificates) and a small number issued to state managed operations (4 certificates). FSC has introduced different certification systems for smallholders and local communities to promote certification among these two groups of stakeholders. One of these options is a simplified and low-cost procedure called Small Low Impact Managed Forests (SLIMF). From the 55 certificates held by groups, 16 of them had opted from SLIMF, covering a relatively small area of 0.09 million ha.

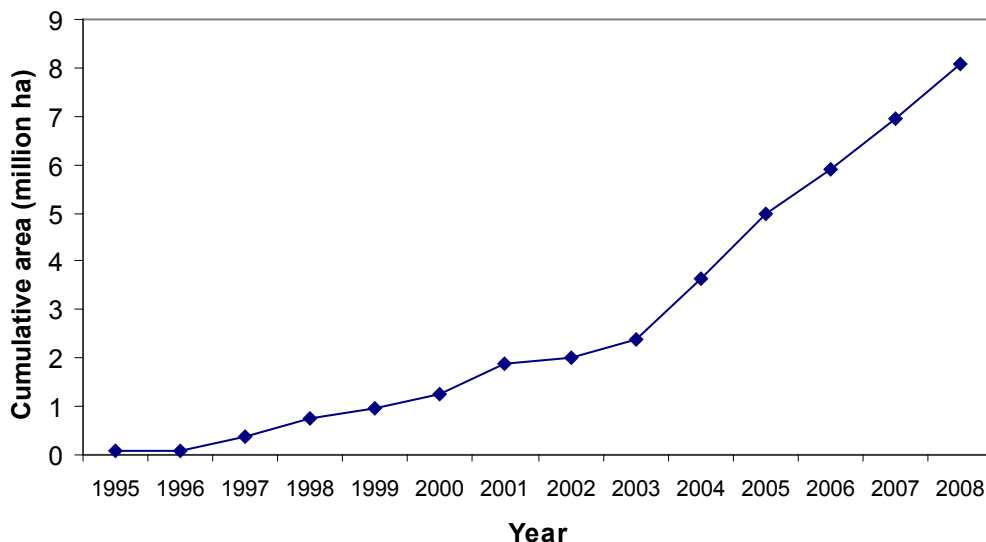


Figure 3. Cumulative area of natural tropical forest certified under the FSC scheme over time.

The largest increase in certified area through time is observed for areas that are managed by individuals (Figure 4A), while areas managed by groups or the state are increasing at a lesser rate. The number of certificates shows, however, a different development as certificates held by individuals and groups have increased in a similar rate through time (Figure 4B). These results indicate that certification is being obtained equally by these two types of certificate holders but that on average groups manage smaller areas (31,615 ha) than individual owned FMU (97,955 ha).

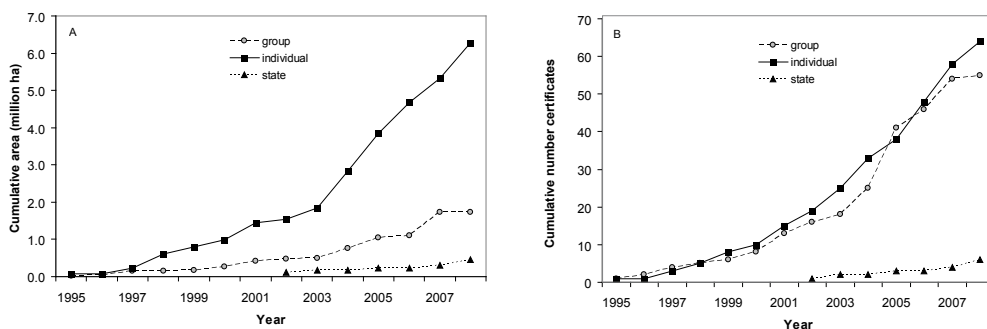


Figure 4. Cumulative area (A) and cumulative number of certificates (B) issued in the tropics per type of certificate holder. Only areas managing natural tropical forest are included. “Group” refers to certificates being hold by a group of people, indigenous communities or smallholders of land. “Individual” refers to certificates being hold by an individual-owned FMU. “State” refers to certificates being hold by the state.

Product harvested

Most certified tropical natural forests are extracting timber for commercial purposes (6.4 million ha, 76%), followed by the extraction of timber and non-timber forest products (NTFP) for commercial and non-commercial purposes (1.6 million ha, 19%) and the extraction of NTFP alone for commercial and non-commercial purposes (0.5 million ha, 5%). Among NTFP being harvested are bamboo (*Gadua* sp.), palm fruits (vegetal ivory, *Phytelephas* sp.), resins (*Copaifera* sp.), fibers (*Astrocarium vulgare*), seeds (*Bertholletia excelsa*).

Area under protection in FMU

About 18 % of the FMU area has been set aside for protection, i.e. no harvesting operation is allowed to take place in these areas. These areas are riparian forests, areas important for the wildlife, buffer zones or have been set aside as high value conservation forests or representative patches of forests without human disturbance.





4. Common problems at forest management unit (FMU) level

We have reviewed in total 135 public summaries of certification reports belonging to 123 FMU. The reports were prepared by a team of evaluators that assessed if companies were fulfilling the requirements for obtaining FSC certification. Evaluators issued a total of 3211 CAR, 547 major CAR (need to be solved before obtaining certification) and 2664 minor CAR (can be solved after becoming certified). On average, the evaluators gave to a FMU 4 major CAR and 22 minor CAR. CAR can refer to more than one criterion, so in total criteria were mentioned 3952 times, with an average of 1.2 criteria mentioned per CAR.

Common problems identified in main reports

Criteria differed in the number of times they were mentioned in our sample. The first most common 8 criteria made up 42% of the problems raised in the evaluation reports, while 22 criteria made up 75% of those problems (Table 3; complete list in Annex 3). These results indicate that none of the criteria dominated heavily in the 104 main reports analyzed, suggesting that certification has a potential impact on different aspects of forest management in the tropics.

Common problems per country

It could be expected that FMU located in the same country will share more common problems than FMU in different countries due to the fact that FMU in the same country have to follow the same regulations and are imbedded in the same socioeconomic and political framework. Therefore, we compared the common problems found worldwide with the common problems found in Bolivia, Brazil and Mexico.

The number of times that criteria are mentioned in the CAR given to Bolivian FMU did not differ significantly from the pattern observed for the whole tropical region (Chi square = 30.10, $p=0.66$). On the other hand, the number of times criteria were mentioned in the CAR given to Brazilian FMU and Mexican FMU differed from the general pattern observed in the tropics (for Brazil, Chi square=71.8, $p=0.002$; for Mexico, Chi square=44.4, $p=0.025$; Figure 5). For example, FMU in Brazil had more problems fulfilling the criteria “health and safety for employees and families”, probably because the labors law in Brazil is very demanding, while FMU in Mexico had more problems fulfilling the chain of custody standards.

Uncommon problems identified in main reports

Logically the least mentioned criteria are related to management aspects relevant mostly for plantations or mixed managed forests, like use of exotic species (criteria 6.9), use of biological control agents (criteria 6.8) (Annex 3). Contrary to our expectations several social aspects that are thought to be very relevant for the tropics are also ranked very low and are found in

less than 15 % of the certified FMU (Annex 3). Especially criteria related to indigenous people’s rights (3.1- 3.4) and workers’ right to organize and negotiate (criterion 4.3) are in this category. It is also worth mentioning that there were only very few cases FMU with evidence of forest conversion (criterion 6.10).

Table 3. The most commonly mentioned criteria given to the forest management units (FMU) in the list of Correction Action Request (CAR). Data was extracted only from main reports (n=104 main reports). “Ranking” refers to the percentage of times a given criterion was mentioned in our sample (total of 3102 times). “Distribution” refers to the percentage of FMU that had at least once an issue raised in certain criterion.

| Criterion | Description | Ranking | Distribution |
|-----------|--|---------|--------------|
| 4.2 | Health and safety for employees and families | 8,2 | 87 |
| 7.1 | Management plan | 6,7 | 79 |
| 6.5 | Use of reduced impact logging techniques to reduce impact to the forest | 5,6 | 74 |
| 8.2 | Monitoring of indicators, such as productivity, forest diversity, socioeconomic impacts | 4,8 | 76 |
| 5.6 | Harvesting regulations to assure long-term sustainability | 4,5 | 61 |
| 6.2 | Rare, threatened & endangered species | 4,0 | 73 |
| 8.3 | Chain of custody | 4,0 | 58 |
| 5.1 | Economic viability | 3,7 | 68 |
| 7.3 | Training and supervision of forest workers to ensure implementation of the management plan | 3,1 | 61 |
| 8.1 | Frequency and intensity of monitoring | 2,8 | 63 |
| 6.1 | Assessment of environmental impact | 2,7 | 54 |
| 4.1 | Communities are given employment, training, services | 2,7 | 46 |
| 1.1 | National & local laws | 2,6 | 46 |
| 1.5 | Protection from illegal activities | 2,6 | 54 |
| 4.4 | Evaluation of social impact | 2,5 | 60 |
| 6.3 | Ecological functions & values | 2,4 | 55 |
| 2.3 | Mechanisms to solve disputes | 2,3 | 44 |
| 6.4 | Protected areas | 2,1 | 44 |
| 6.7 | Waste (garbage) | 2,0 | 54 |
| 9.1 | Define existence of high conservation forest values | 1,9 | 52 |
| 2.2 | Local communities maintain control or they delegate it | 1,9 | 30 |
| 7.4 | Public summary of management plan | 1,8 | 57 |

