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Instituto de Manejo e Certificação Florestal e Agrícola (Imaflora)
University of São Paulo (USP)
Entropix Engineering Company

Impact assessment of FSC certification on forest enterprises in southern Brazil

André Luiz Novaes Keppe, Ana Carolina B. de Lima, Marcelo
Corrêa Alves, Rodrigo Fernando Maule and Gerd Sparovek



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1. Introduction

1.1 Forest Certification

Forest certification may be defined as a marketing tool, based on an independent process of forest management verification, in order to ensure that such management follows pre-established socioenvironmental standards. The main reason for establishing these socioenvironmental standards was the strong concern voiced by the international community, especially by consumers and NGOs, with environmental degradation involving deforestation and overuse of natural resources. In this scenario, the sustainable use of natural resources in general and of forest resources in particular, became an undisputed priority. In the early stages, forest certification was used as a strategy for adding value and providing access to upscale markets to forest products from all types of forests. Later on, it was adopted to comply with demands from consumers, trade partners and also as a way to demonstrate socially and environmentally adequate corporate practices. More recently, in some countries like Mexico, it has been used together with public policies (NUSSBAUM, 2005). Today, one of the most widely used forest certification systems in the world is the FSC certification (Forest Stewardship Council), which has been used in the formulation of public policies in countries such as Germany, United Kingdom and Denmark (HIGMAN, 2005).

In Brazil, a country with vast forest resources, FSC certification is present in a strong way with 42 certified forests as of March, 2008 (FSC/Brazil reference!!). Four certification organizations are active in the country: the Institute for Forest and Agricultural Management and Certification (IMAFLO-RA/SmartWood); Scientific Certification System, Inc. Forest

Conservation Program (SCS), South Africa (Pty) Ltd. - Qualifor SGS Program (SGS), and Control Union Certifications - Skal International - (<http://www.fsc.org.br/index.cfm?fuseaction=conteudo&IDsecao=165>).

Throughout the world, certification organizations have been accredited by FSC to carry out forest management assessments using FSC standards, which are based on ten principles. Principle number 10 deals specifically with forest plantations. These principles are listed in the table below:

Principle #1: Compliance with all applicable laws and international treaties.

Principle #2: Demonstrated and uncontested, clearly defined, long-term land tenure and use rights.

Principle #3: Recognition and respect of indigenous peoples' rights.

Principle #4: Maintenance or enhancement of long-term social and economic well-being of forest workers and local communities and respect of worker's rights in compliance with International Labor Organization (ILO) conventions.

Principle #5: Equitable use and sharing of benefits derived from the forest.

Principle #6: Reduction of environmental impact of logging activities and maintenance of the ecological functions and integrity of the forest.

Principle #7: Appropriate and continuously updated management plan.

Principle #8: Appropriate monitoring and assessment activities to assess the condition of the forest, management activities and their social and environmental impacts.

Principle #9: Maintenance of High Conservation Value Forests (HCVFs) defined as environmental and social values that are considered to be of outstanding significance or critical importance.

Principle #10: In addition to compliance with all of the above, plantations must contribute to reduce the pressures on and promote the restoration and conservation of natural forests.

Sources: IMAFLORA, 2006

Because conditions vary from country to country, usually forest management standards are detailed and adapted to each country by local FSC National Initiatives and submitted to FSC for approval as National Standards. In Brazil, these standards have been approved for the two most important subsectors of the national forest industry: Amazon native forests and forest plantations in southern Brazil. The Brazilian FSC National Initiative has its origin in the Brazilian Council for Forest Management (FSC/Brazil), established in September 2001 by a group of more than 50 institutions, including forest companies, and social and environmental NGOs. According to FSC/Brazil (FSC/Brazil reference!!), as of March 2008 the numbers for FSC-certified forests are the following: a) total area certified: 5.3 million hectares, with certified forests located in 12 states that represent all geographical regions of the country; b) 2.5 million hectares of certified native forests and 2.8 million hectares of forest plantations (Table 1); c) 69 certified forest units, 30 of which are native forests and 39 are forest plantations; d) 10 certified community forests, and e) eight certified non-timber forest product operations.

Plantations represent about 53% of all FSC-certified forests in Brazil and certified plantations represent 48 % of all

plantations. These figures suggest that certification is making an important contribution to the conservation of biodiversity. The statistics also show that 37% of the areas certified as forest plantations are made up of conservation areas, which represent a total of 1,036,000 hectares of conservation forests (FSC Brasil, 2008). In addition, according to the Brazilian Association of Mechanically Processed Wood (Associação Brasileira de Madeira Processada Mecanicamente, ABIMCI, www.abimci.com.br), planted forests are able to supply forest raw material that replaces what is obtained from illegal logging, therefore lessening the pressure on native forests (ABIMCI, 2007).

With respect to FSC-certified forests around the world, the FSC report states that 32% of them are located in North America, 31% in Europe, 22% in Asia and only 12% in Central and South America. The conclusion is that there is a greater concentration of FSC-certified forests in industrialized countries than in tropical timber producing countries. An ITTO (International Tropical Timber Organization) study of May 2003 reached the conclusion that only 4% of the total area of certified forests in the world is located in tropical timber producing countries.

Table 1. Planted forest operations certified according to the FSC scheme in Brazil

Operation name	Certified Area (ha)	Location (state)	Certification organization
Soroteca Agroflorestal Ltda.	1.232	PR	SKAL
Agro-Florestal Motrisa Ltda.	1.812	RS	IMAFLORA/ Smartwood
Tectona Agroflorestal Ltda.	2.892	MT	IMAFLORA/ Smartwood

cont. Table 1

Operation name	Certified Area (ha)	Location (state)	Certification organization
Cáceres Florestal S/A	3.201,52	MT	SCS
Souza Cruz S/A	4.360	RS	IMAFLOA/ Smartwood
Madepar Ind. e Com. de Madeiras Ltda.	5.416,44	SC	SCS
Flosul Ind. e Com. de Madeiras Ltda.	5.817	RS	IMAFLOA/ Smartwood
Agropastoril Novo Horizonte	7.686	SC	SCS
A.W. Faber-Castell AS	8.987	MG	SCS
GRIM - Grupo de Re-florest. do Imbaú	9.942	PR	IMAFLOA/ Smartwood
Seta S/A - Extrativa Tanino de Acácia	10.333	RS	IMAFLOA/ Smartwood
Juliana Florestal	11.298	SC	IMAFLOA/ Smartwood
Sguario Florestal S/A	12.522,54	SP	SGS
Seiva S/A	13.799,78	SC	IMAFLOA/ Smartwood
Madecal Agro-Industrial Ltda (Div. Florestal)	14.557	SC	IMAFLOA/ Smartwood
Sincol S/A – Reflorestadora	15.335	SC	IMAFLOA/ Smartwood
Renova Florestal Ltda.	20.981	SC	IMAFLOA/ Smartwood
Modo-Battistella Reflorestamento S/A - Mobasa	22.326	SC	IMAFLOA/ Smartwood
Lwarcel Celulose And Papel Ltda.	24.825	SP	SCS
Caxuana S/A - Reflorestamento	28.229	MG	IMAFLOA/ Smartwood
Floresteca Agroflorestal Ltda	30.927,23	MT	SGS
Araupel S/A (Divisão Florestal)	30.940	PR	IMAFLOA/ Smartwood
Masisa do Brasil Ltda.	32.414	PR	IMAFLOA/ Smartwood
Plantas S/A	33.214	MG	SCS
Adami S/A – Madeiras	35.058	SC	IMAFLOA/ Smartwood

cont. Table 1

Operation name	Certified Area (ha)	Location (state)	Certification organization
Arauco Forest Brasil S/A	39.088	PR	IMAFLORA/ Smartwood
Eucatex S.A.	40.665	SP	SCS
Tanagro S.A.	47.559	RS	SGS
Satipel Florestal Ltda.	57.801	MG	IMAFLORA/ Smartwood
Votorantim Celulose e Papel S.A.	70.528,66	SP	SCS
Ripasa S.A. Celulose e Papel	77.066	SP	SCS
Suzano Papel e Celulose S/A. (Unidade Suzano)	77.078	SP	IMAFLORA/ Smartwood
Duraflora S.A (Dura-tex)	77.187,77	SP	SCS
Vale do Corisco AS (PISA)	103.036	PR	SCS
CAF Santa Bárbara Ltda	122.824	BA/MG	SGS
Klabin S/A - Unidade Florestal Santa Catarina	124.128	SC	IMAFLORA/ Smartwood
Acesita Energética Ltda	126.263,54	MG	SGS
Suzano Papel e Celulose S/A. (Unidade Mucuri)	166.392	BA	IMAFLORA/ Smartwood
Veracel Celulose S.A.	205.364	BA	SGS
Cenibra – Celulose Ni-po Brasileira S.A.	233.778	MG	SGS
Klabin S/A - Klabin Florestal Paraná	249.398	PR	IMAFLORA/ Smartwood
Jari Celulose S.A.	427.736	PA	SCS