Distribution of issues over pillars of sustainability

It has been argued that certification in the tropics is focussing mostly on social aspects related to forest management. To assess this statement we categorized the FSC criteria into the three pillars of sustainability: social, economical and ecological aspects, allowing if necessary each criterion to refer to more than one pillars depending on their scope. Then per pillar

of sustainability we summed up the number of times criteria had been mentioned in our analysis, and calculated a percentage. Criteria referring to management (like criteria 7.1, 7.2) and monitoring (like criteria 8.1, 8.2, 8.4, 8.5) were counted in each pillar as their scope refers to all of them. This exercise showed that the issues raised by evaluators are distributed relatively even among the different pillars of sustainability: ecological aspects (35%), economical aspects (34%) and social aspects (31%). The distribution found in our analysis matches very closely the frequency in which ecological, social, and economical criteria are present in the FSC International standards (Chi square=0.02, p=0.99). This result suggests that the composition of the standard directly influences the number of times ecological, social and economical aspects are mentioned in the CAR raised by the evaluation team.

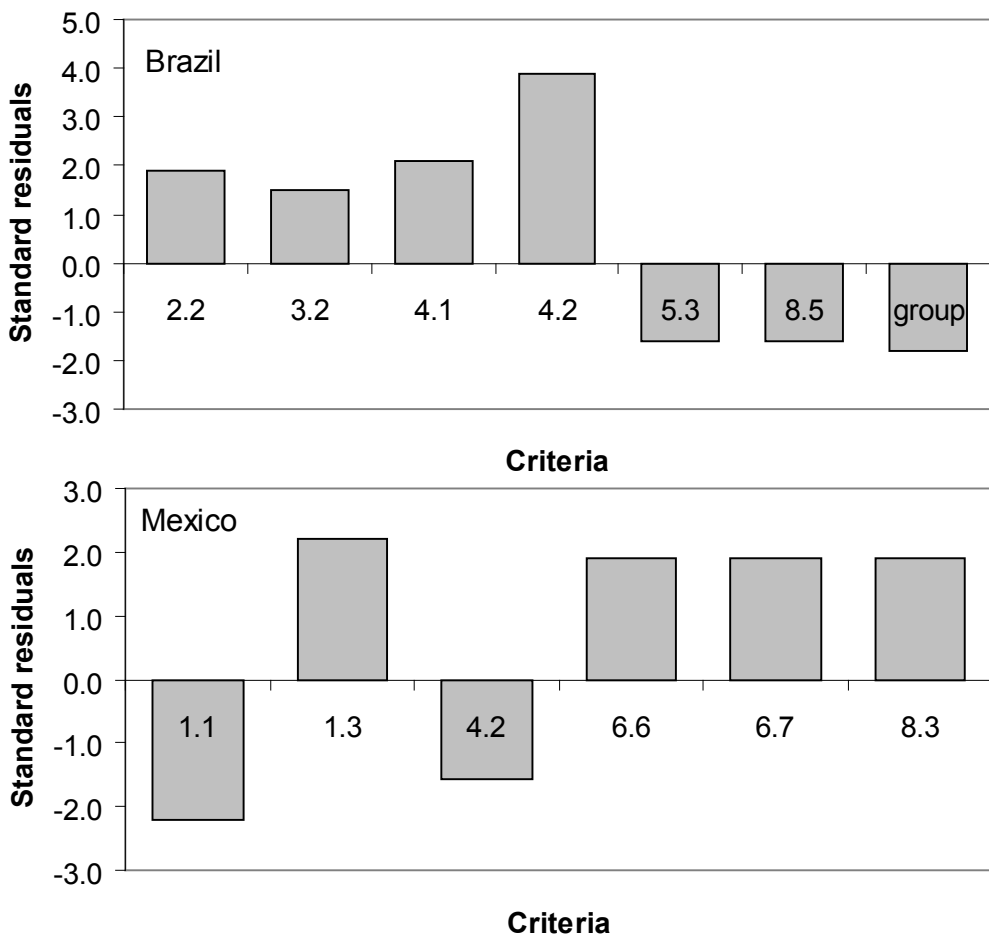


Figure 5. Criteria that are mentioned significantly more (values larger than 0) or less (values lower than 0) in forest management units (FMU) in Brazil and Mexico than it was expected based on the general pattern found for all FMU included in our sample. For criteria code see Annex 1.

Distribution of issues over operations

To evaluate the distribution of issues among FMU we calculated how many companies had a given issue raised at least once (Table 3). The criteria that were commonly mentioned in our analysis (“ranking” in Table 3) were also present in the majority of the FMU included in our sample (“distribution” in Table 3). For example, issues related to the health and safety of employees, the forest management plan, the monitoring plan of the FMU, the use of reduce-impact logging techniques, the protection of endangered or threatened species, and the economic viability of the FMU are common problems found in 61 to 87% of the FMU certified in the tropics.





5. Changes over time at the FMU level

General assessment of change over time

The frequency with which criteria were mentioned differed significantly between main evaluation reports and the re-certification reports (Chi square=54.7, $p=0.02$). This difference is mainly due to a decrease in the frequency of criteria “working conditions for workers” (criterion 4.2), “assessment of environmental impact” (criterion 6.1), and “the application of reduced-impact logging techniques” (criterion 6.5), and an increase in frequency of criteria “elaboration of summary of management plan” (criterion 7.4), “design of monitoring system” (criterion 8.1), and “monitoring of high conservation value forest” (criterion 9.4).

Evaluating changes with the annual audits

The certification body checks each year if minor CAR have been fulfilled by the certified FMU within a given timeframe. Our analysis shows that the certification body used different options in dealing with (partially) unsolved CAR: (1) the FMU was given more time to deal with the CAR if there was a good reason for the delay; (2) the CAR was upgraded to a major CAR if there was not a good reason for the delay; and (3) the partially solved CAR was closed and a new CAR was opened dealing with the remaining open aspects of the old CAR. Especially the last option made it hard to judge whether the issue being dealt in the CAR was solved within the given timeframe. All these observations, made us conclude that CAR should not be assessed one by one, since required changes often call for a sequence of CAR (first dealing with a plan, then with the implementation of the plan, and then the monitoring of the plan). Therefore, it is more appropriate to follow a given topic over time, than to follow a given CAR over time.

We followed the yearly audits of 11 certified FMU to assess how these FMU had dealt with CAR related to 6 criteria. These 6 criteria were the most common ones in our sample and covered economical, ecological and social aspects (Table 3); in this subsample they were mentioned 105 times. Of these 105 issues raised, we could only follow 86 of them (82%) through time because some issues were not reported back in the yearly audits. It is possible that these issues were closed or were skipped from the evaluation but no statement defining their status could be found in the yearly audits.

From the 86 issues that we could follow through time a subset (17 issues) was classified by the evaluation team as permanent issues, to be checked every year, regardless of the outcome of the yearly audit. Permanent issues were mainly related to the management plan (7 issues) and reduced-impact logging techniques (7 issues). The evaluation team considered that most of them (82%) have been dealt with properly by the FMU during the five year period analyzed. Similar results were also found for the other 69 non-permanent issues, of which 98% have been considered closed by the evaluation team during the same period.

The FMU were given by the evaluation team on average 14.6 months (range 6 - 48 months) to solve a given issue. The time needed to solve the issue was almost twice as long as the time given by the evaluation team (average 27.7 months, range 6- 60 months). Consequently, the time given is significantly shorter than the time needed to solve an issue (paired t-test, $t=-7.6$, $p<0.001$; Figure 6). The criteria analyzed differed in the number of months they required for being solved (ANOVA, $F_{5,62}=2.4$, $p=0.046$; Figure 6). The FMU needed significantly less time to solve problems related to the health & security of employees (criterion 4.2) than to solve problems related to monitoring of indicators (criterion 8.2). The time needed by the other criteria was intermediate between these extremes.