Source: http://www.fsc.org.br/arquivos/2008.04.02%20Florestas_certifica das_FSC.xls

1.2 History and characterization of the forest sector in Brazil

Before the 1988 Federal Constitution and the

establishment of state environmental agencies, clearing of native vegetation – including native forests – and reforestation with exotic species, mainly of the genera *Pinus* and *Eucalyptus*, was the basis of the expansion of forest activities in Brazil. A strong factor in the promotion of planted forests was the fiscal incentive laws passed during the military government that, for about 20 years - from 1967 to 1987, funneled vast financial resources into tree planting activities, with little environmental restrictions. The reforestation fiscal incentive program did not consider environmental resources from a comprehensive point of view, but only interpreted them as economic resources.

In this scenario, the first extensive tree planting programs with exotic species were carried out by pulp and paper companies during the 60's within the National Development Plan (PND), with funds from the reforestation fiscal incentive program (FISSET). In addition to fiscal incentives, the approval of the 1965 Forest Code and the establishment of the Brazilian Institute for Forest Development (IBDF) two years later were decisive actions that helped define a new forest policy for the country (FAO, 2004). A number of species of the genus *Pinus*, which had been initially introduced in southern Brazil to provide raw material for the pulp and paper industry, showed good growth and were planted in large scale. As the supply of Paraná Pine, or Brazilian Pine [*Araucaria angustifolia* (Bert) O. Kuntze] – the only Brazilian softwood species of economic importance – became scarce, those pine species became a significant source of raw material for lumber and plywood manufacturers (DUARTE, 2007) – Table 2.

Table 2. Evolution of the area planted with pine and eucalypt in southern and southeastern Brazil

Year planted	Area planted with eucalypt (ha)	Area planted with pine (ha)
1947 - 1988	45.420	59.651
1989 - 1992	35.466	34.210
1993 - 1996	41.208	59.424
1997 - 2000	159.693	63.867
2001 - 2004	553.478	76.335
Total	835.266	293.488

Source: adapted from Bracelpa, 2006 (http://www.bracelpa.org.br/bra/estatisticas/pdf/anual/reflo_01.pdf)

Until the early 60's, native forests of southern Brazil were the main source of industrial wood in the country. These forests were logged without any technical criteria or environmental considerations. Such deforestation activities, which were also carried out to provide for agricultural land and pasture, resulted in serious environmental degradation (FAO, 2004). According to the Floristic Inventory of the state of Santa Catarina, in the period 1950-1960, forest products represented more than 50% of the total exports of the state.

As already mentioned, Paraná Pine was the main species logged in southern Brazil. Industrial processing, trade and utilization of this wood reached a peak between 1940 and 1960; extinction of its supplies brought on an economic stagnation to the region that lasted from 1970 to 1980 (DUARTE, 2007). The publication Atlas of Forest Remnants of the Atlantic Forest (Atlas de Remanescentes Florestais de Mata Atlântica) issued jointly in 2008 by the SOS Atlantic

Forest Foundation (Fundação SOS Mata Atlântica) and by the National Institute for Space Research (Instituto Nacional de Pesquisas Espaciais, INPE) shows that fragments of the Atlantic Forest are quite sparse and that deforestation has continued, although at a lower rate, in the period 2000 - 2005 (Table 3). It is obvious that, in this case, deforestation is the result of various human activities. However, agricultural, grazing, and reforestation activities were certainly a strong factor. The state of Rio Grande do Sul, which had approximately 50% of its territory included in the survey, has only 7.4% of its original Atlantic Forest cover, the state of Parana has 10.6%, and Santa Catarina has the highest percentage: 23.8%.

Table 3. Deforestation in Brazilian states with the largest portions of the Atlantic Forest biome

State	Area of the Atlantic Forest biome in the state (ha)	Percentage of the original forest cover remaining (%)	Deforestation in 2005 (% compared to remaining area in 2000)
Paraná	19.517.382	10.6	1.35
Santa Catarina	9.565.484	23.82	2.02
Rio Grande do Sul	13.352.714	7.39	0.3
Minas Gerais	28.939.588	9.62	1.46
São Paulo	20.528.181	13.24	0.18

Source: Adapted from Atlas of Forest Remnants of the Atlantic Forest (Atlas dos Remanescentes Florestais de Mata Atlântica), 2008

More recent data on areas planted with eucalypt and pine show that in 2007 there were 5,560,204 hectares planted

with species of these two genera, which represents an increase of 186,786 hectares in relation to the 2006 figures, i. e., an increase of 3.4% (SBS, 2007).