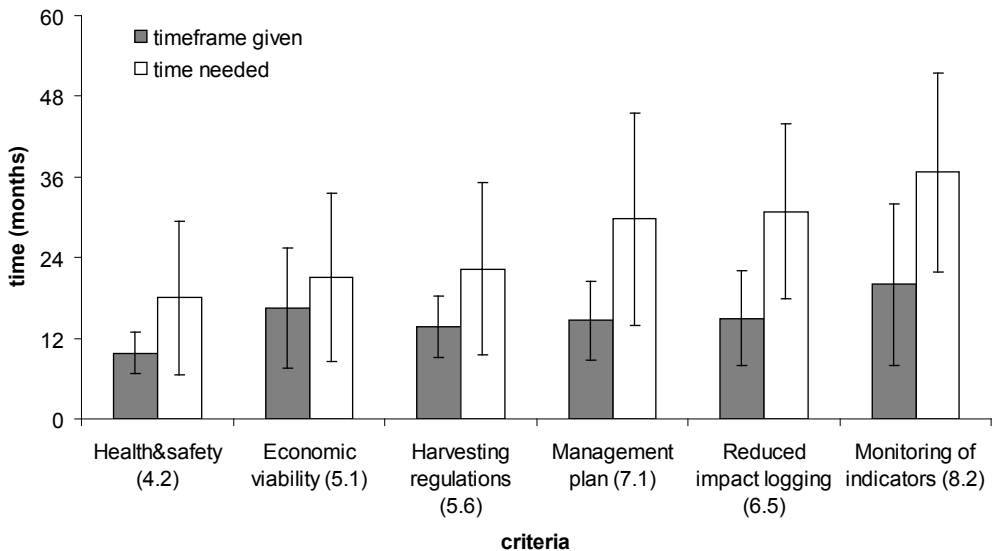


Figure 6. Timeframe given by the evaluation team versus time needed by the FMU to solve the most common problems found in our sample. Based on audits reports of 11 FMU.

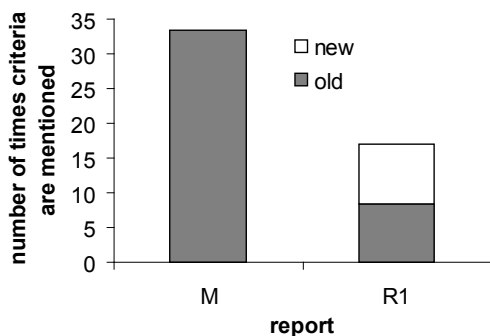


Figure 7. Average number of times criteria were mentioned in the main report (M) and re-certification report (R1), showing for the re-certification report the average number of times new criteria are mentioned and the average number of times that criteria already mentioned in the main report are still mentioned in the recertification report.

Evaluating changes using main reports

We also followed the changes done by FMU by looking at the main report and the first re-certification report of 13 operations (out of 15 with public summaries of both evaluations). This comparison allows comparing data coming from evaluations that are very similar in effort, time and scope used during the evaluation process. The number of times a given criteria was mentioned in the main report was higher than the number of times a given criteria was mentioned in the re-certification report (paired t-test, $t=4.7$, $p=0.001$; Figure 7), indicating that overall FMU improved their management level through time. If we considered only the criteria being mentioned in the first evaluation, we found that FMU have dealt with most of them by the second evaluation (paired t-test, $t=7.6$, $p<0.001$; Figure 7, “old issues”). It is likely that some of the pending “old issues” during the second evaluation included criteria that needed continuous evaluation (i.e. permanent CAR), which means that the “old issues” could be less than presented here.

Changes over time vary depending on the criterion considered. Criteria may increase, decrease or remain equal in frequency through time. Depending on their frequency both in the main report and the recertification report, we were able to identify four possible patterns of change through time, and have classified criteria as following:

1. “Silent criteria” are criteria having a low frequency both in the main and recertification reports (mentioned <3 times in both reports analyzed of the 13 FMU included in the sample). Examples of this type of criteria are conflicts between law and FSC criteria (1.4), rights of indigenous peoples (3.1, 3.2, 3.3, 3.4), right of forest workers to organize and negotiate with their employers (4.3), control over exotic species (6.9), and land conversion (6.10).
2. “Criteria sequences” are criteria producing a low number of issues in the main report and a high(er) number of issues in the recertification report because they require further action. For example, the maintenance of high conservation value forests is a stepwise process. These forests are first identified (9.1), then the decision is discussed with stakeholders (9.2), measures for their maintenance are developed (9.3) and monitored (9.4). The sequence takes more than 5 years; therefore, these criteria are mentioned more often through time. Another example of criteria sequences are criteria related to monitoring, which is a management aspect that requires time.
3. “Easy to solve criteria” are criteria having a high frequency in the main report (>10) and a low frequency in the recertification report (<5). These criteria are solved within the first 5 years of certification. Examples are criteria such as communities within the forest management area are given opportunities for employment, training or other services (4.1), forest services (watersheds, fisheries) are recognized (5.5), rate of harvest is sustainable (5.6), environmental impact assessments are executed (6.1), endangered species are protected (6.2), ecological functions and

values are maintained (6.3), and protected areas are established inside the FMU (6.4).

4. "Difficult to solve criteria" are criteria having a high frequency both in the main and recertification report (>10). Examples of these criteria are health & safety of workers (4.2) and the results of socioeconomic impact assessments (4.4). These criteria are difficult to solve probably because they are very broad in scope and include a variety of topics ranging from working conditions, contracts, insurances gender issues to safety related aspects (like 4.2).





6. Factors influencing the impact of certification at different levels

We analyzed what characteristics of the FMU determined the number of changes that FMU were required to make during the first certification process they underwent. We found that the number of issues raised by evaluators decreased through time (since forest management certification has been in place) and increased with area of the FMU (multiple forward regression, $r^2=0.29$, $p<0.001$; Figure 8). The fact that the number of issues decreased through time suggests that the standards of forest management certification have become better known through time and that companies have better working standards before requesting a certification evaluation than they used to do at the beginning of the certification movement. The fact that the number of issues raised increased with area of the FMU indicates that larger FMU are faced with more challenges for obtaining certification than smaller FMU, maybe because the evaluation team tends to be stricter when certifying larger areas. At the country level the factor determining the number of times criteria were mentioned varied but it was mostly related to area of the FMU (Table 4). It is worth mentioning, however, that for most countries no relationship was found probably due to small number of certified FMU.

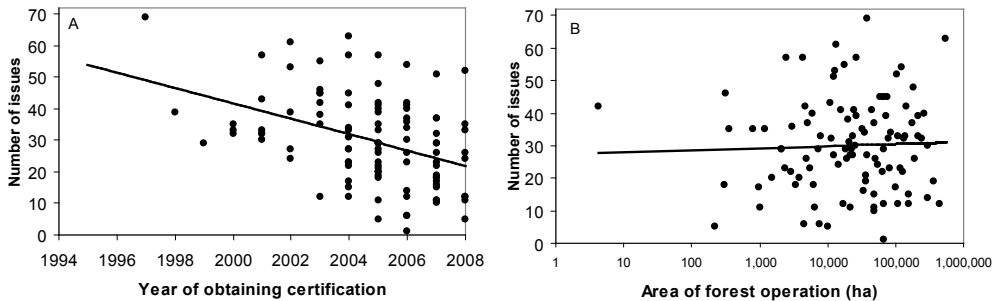


Figure 8. Relationship between number of issues given to a FMU during the certification process and year of obtaining certification (A) and area of FMU (B). X-axis in B is in log-scale. Each dot represents a FMU.

FMU were classified in 3 groups based on their area to assess if different factors were affecting the number of issues raised when FMU of similar sizes were considered. Large FMU (>100,000 ha) had on average a higher number of issues raised than medium (10,000-100,000 ha) and small (<10,000 ha) FMU (ANOVA, $F=9.9$, $p<0.001$; Figure 9A). In the case of the medium and large FMU, the number of issues being raised decreased with year of obtaining certification (multiple forward regression; for medium size FMU: $r^2=0.14$, $p<0.008$; for large size FMU: $r^2=0.30$, $p<0.007$). There was no effect of the other variables included in the model (area of FMU and number of certified companies in the country). Number of issues

raised to small size FMU was not affected by any of the variables being tested. These results suggest again that FMU have gone through a learning process since the start of the certification movement and that FMU being certified nowadays have higher working standards than in the early years of certification. This learning process seems, however, to be restricted to medium and large size FMU regardless of the certificate holder.

Table 4. The effect of year of obtaining certification, area of FMU (in log) and number of certified companies in the country on number of times criteria are mentioned in the list of CARS given to FMU during the certification process. Countries not included in this table did not show an effect of these variables on number of issues, probably because of low number of certified companies in the country. Slope and direction of relationship is provided.

| Country | Number of FMU | Year of certification | Area forest operation | # certified companies | p | r ² |
|---------------------------|---------------|-----------------------|-----------------------|-----------------------|--------|----------------|
| Bolivia | 16 | . | . | -1.6 | 0.02 | 0.32 |
| Brazil | 24 | . | 12.2 | . | <0.001 | 0.48 |
| Mexico | 18 | . | 9.2 | . | <0.001 | 0.68 |
| Peru | 10 | . | -15.8 | . | 0.05 | 0.40 |
| Rest America ¹ | 6 | 14.6 | . | . | 0.02 | 0.96 |

¹ Countries included in this group are Argentina, Belize, Colombia, Costa Rica, Dominican Republic, and Nicaragua.