As shown in Table 4, the states of Paraná and Santa Catarina are the leaders in reforestation with pine. Together they account for 67% of the total area planted with this genus in Brazil (ABIMCI, 2007).

Table 4. Area (ha) and distribution of pine forests planted in Brazil (2005-2007)

State	2005	2006	2007
Paraná	677.772	666.453	701.578
Santa Catarina	527.079	530.992	548.037
Rio Grande do Sul	185.080	181.378	182.378
Minas Gerais	153.000	152.000	144.248
São Paulo	148.020	146.474	143.148
Bahia	54.746	54.820	41.221
Mato Grosso do Sul	38.909	28.500	20.697
Amapá	27.841	20.490	9.000
Outros	22.123	23.162	18.029
Total	1.834.569	1.824.270	1.808.336

Source: ABRAF Statistic Yearbook (Anuário Estatístico da ABRAF), 2008

2. Scope of the research

2.1 Impact Assessment

The main interest of an impact assessment study rests on the identification of the consequences of a given treatment on one or more variables that receive its effect (PRENNUSHI et al., 2000; RAVALLION, 2003; RAVALLION, 2006). In the present case, impact assessment of FSC certification on planted forests, the treatment is represented by the reforestation enterprises certified according to the FSC label in the states of Santa Catarina and Rio Grande do Sul.

In order to evaluate an impact it is necessary to compare the group being affected by the treatment with a control group, i. e., a group that is not exposed to the treatment under consideration. This way, it is possible to associate a change in the dependent variable to the treatment imposed on it, thus excluding alternate or incidental explanations not related to the treatment itself. In the present context, the control sample is made up of reforestation enterprises, not certified by FSC, but with similar characteristics to those that had received the FSC label.

The objective of this study was to evaluate the impact of the FSC certification on planted forests enterprises of the states of Santa Catarina and Rio Grande do Sul, two states that concentrate the largest number of certified plantations, mostly pine. The impact assessment methodology used to achieve this objective was that developed by LIMA, et AL, (2008), to evaluate certified coffee operations. In the present case, the impact assessment analyzed data of treated enterprises (FSC-certified) and compared them with those of the control group (non-certified enterprises), thus making

possible the identification of socioenvironmental impacts caused by FSC certification.

The main topics considered in this research were: environmental preservation, work safety, training and capacity building, working conditions, hiring procedure, access to education and health services, social organization, and community relations. Using these topics as basic references, the research team tried to establish a relationship between the treatment considered, i. e., FSC certification, and the changes in the dependent variables.

2.2 Justification

One of the consequences of alarming social and environmental effects related to the inadequate use of forests, such as loss of biodiversity and other natural resources, climate change, desertification, land disputes and others was the establishment of international agreements and sustainable forest management practices. As already mentioned, one of the international attempts to promote sustainable forest management was the creation of a market mechanism based on socioenvironmental standards under the aegis of the Forest Stewardship Council (HIGMAN, 2005).

The impact of socioenvironmental certification of planted forests has been the subject of constant debate and review in national and international fora and it is, no doubt, a polemic issue. A number of beneficial effects can be mentioned, such as the conservation of natural ecosystems, enriched biodiversity, better quality of life for workers and guarantee of their legal rights, community participation, rural poverty abatement, better administrative control and

economic viability, market access etc. (NUSSBAUN, 2005). On the other hand, some authors offer criticism about the role of certification with respect to planted forests, stressing its negative impacts and deficiencies in the certification process and recommend the cancellation of their certificates (CARRERE, 2003).

As mentioned earlier, reforestation enterprises in Brazil are based mainly on exotic species of the genera Pine and Eucalyptus. These are highly productive operations, which could be seen more recently as a strategy to minimize the impacts of logging in tropical forests. However, as in any other productive rural activity, due to its history of large scale land occupation, it is the objective of intense debates by civil society. As a result, these operations seek FSC certification as a way to comply with its principles and criteria without jeopardizing their economic viability and, more than that, as a way to enhance their market position as they achieve better recognition by consumers.

Given the above scenario, the positive and negative impacts of socioenvironmental certification are extremely important for evaluating the effectiveness of this tool and validating its initial objectives. Therefore, the socioenvironmental changes promoted exclusively by FSC certification represent a precious result for the various players involved in the certification of planted forests, such as reforestation enterprises, consumers of forest products, support and financial institutions, governments and local communities.

2.3 Limitations

The identification of the changes introduced in planted forests by socioenvironmental certification is a complex task. These changes are related to the structure and composition of highly variable forests and to processes that are being constantly updated in various regions, as is the case with the Brazilian environmental legislation. These limiting factors had already been pointed out by authors trying to identify the changes produced by certification (NUSSBAUM, 2005; HIGHMAN, 2005).