Given that individual-owned FMU in the tropics tend to have more economic means to meet the certification standards than group-owned FMU, we expected that the number of issues raised during the evaluation process would vary with certificate holder (i.e. individual or group). Our analysis, however, does not support that expectation, as the number of issues being raised was not affected by certification holder (ANOVA, $p=0.31$) but depended on the size of the FMU (ANOVA, $p<0.01$; Figure 9B).

The extraction of NTFP is in general less deleterious to the environment than timber extraction (Putz et al., 2001), and it is supposedly done taking into account more seriously the social aspects. Consequently, we were expecting that the number of issues being raised during the evaluation process would vary with product extracted. Our results, however, indicate that the forest product being harvested does not influence the number of issues being raised (ANOVA, $p=0.47$; Figure 9C).

Forest biomes influenced the number of issues raised during the evaluation process (ANOVA, $p=0.03$; Figure 9D). FMU comprising tropical forests received on average more issues than FMU with subtropical forests probably because tropical forests are more complex in terms of structure and have higher diversity than subtropical forests. Although temperate forests are less complex in structure and less species diverse, they receive an intermediate number of issues raised. This result could be due to several factors, among them that temperate forests were mostly located in hilly terrains and higher altitudes than the other forest biomes, they are all located in Mexico, and all of them are managed by local people.

The number of times the most common criteria were mentioned in our sample decreased mainly with year of obtaining certification (Table 5), again indicating that FMU getting recently certified fulfilled better the FSC standards regarding specific issues than companies certified at the start of the certification movement (Figure 10).

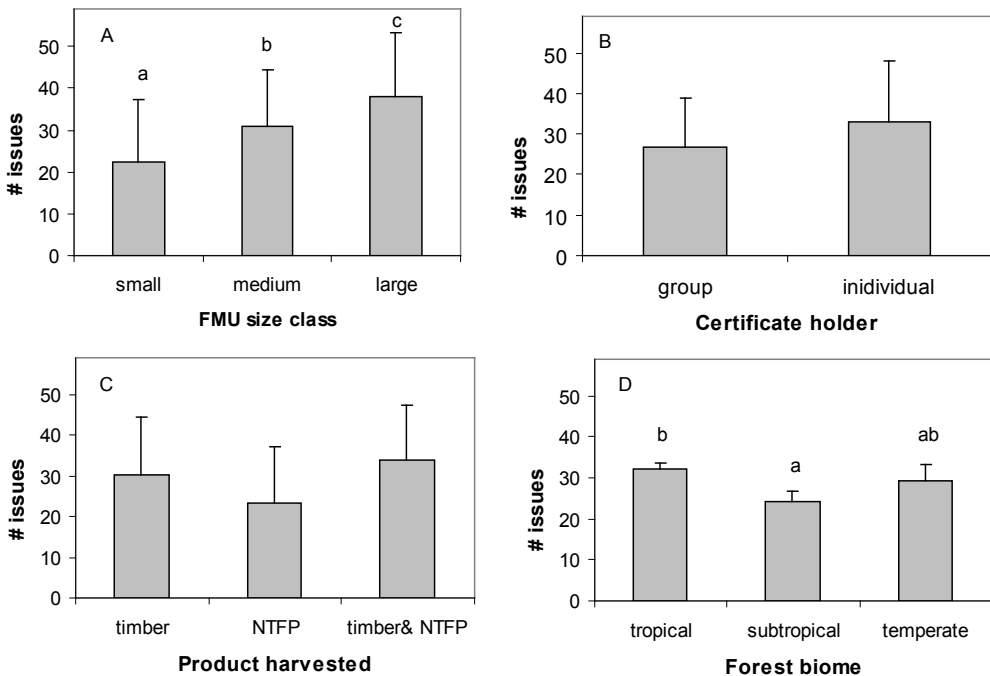


Figure 9. Number of issues being raised during the evaluation process in FMU differing in size class (A), certificate holder (B), product harvested (C), and forest biomes found in the tropical region. Temperate forests are found at high altitude levels (mostly Mexico). Different letters indicate significant differences among groups.

At the country level the factors determining the number of times the most common criteria were mentioned varied with country and issue considered.

Number of times a given criteria was mentioned increased mostly with area of FMU and decreased with year of certification and number of certified companies in the country. In general these factors could explain between 30 to 90 % of the variation found in the data (Table 6). There were, however, issues like “health and safety for employees and their families” and “monitoring of various aspects” that were rarely or never explained by the factors included in the analysis. These results indicate that the number of

Table 5. Factors determining the number of times common issues are raised in our sample (n=102 FMU). Only the five most common issues were included in the analysis. Slope and direction of relationship is provided for each factor included in the model.

| Issue | Year of certification | Area FMU | # certified companies | p | r ² |
|--|-----------------------|----------|-----------------------|--------|----------------|
| Health and safety for employees & families | . | . | . | . | . |
| Economic viability | -0.13 | . | . | 0.004 | 0.08 |
| Harvesting regulations | -0.22 | 0.50 | . | <0.001 | 0.16 |
| Reduce impact of logging operation | -0.28 | 0.51 | . | <0.001 | 0.20 |
| Management plan | -0.39 | . | . | <0.001 | 0.24 |
| Monitoring of various aspects | -0.19 | . | . | <0.001 | 0.12 |

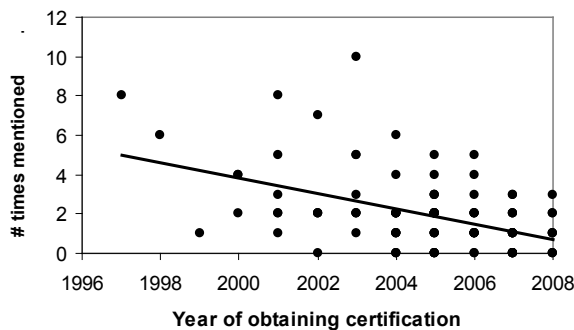
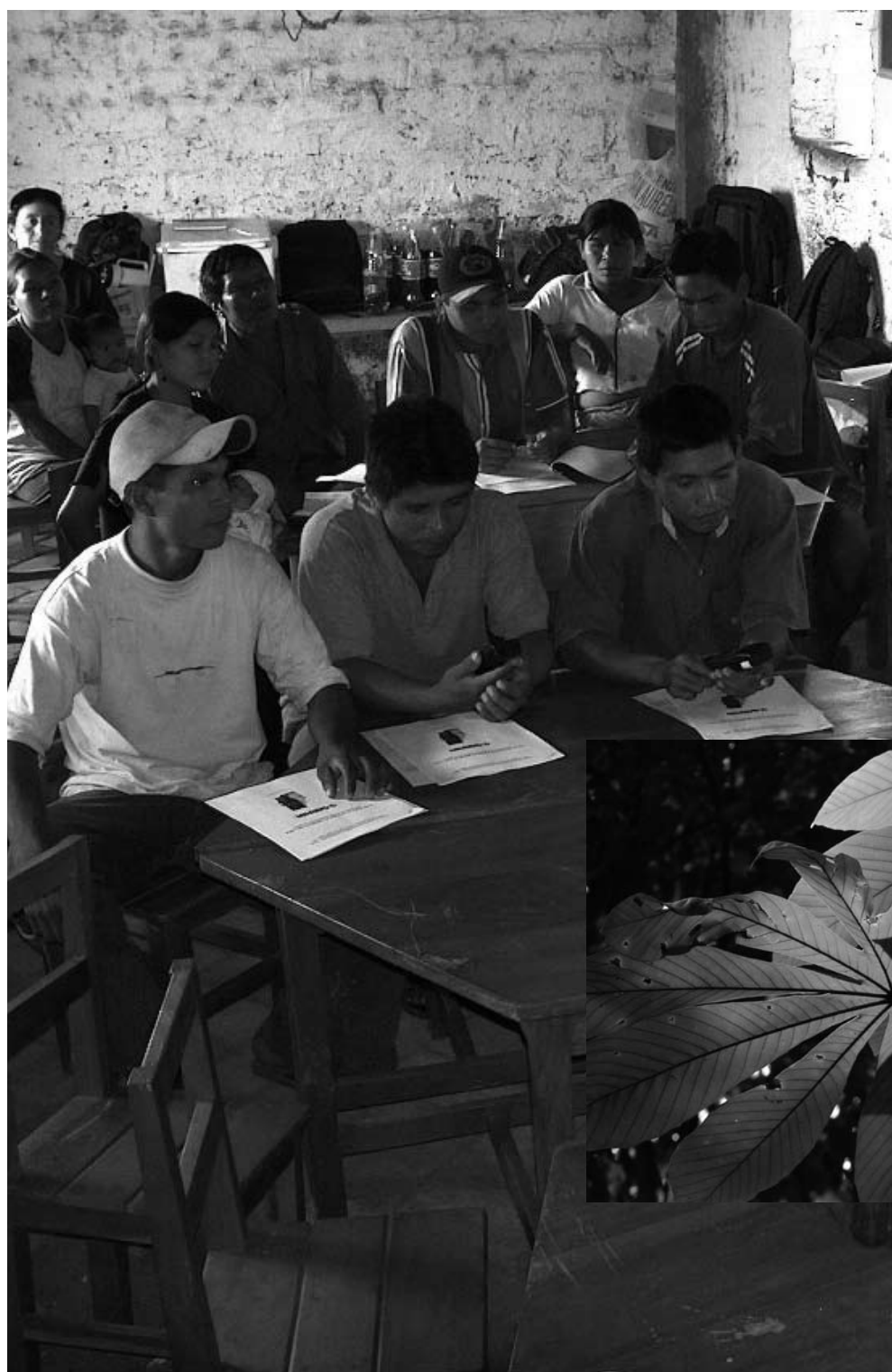


Figure 10. Examples of the relationship between year of obtaining certification and number of times management plan (criterion 7.1) was mentioned as an issue in our sample.

times these criteria were mentioned at the country level varied with other factors than the ones being evaluated in this study. Additionally it is also worth mentioning that in Brazil factors like year of obtaining certification and area of forest production were equally important for explaining the number of times issues were mentioned, while in Mexico the most important issue was area of FMU. It was also interesting to see that the factors tested explained very few of the most common criteria in Bolivia.

Table 6. Factors determining the number of times common issues are raised in our sample. Only the six most common issues were included in the analysis. Slope and direction of relationship is provided for each factor included in the model.

| Issue | Year of certification | Area FMU | # certified companies | p | r ² |
|--|-----------------------|----------|-----------------------|--------|----------------|
| Bolivia (n=20 FMU) | | | | | |
| Reduce impact of logging operation | -0.44 | . | . | 0.03 | 0.30 |
| Management plan | . | . | -0.21 | 0.003 | 0.47 |
| Brazil (n=26 FMU) | | | | | |
| Health and safety for employees & families | . | 1.90 | . | 0.03 | 0.20 |
| Economic viability | -0.46 | . | . | <0.001 | 0.53 |
| Harvesting regulations | . | 1.13 | . | 0.04 | 0.19 |
| Reduce impact of logging operation | -1.93 | 1.53 | 0.46 | <0.001 | 0.72 |
| Management plan | -0.64 | . | . | 0.001 | 0.39 |
| Mexico (n= 22 FMU) | | | | | |
| Economic viability | . | 0.20 | . | 0.007 | 0.48 |
| Harvesting regulations | . | 0.66 | . | 0.01 | 0.32 |
| Reduce impact of logging operation | . | 0.58 | . | 0.008 | 0.36 |
| Management plan | . | . | -0.15 | 0.04 | 0.24 |
| Peru (n=10 FMU) | | | | | |
| Economic viability | . | -1.45 | . | 0.03 | 0.47 |
| Reduce impact of logging operation | . | -1.78 | . | 0.03 | 0.45 |
| Honduras (n=6 FMU) | | | | | |
| Harvesting regulations | . | -0.32 | . | 0.01 | 0.90 |



7. Discussion

Forest management certification is a mechanism that guarantees that forest products being acquired by buyers come from socially and environmentally well-managed forests. This voluntary market-driven mechanism was established in 1993 after a long consultation process, and provides an honest and credible system to identify well-managed forests. The total area of certified natural tropical forests is currently 8.5 million ha¹. The certified area has increased through time, at a higher rate since 2003 (Figure 3), but it still represents a small proportion of the total area certified in the world (about 3%) and a small proportion of the total area covered by tropical forests (0.5%; Wenban-Smith, 2007). If the certified area in the tropics is compared to the total area of forest considered to be sustainably managed by ITTO in 2005, then the certified area of natural tropical forest represents 27% (Wenban-Smith, 2007). This percentage is considered a good accomplishment given the low area being managed sustainably in the tropics when certification started. These numbers also mean that there is a large scope for expanding the area of certified natural forests (as 73% of the production forests have not been certified yet). For increasing the area of certified forests it would be necessary to deal with several limitations that have hindered its adoption in the tropics, such as trade barriers, low supply of tropical wood, high cost of certification, high technical demand, lack of straightforward financial benefits, among others (Wenban-Smith et al., 2007).

The area certified in the tropics tends to be mostly located in Central and South America, with much less area in Africa, Asia and Oceania. This trend could be related to the fact that there have been several initiatives embracing and promoting forest management certification in several countries in Latin-America (such as in Bolivia, Brazil and Peru), and that there were several FMU with experience on sustainable forest management when the certification movement started (such as several 'ejidos' in Mexico). Additionally there were several development projects providing technical and financial assistance to improve the working standards of FMU so that certification could be reached (such as BOLFOR project in Bolivia, PERUFOR in Peru). Another reason may be related to the fact that the headquarters of FSC were located in Mexico for the first 10 years of the certification movement. A similar effect is also being observed nowadays in Africa where a regional FSC office has been recently established in Ghana. There are several initiatives promoting certification and the first concrete results are being observed: recently more than 2 million ha have become

¹ After we constructed our database there were two FMU being certified in Africa with a total of 2 million ha. These areas have not been included in our analysis and statistics as their information was not available online before October 20th, 2008.

certified². Consequently, one may conclude that for increasing the area of certified natural tropical forest it is not only necessary to increase the demand for certified wood but it is also necessary to provide technical and financial assistance.

It has been claimed that most of the certified area is being managed by large individual-owned FMU, and that consequently, certification is not really accessible to smallholders and local communities. If we look at the area data, this claim is clearly confirmed (Figure 4A) as the majority of the certified area is being managed by individual-owned FMU. If we look at the number of certificates instead, then this claim does not hold because there is more or less the same number of certificates owned by individual and group-managed FMU (Figure 4B). This trend also indicates that groups are opting for certification but that their areas tend to be smaller in size than areas of individual-managed FMU. Given that in several tropical countries local and indigenous communities have been granted legal access to the forest in the last decade (White & Martin, 2002), it can be expected that with time these groups are going to opt for certification and that the total certified area managed by them will also increase.

Assessing the impact of certification

To assess the impact of forest management certification on ecological, economical and social aspects we have carried out an analysis of the Corrective Action Requests (CAR) resulting from the evaluation process that FMU undergo to become certified. The assumption of this type of studies is that FMU will carry out all needed activities to solve the problems being raised in the CAR. Few studies have looked if this assumption is met through time, although the information for doing so (annual audits and recertification reports) is available online.

In this study we checked if the abovementioned assumption held for FMU managing natural tropical forests, using different approaches (Table 2). We found that of the issues that we were able to follow through time (82% of all issues raised) most of them were solved by the company (82% of permanent issues and 98% non-permanent issues) during the five annual audits after the main evaluation. We found also a decrease in number of issues raised from the first to the second main evaluation (Figure 7). Therefore, our results strongly support the assumption that issues raised in the CAR result in an improvement of forest management standards of certified FMU. They also indicate that the CAR analysis is an appropriate tool for evaluating the impact of forest management certification because the majority of the issues raised in the list of CAR could be followed by reviewing the annual audits (for more on this last point see section “Public summaries – their use as a monitoring tool”).

² Idem as footnote 1.

The most common criteria in our CAR analysis were related to economical, ecological as well as social issues (Table 3), indicating that certification has a positive impact on all aspects of forest management. This finding contradicts the general belief that the impact of certification in tropical forests is mostly on social issues. Moreover it is actually interesting that several social criteria (mostly related to indigenous people) are not included among the most common issues raised in our sample (see Annex 3), suggesting that managers of FMU are dealing with these issues in a satisfactory way before undergoing the certification process, that these issues are not really a problem in the tropics, or that the evaluation team, regardless of their efforts, is not being able to identify these issues as a problem during the evaluation process. Finally, our data indicate that certification improves the working conditions and training of employees working in the FMU, creates employment opportunities for local people, enhances the mechanisms to solve disputes, and provides guarantees that local communities keep in control of their forests.

Among the economical aspects related to forest management, we found that the long-term economic viability of the FMU was the most common issue being raised by the evaluation team. This result is in agreement with results found in another study (Newson and Hewitt, 2005), indicating that FMU in the tropics are more in need of business plans and financial analyses than FMU elsewhere. These requirements have sometimes led to the restructuring of the company to include an accounting division and to an improved monitoring system of the costs and income from forest operations.