Other factors may also turn out to be limiting factors, such as the double sampling effort in an impact assessment, considering that, in this case, the data must be collected and analyzed not only at certified enterprises but also at enterprises of the control group, i. e., those non-certified. In addition, seasonal effects would only be excluded if the assessment could be repeated at different times, which would increase costs.

Another important issue is the variability related to the year when the enterprises were certified. Certification is a process of continuous improvement and, consequently, enterprises that have been certified for a longer period would show differences when compared to enterprises that have received certification more recently. Although this study encompassed enterprises that had been certified for one to seven years, the effect of certification was considered the same for all of them.

Economic variables, such as costs and financial gains related to FSC certification, may also bring difficulties to the assessment process. These variables have a direct influence on the viability of FSC certification to promote the long term sustainability of forest operations. However, estimating costs and benefits of certification is quite often misleading because

costs are not related only to certification. Certification benefits are also hard to evaluate because, in many cases, they may not represent direct financial gains. Instead, they may be related to market access, streamlining production activities, improvement in the quality of life of workers, and in the preservation and conservation of natural resources.

2.4 Research team

Table 5 lists in alphabetical order the members of the research team that took part in this study.

Table 5. Members of the research team involved in the project Impact Assessment of Socioenvironmental Certification

Ana Carolina B. de Lima	Responsável técnico e execução de campo	Entropix engenharia
André Luiz N. Keppe	Responsável técnico e execução de campo	Entropix engenharia
Fábio Eduardo Maule	Desenvolvimento de software	Entropix engenharia
Gerd Sparovek	Coordenação Geral	ESALQ/USP
Marcelo Corrêa Alves	Processamento de dados	ESALQ/USP
Rodrigo F. Maule	Coordenação operacional	Entropix engenharia

3. Method

3.1 Sample universe and sample size

This research on the impact assessment of certification on planted forests was carried out with a random sample obtained from a universe of 12 enterprises that had been certified according to the FSC scheme by Imaflora, in partnership with the Rainforest Alliance SmartWood Program (IMAFLOA/SmartWood). These certified enterprises were selected among others certified by IMAFLORA/SmartWood because they were located in the same geographical region and shared some common characteristics, such as area covered by planted forests, number of employees working in forest activities, both company and subcontractors' workers, and the existence of non-certified enterprises with similar profile.

The sample studied consisted of seven certified enterprises selected at random from this universe of 12 enterprises and seven non-certified operations, all of them located in the states of Santa Catarina and Rio Grande do Sul. Each operation, here identified only by a letter (Table 6) in order to preserve their identities, included a number of tree farms under the same administration.

Non-certified enterprises (control group) were randomly selected from a list of 38 operations with similar characteristics (according to similarity criteria previously established) to those of certified operations, but without any former contact with FSC certification. This list was prepared

¹ The three criteria for defining similarity were: i) geographical location (in the states of Santa Catarina and Rio Grande do Sul), ii) total area of planted forests and iii) total number of workers, i.e., company and subcontractor workers.

after consultation with local labor unions and timber associations. Eight of the non-certified operations that had been selected initially declined to participate in the study and were replaced by others chosen in a subsequent random lottery.

Table 6. Characterization of enterprises studied

Enterprise	Location	Total area (ha)	Planted area (ha)	Number of Employees*	Type of Certificate
Certified enterprises					
A	SC	12000	7000	89	FSC
B	SC	14000	5400	131	FSC
C	SC	16000	10000	171	FSC
D	SC	22272	8615	376	FSC
E	SC	22845	13869	147	FSC
F	RS	3116	1408	79	FSC
G	RS	3109	1591	84	FSC
Enterprises of the control group					
H	SC	14740	8000	113	-
I	SC	18500	10500	81	-
J	SC	3000	1800	69	-
K	SC	2666	1750	30	-
L	SC	6994	3317	87	-
M	RS	12600	7500	190	-
N	RS	6200	3300	110	-

* Number of field workers of the forest area at the occasion of the study.

3.2 Data sources

The data analyzed in this study came from two sources: field observations and interviews based on structured questionnaires.

Field observations were obtained during visits to Permanent Preservation Areas (PPAs), Legal Reserve Areas (LRAs), logging sites and infrastructure components (housing, dormitories, transportation vehicles, roads, etc.).