The majority of the most common criteria were related to ecological aspects of forest management (Table 3), such as the application of proper reduced-impact logging techniques, harvesting regulations, and protection of rare, endangered and threatened species. Similar issues were also found to be common among FMU in temperate forests (Newson and Hewitt, 2005; Newson et al., 2006). It is, however, worth mentioning that in total there was no large difference among the three pillars of sustainability (social, economical and ecological aspects) in terms of the number of times each pillar was mentioned in the public summaries.

Our results also indicate that certification is likely to have a large impact on the long-term sustainability of forest management mainly because FMU are requested to improve their monitoring system and to incorporate the results of the monitoring system into their management practices (Table 3). The monitoring system should monitor among others forest productivity, impact of harvesting on forest diversity, and changes in species composition. The monitoring system is, however, also a substantial burden for the FMU because often managers are requested to carry out a series of research activities that are costly and for which they do not have

the appropriate staff and financial means. Actually it has been questioned if this approach is the correct one to follow given that FMU have also vested interests on the results they are obtaining (Schulze et al., 2008). Consequently, it has been suggested that the evaluation team should promote strong partnerships between FMU and research institutions. In that way the information required to improve the harvesting regulations (such as cutting cycles, harvesting intensities) can be defined based on proper and long-term monitoring carried out by independent researchers (Schulze et al, 2008; Putz et al., 2008). This type of partnerships are probably crucial, given the fact that several studies have shown that neither the FMU nor the certification schemes are incorporating rapidly enough research results into their management practices or evaluation standards. For example, the application of reduced-impact logging techniques, which have been heavily promoted by the certification movement and which occupies the third position among the most commonly mentioned criteria in our study, is not enough to guarantee sustainable timber yields in most tropical forests (e.g., Dauber et al, 2005; Fredericksen et al., 2003; Peña-Claros et al., 2008, Valle et al., 2007; van Gardingen et al., 2006). There are several approaches that can be taken to solve this issue (Dauber et al, 2005), being the application of silvicultural treatments one of the most promising ones (Peña-Claros et al., 2008; Putz et al., 2008; Wadsworth and Zweede, 2006). Consequently, it has been argued that certification should also promote the application of such treatments as it has promoted the application of reduced-impact logging techniques (Peña-Claros et al., 2008; Putz et al., 2008).

Factors influencing the impact of certification at different levels

Our results suggest that there has been a learning process since the forest management certification movement started. This learning process has occurred at different levels or scales: tropical region, country and FMU level. At the tropical region level the learning process has resulted in a decrease in the number of issues being raised by the evaluation team through time (Figure 8A), so that FMU being evaluated nowadays have fewer issues raised than FMU evaluated in the past. This result suggests that FMU have now higher working standards than in the past, which in turn suggests that certification is having a positive impact on FMU even before they are certified. Additionally at the FMU level our results clearly show a learning process because the same FMU had fewer issues raised in the second main evaluation than in the first main evaluation (Figure 7). If one considers only the issues being raised in the first main evaluation, then the learning process becomes even more pronounced because only few issues remained open after five years. This trend is also observed when reports from the first and the second evaluation are compared, indicating that FMU in general do better during their second evaluation than during their first one. These results contradicts the idea that the decrease in number of times criteria

are mentioned in the reports is due to an improvement in the certification system.

The learning process that FMU have undergone through time since the start of the certification movement is also clearly observed when the most commonly mentioned criteria (Table 5) are considered. Five of the six criteria analyzed have been mentioned less often in the main reports as time has passed (Table 5), indicating that FMU are improving their standards also in the most problematic aspects of forest management in the tropics. Interestingly enough we did not observe such a pattern for the most commonly mentioned criteria: health and safety of employees and their families. This result could be due to the fact that this criterion is very broad in scope and encompasses issues such as health and working conditions but also issues such as training, contracts, gender aspects, etc. It could also be related to the fact that working conditions for employees in the tropics are in general low, and therefore, a larger economic input is needed to solve them. Another explanation is that certain issues included in this criterion need to be solved in a stepwise fashion (e.g., if employees have to be vaccinated against diseases as yellow fever, then FMU have to keep track of people becoming ill with this disease, and training has to be given to reduce cases of infestation). However, the number of times that this specific criterion is mentioned decreases from the first to the second main report, indicating again that certified FMU improve the working and health conditions of their employees through time.

At the country level the factor influencing the number of issues being raised is mostly related to the area of the certified FMU (Table 6). It is, however, difficult to make strong conclusions at the country level because there are only few countries (Bolivia, Brazil, Mexico, and Peru) with enough number of FMU to carry out a proper statistical test.

Another possible explanation for the trends described earlier is the fact that certification bodies and evaluators have also learned during the process. This learning process is observed in the higher quality and clarity of the reports produced from 1999-2000 onwards, and in the fact that evaluators have specialized and have received additional training. Consequently, it is possible that this explanation also plays a role in the improvement that we have observed. We think, however, that its role in our results is not large for several reasons. We have included in our database different countries and different certification bodies that are very likely to have undergone different learning processes through time. This fact is observed when data are analyzed at the country level: different factors determine the number of times criteria are mentioned (Table 4 and Table 6). Actually the year of certification plays a less important role at the country level (Table 4 and Table 6) than at the regional level (Fig. 8, Table 5).

Public summaries – their use as a monitoring tool

The public summaries of certified companies provided a wealth of information. The most relevant information presented is probably the list of CAR given to the FMU by the evaluation team. The CAR have been used by several authors to assess the impact of certification on economical, social and ecological aspects related to forest management (e.g., Newton & Hewitt, 2005; Newton et al., 2006; Hirschberger, 2005). For this study we have reviewed 138 reports (104 main reports and 34 recertification reports). These reports were produced by 9 different certification bodies to present the results of evaluation processes carried out in 22 different countries from 1995 to 2008. As a result of that the reports varied significantly in the format used to present information about the FMU and the results of the evaluation process. These differences have decreased in the last years, with reports getting more similar among each other even in the case of reports written by different certification bodies. In the last years the quality of the reports have also improved as CAR are listed in a more organized way and are clearly related to one or more criteria.

Although reports tend to have different formats, they contain in general terms the same type of information. Reports included generally the following information: basic characteristics of the FMU, socioeconomic and ecological context of the FMU, information about the evaluation team, list of activities carried out during the evaluation process, results of the evaluation process, final decision regarding the certification of the company, and the list of CAR given to the FMU. Nevertheless, we had difficulties finding the following information in the reports:

- year of first certification: needed to assess the performance of the FMU through time;
- total area certified: required to provide statistics on total area certified in the tropics or elsewhere. The total area certified varies through time, mostly in the case of plantations or areas owned by a group of people, which makes it difficult to use the data for producing statistics about the adoption of certification;
- forest type being managed: needed to determine what proportion of the total area certified in the tropics are natural forests or plantations;
- the status of the product being harvested by local people inside a FMU: needed to determine if the company is managing the forest for more than one product.

To assess the impact of certification on forest management more directly, it is necessary to assess how FMU have changed through time as a result of the CAR given to them by the evaluation team. Consequently, for this analysis it is important to have access to all reports produced through time. In several cases this was not possible because the certification bodies only maintain in their webpages the last report produced, which hinders the possibility to assess the performance of FMU that have undergone a second or even third

evaluation process. This is unfortunate because there are a lot of lessons to be learned from FMU that are certified for a longer period of time in terms of changes done, processes undergone, and systems implemented. Additionally certain characteristics of the reports made the analysis of CAR through time difficult. These characteristics are:

- Some CAR were renumbered over the years, which made it hard to follow them through time;
- Not all CAR were related to specific FSC criterion (a common problem with old reports);
- Some CAR could not be found in the following report, and it was not clear if the issues mentioned in the CAR were closed or not;
- The reason why the evaluator decided to close the CAR is often not given, which reduces the options to use this information for drawing lessons learned.

One way to go around these problems is to follow topics instead of specific CAR but based on our experience we think that this option is very time consuming and diminishes the value of the public summaries as monitoring tools. Consequently, we would like to provide the following recommendations to the certification bodies. We believe that our recommendations will facilitate future studies similar to ours but most importantly will improve the quality of the reports and will ease the work of the evaluators. This last point is very important because annual audits are carried out normally by 1 – 2 experts during a short period of time. Consequently, a clear organization of the CAR will probably facilitate and enhance their work. Our recommendations are:

- Each CAR should keep its own number (year, number) throughout the years;
- Each CAR should be connected to specific FSC criteria;
- The closure of a given CAR should be specifically mentioned and a short description on how the issues were solved should be given.

Finally, we think that certification bodies should keep access to all public summaries even when FMU have undergone a second or third evaluation process or have lost their certificate. Maybe the FSC should keep record or a database of all the reports produced by the certification bodies because they are incredible source of information from which lessons learned can be extracted.



8. Conclusions

Our results indicate strongly that forest management certification improves the working standards of forest management units (FMU) in the tropics. The improvement can be seen in the fact that there are fewer issues being raised through time, meaning that forest management is improving even before the FMU are getting certified. The improvements are more evident at the level of individual FMU because their performance is evaluated with a higher score when they undergo a second recertification process.

Contrary to the belief, forest management certification problems in the tropics are not only focussed on social issues. All three pillars of sustainability are included in the list of the most common criteria with problems, indicating that through time an improvement in all aspects can be expected.

There is a need for incentives to increase the total area certified in tropical forests. Both the certified area and the number of certified FMU have increased more rapidly since 2003, but it is necessary to keep promoting that FMU opt for certification if we want that certification helps promoting the conservation and better and more sustainable management of tropical forests. One stakeholder group that needs special attention are local communities or indigenous groups as they have been given legal access to the forests in recent years in several tropical countries. They need strong support not only on technical aspects but also on administrative, institutional, and financial aspects.

Forest management will certainly benefit a lot from close partnerships between companies and research organisations because the latter can assist obtaining information required to guarantee sustainable yields of forest products (e.g., timber). The certification schemes should also incorporate more aggressively all the knowledge being generated by scientists. For example, it is urgent that the certification movement starts promoting the application of silvicultural treatments in certified forests as it has promoted the implementation of reduced-impact logging techniques in the past.

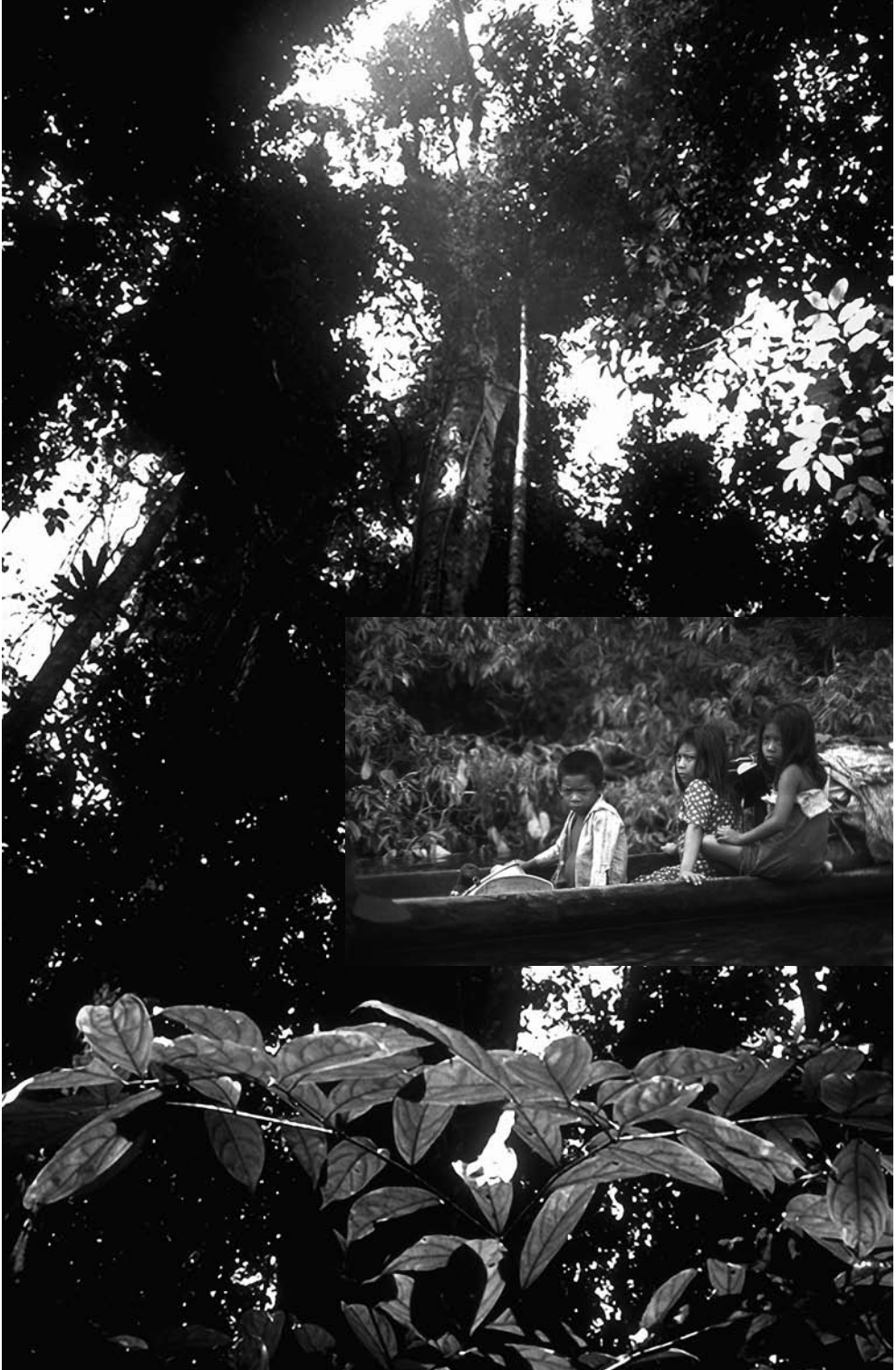
The public summaries include a wealth of information that can be very useful for adjusting the certification schemes, for monitoring the progress made, and for extracting lessons learned that can then be applied elsewhere. For fulfilling that role the content and the quality of the public summaries need further improvement than the ones they have already undergone through time.

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Annex 1

List of FSC Principles and Criteria used for evaluation of companies interested in obtaining FSC certification. The content of each criterion has been summarized as much as possible to refer only to the essential aspect dealt in the criteria.

| Principle | Criterion | Aspect being dealt with |
|--|------------------|--|
| 1. Compliance with laws and FSC Principles | 1.1 | national & local laws |
| | 1.2 | fees, royalties & taxes |
| | 1.3 | international agreements |
| | 1.4 | conflicts between laws and Principle and Criteria of FSC |
| | 1.5 | protection from illegal activities |
| | 1.6 | long-term commitment to FSC |
| 2. Tenure and use right and responsibilities | 2.1 | evidence for use rights to the land |
| | 2.2 | local communities maintain control, under they delegate it |
| | 2.3 | mechanisms to solve disputes |
| 3. Indigenous peoples' right | 3.1 | they maintain control, unless they delegate control |
| | 3.2 | FM is not detrimental to resources of the group |
| | 3.3 | sites of special significance are respected |
| | 3.4 | compensation in case of detrimental effects |
| 4. Community relations & workers' right | 4.1 | communities are given employment, training, services |
| | 4.2 | health and safety for employees & families |
| | 4.3 | right to organize and negotiate (workers) |
| | 4.4 | evaluation of social impact |
| | 4.5 | mechanisms to resolve grievances |
| 5. Benefits from the forest | 5.1 | economic viability (taken into account 3 aspects) |
| | 5.2 | optimal use & local processing |
| | 5.3 | minimize waste (from harvesting) |
| | 5.4 | diversify local economy (community oriented) |
| | 5.5 | forest services and resources |
| | 5.6 | harvesting regulations |

| Principle | Criterion | Aspect being dealt with |
|--|------------------|--|
| 6. Environmental impact | 6.1 | assessment of environmental impact |
| | 6.2 | rare, threatened & endangered species |
| | 6.3 | ecological functions & values |
| | 6.4 | protected areas |
| | 6.5 | reduce impact of logging operation |
| | 6.6 | avoid use of chemicals |
| | 6.7 | waste (garbage) |
| | 6.8 | biological control agents |
| | 6.9 | exotic species |
| | 6.10 | forest conversion |
| 7. Management plan | 7.1 | Management plan content |
| | 7.2 | periodic revision |
| | 7.3 | training of workers for implementation |
| | 7.4 | public summary |
| 8. Monitoring and assessment | 8.1 | frequency, intensity, replicability |
| | 8.2 | indicator: productivity, composition changes, socioeconomic impacts, economical aspects of company |
| | 8.3 | chain of custody |
| | 8.4 | use & implementation of results |
| | 8.5 | public summary |
| 9. Maintenance of high value conservation forest | 9.1 | define existence |
| | 9.2 | consultation process |
| | 9.3 | measures for maintenance and enhancement, public summary |
| | 9.4 | monitoring |
| 10. Plantations | 10.1 | objectives clearly defined |
| | 10.2 | plantations promote conservation of natural forests |
| | 10.3 | diversity in composition of plantations |
| | 10.4 | species selected adequate for management objectives |
| | 10.5 | restoration of natural cover |
| | 10.6 | environmental impact is reduced |
| | 10.7 | measures to minimize pests, diseases, fire, etc |
| | 10.8 | monitoring (ecological and social aspects are included) |
| | 10.9 | plantations established after November 1994 are not subjected to certification |

Annex 2

List of certification bodies certified by FSC to evaluate forest management units interested in obtaining FSC certification. In the list are included all certification bodies that are working in the tropics with natural tropical forests. The public summaries used in this study were obtained from the webpage of the certification bodies..