The interviews were made with the owner or the person responsible for the operation, company and subcontractor workers (including residents, dormitory users, operators in charge of applying agrochemicals, logging equipment and power saw operators, and youngsters 18 years old or less), subcontractors and clients. The main data collected on the socioenvironmental aspects of the operation concerned the following issues: preservation of native vegetation, water resources conservation, solid waste management, working conditions and safety, and training and capacity building.

Qualitative information on the socioenvironmental impacts of planted forest operations were also obtained upon consultation with local labor unions and community associations.

3.3 Support material used during the interviews

The support material used during the interviews to collect data on planted forest operations was based on documents used previously in similar projects and was adapted to the specific conditions of this study with the

assistance of professionals working in the forest certification program of IMAFLORA/SmartWood.

This material consisted of six different questionnaires that were applied to certified and non-certified (control group) enterprises, as described in the following paragraphs:

i) Enterprise profile: questionnaire filled out during interviews with the manager or person responsible for the operation, which supplied information on aspects related to infrastructure, forest management, management of solid waste, compliance with legislation, workers' benefits etc.;

ii) Worker profile: questionnaire filled out during interviews with company and subcontractor employees, which supplied information on aspects related to hiring procedures, working conditions, training and capacity building, family income, access to health services, conservation of natural resources, environmental preservation etc.;

iii) Profile of worker in charge of agrochemical application: questionnaire filled out during interviews with company and subcontractor employees that apply agrochemicals, including products to control leaf-cutting ants. Information gathered during these interviews is related to the protection and care in the use and handling of agrochemicals, familiarity with and use of Personal Protection Equipment (PPE), types of agrochemicals and equipment used for applying them, disposal of residues and empty containers etc.;

iv) Housing profile: questionnaire filled out during interviews with workers living in company houses and dormitories, which gathered information on aspects related to the enterprise infrastructure, waste management (garbage and sewage), comfort level and sanitary conditions of the houses, evacuation of residents during emergency situations etc.;

v) Young worker profile: questionnaire filled out during interviews with workers of the age 18 or younger, which gathered information on aspects related to hiring procedures and incentives to attend formal education programs;

vi) Subcontractor profile: questionnaire filled out during interviews with the persons responsible for subcontract work provided to the planted forest enterprise, which gathered information on aspects related to workers' safety, compliance with labor law, and monitoring on the part of the planted forest enterprise;

vii) Relation with stakeholders: questionnaire filled out during interviews with various stakeholders directly or indirectly affected by the planted forest enterprise, such as rural labor unions, community associations and councils. These interviews provided elements for analyzing the type of relation maintained by the forest enterprise with its neighboring communities and its compliance with social and environmental requirements.

Before interviewers started their field work, a trial run was carried out in an FSC-certified operation in order to validate the intended support material. During this trial run, field researchers had the opportunity to simulate the procedures to be used during the actual interviews and to fine-tune the questionnaires.

Table 7 presents the quantitative details of the application of questionnaires in the field.

Table 7. Number of questionnaires applied to the forest enterprises involved in this study

EN	EP	WP	AWR	HP	YWR	SCP	STKP
Certified enterprises							
A	1	15	3	7	0	2	1
B	1	15	3	3	0	2	1
C	1	15	2	9	0	3	1
D	1	15	5	7	0	2	3
E	1	15	6	0	0	2	2
F	1	10	1	0	0	2	1
G	1	10	3	1	0	1	1
Total	7	95	23	27	0	14	10
Control enterprises							
H	1	15	3	1	0	2	2
I	1	10	2	2	0	2	1
J	1	10	2	6	0	2	1
K	1	11	1	8	1	2	1
L	1	10	2	4	0	2	1
M	1	15	6	10	0	2	1
N	1	15	3	0	0	2	1
Total	7	86	19	31	1	14	8

* EN: enterprise; EP: enterprise profile; WP: worker profile; AWR: profile of worker in charge of applying agrochemicals; HP: housing profile; YWR: young worker profile; SCP: subcontractor profile, STKP: stakeholders profile.

3.4 Data input, analysis and critique

The data collected during the field observations and interviews were fed into a data base type Access® 2003, using a computer program that matched the structure of the questionnaires. The data collected was analyzed by means of a SAS statistical package in order to identify the differences between certified operations and non-certified operations. Further data analysis and critique were performed in two ways: individual and combined.

In the individual analysis, only variables from a single source were used, i. e., from a single questionnaire or field observation. In this case, chi-square statistics (90% confidence interval) were calculated for nominal and ordinal variables, and the difference between certified operations and non-certified operations was used to indicate the impact caused by certification. For interval and rational variables, the presence of certification impact was verified on the basis of the following statistical parameters calculated for certified and non-certified operations: mean, standard deviation, and limits of the confidence intervals.