Bureau Veritas Group (BV)

http://www.bureauveritas.com/wps/wcm/connect/bv_com/Group/Footer/Home/

Control Union Certification (CU)

<http://certification.controlunion.com/main/default.htm>

GFA Consulting Group (GFA)

http://www.gfa-group.de/gfa-consulting-group/gfa_consulting_group_beitrag_890342.html

ICILA

<http://www.icila.org/>

Institute for Marketecology (IMO)

http://www.imo.ch/index.php?seite=imo_index_en

Soil Association Woodmark (SA)

<http://www.soilassociation.org/FORESTRY>

Scientific Certification Systems (SCS)

<http://www.scs-certified.com/>

SGS Group (SGS)

<http://www.sgs.com/home.htm>

Smartwood Program of Rainforest Alliance

http://www.rainforest-alliance.org/forestry.cfm?id=smartwood_program



Annex 3

The list of FSC criteria used to evaluate forest management units, organized based on the most commonly mentioned criteria in our CAR analysis (based on main reports). “Distribution” refers to the percentage of forest management units (FMU) that had at least once an issue raised in a given criterion. Criteria related to plantations are not included as we were focusing on FMU with natural tropical forests.

| Criterion | Description | Ranking (% of total issues) | Distribution (% of FMU) |
|-----------|---|--------------------------------|----------------------------|
| 4.2 | Health and safety for employees and families | 8.2 | 87 |
| 7.1 | Management plan | 6.7 | 79 |
| 6.5 | Use of reduced impact logging techniques to reduce impact to the forest | 5.6 | 74 |
| 8.2 | Monitoring of indicators, such as productivity, forest diversity, socioeconomic impacts | 4.8 | 76 |
| 5.6 | Harvesting regulations to assure long-term sustainability | 4.5 | 61 |
| 6.2 | Rare, threatened & endangered species | 4.0 | 73 |
| 8.3 | Chain of custody | 4.0 | 58 |
| 5.1 | Economic viability | 3.7 | 68 |
| 7.3 | Training and supervision of forest workers to ensure implementation of the management plan. | 3.1 | 61 |
| 8.1 | The frequency and intensity of monitoring | 2.8 | 63 |
| 6.1 | Assessment of environmental impact | 2.7 | 54 |
| 4.1 | Communities are given employment, training, services | 2.7 | 46 |
| 1.1 | National & local laws | 2.6 | 46 |
| 1.5 | Protection from illegal activities | 2.6 | 54 |
| 4.4 | Evaluation of social impact | 2.5 | 60 |
| 6.3 | Ecological functions & values | 2.4 | 55 |
| 2.3 | Mechanisms to solve disputes | 2.3 | 44 |
| 6.4 | Protected areas | 2.1 | 44 |
| 6.7 | Waste (garbage) | 2.0 | 54 |
| 9.1 | Define existence of HCVF | 1.9 | 52 |
| 2.2 | Local communities maintain control, under they delegate it | 1.9 | 30 |
| 7.4 | Public summary of management plan | 1.8 | 57 |
| 1.6 | Long-term commitment to FSC | 1.7 | 42 |
| 5.3 | Minimize waste (from harvesting) | 1.6 | 42 |
| 7.2 | Periodic revision | 1.6 | 40 |
| 6.6 | Avoid use of chemicals | 1.5 | 28 |
| 4.5 | Mechanisms to resolve grievances | 1.4 | 31 |
| group | Issues regarding group certification | 1.4 | 19 |
| 1.3 | International agreements | 1.4 | 34 |

| Criterion | Description | Ranking (% of total issues) | Distribution (% of FMU) |
|------------------|---|--|------------------------------------|
| 8.5 | Public summary of monitoring results | 1.4 | 41 |
| 5.2 | Optimal use & local processing | 1.3 | 33 |
| 8.4 | Use & implementation of results | 1.2 | 30 |
| 9.3 | Measures for maintenance and enhancement, public summary | 1.2 | 37 |
| 2.1 | Evidence for use rights to the land | 1.2 | 23 |
| 9.2 | Consultation process | 1.2 | 34 |
| 5.5 | Forest services and resources | 1.0 | 24 |
| 9.4 | Monitoring | 0.9 | 30 |
| 1.2 | Fees, royalties & taxes | 0.8 | 23 |
| 3.3 | Sites of special significance are respected | 0.8 | 15 |
| 3.2 | FM is not detrimental to resources of the group | 0.7 | 12 |
| 3.1 | They maintain control, unless they delegate control | 0.7 | 10 |
| 5.4 | Diversify local economy (community oriented) | 0.6 | 16 |
| 4.3 | Right to organize and negotiate (workers) | 0.6 | 17 |
| 1.4 | Conflicts between laws and Principle and Criteria of FSC | 0.4 | 10 |
| 6.10 | Forest conversion | 0.3 | 9 |
| 6.9 | Exotic species | 0.1 | 3 |
| 3.4 | Compensation in case of detrimental effects | 0.0 | 1 |
| 6.8 | Biological control agents | 0.0 | 1 |



ISBN 9789085856962



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Abstract

Forest management certification is a market based conservation initiative that aims to promote the environmental appropriate, socially beneficial, and economical viable management of forests. Certification schemes are based on a set of Principles and Criteria dealing with legal, social, economical, and ecological aspects related to forest management and its chain of custody. This set of Principles and Criteria are used to evaluate the performance of forest management units (FMU) and to determine if the FMU should be certified or not.

In this study we have analyzed the evaluation reports of 123 FMU managing natural tropical forests that are certified under the scheme of the Forest Stewardship Council. We have also followed through time the list of actions given by evaluators to a subset of FMU. These approaches allowed us to assess the impact of certification on forest management, to determine if issues raised in the list of actions are solved by the FMU through time, and to evaluate factors that influence the impact of forest management certification at the country and the tropical region level.

Most certified forest area is in the Neotropics. The claim that most certified area is managed by large individual-owned FMU, and that certification is not really accessible to smallholders and local communities, is true based on certified area, but not true based on the number of certificates. We show that there is a learning process since forest certification was introduced, with less problems being found through time. Forest management certification improves the working standards of FMU in the tropics in all different aspects, as all three pillars of sustainability are included in the list of the most common problems found. Additionally it is likely that certification will have a large impact on the long-term sustainability of forest management mainly because FMU are requested to improve their monitoring system and to incorporate the results of the monitoring system into their management practices. Finally, public summaries include a wealth of information that can be better used for adjusting the certification schemes, for monitoring progress, and for extracting lessons learned that can then be applied elsewhere.

Résumé

La certification d'aménagement forestier est une initiative de conservation basée sur le marché qui conduit à promouvoir une gestion des forêts environnementalement responsable, socialement bénéfique et économiquement viable. Les projets de certification sont basés sur une série de principes et critères traitant des aspects légaux, sociaux, économiques et écologiques liés à l'aménagement forestier, et à ses règles. Cette série de principes et critères sont appliqués pour évaluer le fonctionnement des unités d'aménagement forestier (FMU) et pour déterminer si le FMU doit être certifié ou non.

Dans cette étude nous avons analysé les rapports d'évaluation de 123 FMU aménageant des forêts naturelles tropicales certifiées selon le plan du « Forest Stewardship Council ». Nous avons aussi suivi au cours du temps la liste des actions mentionnées par ceux qui ont évalué un échantillon de FMU. Ces approches nous ont permis d'analyser l'impact de la certification d'aménagement forestier, de déterminer si les aspects signalés sur la liste d'actions ont été résolus par le FMU au cours des années et d'évaluer les facteurs qui ont influencé l'impact de la certification d'aménagement forestier au niveau du pays et de la région tropicale.

La région forestière la plus certifiée se trouve dans les Néotropiques. L'assertion que la plus grande partie des zones certifiées soit aménagée par de grandes FMU privées, et que la certification ne soit pas accessible aux petits agriculteurs et communautés locales, est vraie en ce qui concerne la superficie certifiée, mais pas vraie en ce qui concerne le nombre de certificats. Nous laissons voir qu'il y a un processus d'instruction depuis l'introduction de la certification forestière, avec de moins en moins de problèmes au cours du temps.

La certification d'aménagement forestier améliore les standards d'opération du FMU dans les tropiques sous tous les différents aspects, parce que les trois piliers de durabilité sont inclus dans la liste des problèmes les plus communs rencontrés. De plus, il est probable que la certification ait un grand impact sur la viabilité à long terme de la gestion des forêts principalement parce qu'il a été demandé aux FMU d'améliorer leur système de suivi et d'incorporer les résultats du système de suivi dans leurs pratiques de gestion.

En conclusion, les résumés publiés incluent une richesse d'information qui peut mieux être employée pour ajuster les arrangements de certification, pour suivre le progrès, et pour profiter de l'expérience acquise qui peut être appliquée ailleurs.