In the combined analysis variables referring to the same issue, but from different sources, were grouped in order to maximize positive aspects and minimize the negative aspects of their respective prerogatives. Uncertainty in the determination of the variables, potential bias and reliability of the answers obtained during the interviews were the prerogatives taken into consideration. Thus, the prerogatives of this combined analysis were the following:

i) during the field observations, the researcher was able to verify that a certain situation occurred in the field.

However, not all types of situations could be observed during the data gathering period; therefore, such information has limited coverage;




ii) when establishing the enterprise profile and the subcontractor profile, one could expect that there could be a tendency to stress favorable conditions and/or to omit improper situations or situations that could imply the violation of legislation or of FSC certification standards;

iii) a wide range of information, which included subjective opinions and judgment of situations that had occurred in the operation, was taken into consideration in order to establish the worker profile, profile of workers in charge of agrochemical application, housing profile, and young worker profile. However, the large number of interviews involved lessens the influence of biased information on the aggregate data, thus reflecting situations that can be considered real or that represent the perception of most people.

Therefore, in the combined analysis, the impact of certification was determined mainly on the basis of the data gathered during the field observations. The interviews with the owner or person in charge of the operation, subcontractors and workers were taken into consideration in the cases where field observations were lacking and according to the criteria described for each analysis.

In all analyses, the type of impact caused by certification is represented by the symbols shown in Table 8.

Table 8. Symbols representing the type of impact

Symbol	Type of impact
	positive
	neutral (there was no difference between the certified group and the non-certified group)
	negative

In addition to characterizing the type of impact of certification, each enterprise received a score, represented by a varying number of stars, indicating its quality level as determined by the percentage of positive results for the items analyzed, as shown in Table 9. Five stars (★★★★★) is the highest score, and one star (★) is the lowest.

Table 9. Enterprise quality classification system

Symbol	Percentage of positive results
★★★★★	81 a 100%
★★★★	61 a 80%
★★★	41 a 60%
★★	21 a 40%
★	0 a 20%

In addition, during the field observations it was possible to identify, for some of the items considered in the assessment of certified and non-certified enterprises, best and worst situations as shown in the photos presented in Chapter 4.3 - Socioenvironmental Impacts. Moreover, each situation

was classified as adequate or inadequate.

Each item analyzed in this study to assess the impacts of social environmental certification is identified by a letter that corresponds to the type of analysis carried out. This can be an individual analysis, based on a single source of information, or a combined analysis that includes more than one source of information. The meaning of the letters used to identify the various items analyzed is presented in Table 10.

Table 10. Identification of analyses carried out

Identification	Type of analysis
a	Individual analysis of a nominal or an ordinal variable obtained from statements made by the owner or person responsible for the enterprise.
b	Individual analysis of a nominal or an ordinal variable obtained from statements made by forest workers.
c	Individual analysis of a nominal or an ordinal variable obtained from field observations.
d	Individual analysis of a nominal or an ordinal variable obtained from statements made by subcontractors or their representatives.
e	Individual analysis of a nominal or an ordinal variable obtained from statements made by representatives of local rural labor unions.
f*	Combined analysis of the information obtained from various sources: interview with the owner or person responsible for the enterprise + interview with workers + field observations.
g*	Combined analysis of the information obtained from two sources: interview with the owner or person responsible for the enterprise + interview with workers.
h*	Combined analysis of the information obtained from two sources: field observations + interview with workers.
i*	Combined analysis of the information obtained from two sources: field observations + interview with the owner or person responsible for the enterprise.

cont. Table 10

j*	Combined analysis of the information obtained from two sources: interview with subcontractors or their representatives + interview with the owner or person responsible for the enterprise.
k*	Quality classification attributed to the enterprises included in this study.
l*	Quality classification attributed to enterprises for the variable salary.
m*	Quality classification attributed to enterprise for the variable length of time worked at the enterprise.
n*	Classification of best and worst situations found in certified and non-certified enterprises, based on field observations and recorded by the photos presented in Chapter 4.3 – Socioenvironmental Impacts.

* Additional details are presented in Appendix I.

4. Results

4.1 Enterprise profile

The main activity of the forest enterprises analyzed in this study was reforestation with pine species with the objective of producing wood for different purposes: lumber, furniture, pulp and paper, energy generation and firewood.

However, all of them had uneven-aged stands that required planning of management activities (thinning or pruning) or even clear cutting, depending on market conditions, yields etc.

At the time this study was developed, because of this required flexibility in carrying out forest activities, the number of forest workers at the various enterprises was quite variable. Such variation was due to the scale and type of operation being undertaken at that particular moment and, therefore, the number of forest workers was not directly related to the size of the enterprise or total planted area.

The size of the enterprises and their respective planted areas are presented in Table 6. They consist mainly of small and medium size companies, normally owned and managed by families. Their areas, including land managed under partnership and leasing agreements, are between 1,400 and 14,000 hectares.

The presence of subcontractors was another common element in the enterprises analyzed in this study. Quite often, the use of subcontracted manpower leads to poor working conditions because the subcontractor is not prepared to meet all legal work and environmental requirements. As already mentioned, this study was not restricted only to company employees, but considered all forest workers in charge of forest activities at the site under consideration, including those of clients and subcontractors. The fact that outside forest workers - those of subcontractors and clients - had been included in the scope of the research made possible the analysis of topics related to manpower subcontracting (see item 2.3.4 "Relation with Stakeholders").

In most cases, manual harvesting is the standard practice. This was particularly true for the control group. Total mechanical harvesting was found only in certified enterprises (28%) and a combination of manual and mechanical harvesting was practiced by the majority of certified enterprises (50%) and in only one of the control group (14%). This finding indicates that certified enterprises are probably shifting more and more towards mechanical harvesting.

4.2 Worker profile

This study focused only on workers that carried out

activities within the forest areas of the participant enterprise. This section describes the profile of these workers and addresses aspects related to their main tasks, migration, age, gender and levels of schooling.

Because of their importance in forest production, and because they require specific attention with respect to training and capacity building, some tasks were given priority in this study. The workers selected to be interviewed had the following main duties: i) Nursery and silvicultural treatment: workers in charge of activities related to planting, pruning, mowing (including brush hook), and seedling production; ii) Power saw operation: workers in charge of felling trees with a chain saw; iii) Forest equipment operation: workers in charge of operating equipment, from a simple agricultural tractor to specialized logging equipment, such as harvesters and skidders; iv) Agrochemical application: workers in charge of applying biocides to control leaf-cutting ants or other agrochemicals used in reforestation activities; v) Transportation: drivers of trucks used in hauling harvested logs.

About 30% the workers interviewed had come from other regions in the last ten years, mostly from the state of Paraná, or from distant areas of the same state where they were currently working, i. e., Santa Catarina or Rio Grande do Sul. Therefore, it is safe to say that the majority (70%) already lived in the region by the time they were hired.

The majority of workers interviewed were between 21 and 55 years old. However, there was a statistically significant difference in the age of workers of certified and non-certified enterprises, with certified enterprises having younger workers (Table 11).

Table 11. Workers' age in certified enterprises and in the control group

Age	Certified Group	Control Group
18 to 30 years	41%	22%
31 to 45 years	43%	42%
46 to 65 years	16%	36%

Less than 3% of the forest workers were women; they worked in the nurseries (certified and control enterprises) or in the application of biocides to combat leaf-cutting ants (control enterprises).

Despite the different social contexts surrounding the various forest enterprises and the complexity involving the gender issue in hired labor, the conditions of women's work unveiled in this study suggest that this issue needs adequate incentives.

With respect to schooling, the statements of the forest workers interviewed were divided in the following categories: i) no schooling – did not attend formal educational institutions; ii) incomplete fundamental school – attended between the first and seventh grade; iii) fundamental school complete – finished eighth grade; iv) incomplete high school – finished the first or second year of high school; v) high school complete – finished the third year of high school or of a technical school.

Based on the data presented in Table 12, the research team suggested that workers of certified enterprises have a higher level of schooling. This may be the result of educational incentives offered to workers or of higher qualification required for carrying out forest activities.

Table 12. Schooling of workers of certified and non-certified enterprises

Level	Certified group	Control group
No Schooling ^b	1%	6%
Incomplete Fundamental School ^b	67%	72%
Fundamental School Complete ^b	12%	13%
Incomplete High School ^b	7%	2%
High School Complete ^b	13%	7%

4.3 Socioenvironmental impacts

4.3.1 Work Health and Safety

The evaluation of workers' health and safety conditions at the forest enterprises was based on the requirements of two Brazilian official regulatory documents: NR31 and NR9. Some of the requirements specified in these documents were divided into the following categories: preventive health; Environmental Risk Prevention Program (ERPP) and Personal Protection Equipment (PPE); agrochemical use; training and capacity building; written support material offered to workers; food, nutrition, and support structure for serving meals to crews working in the field; transportation, and state of repair of forest equipment.

In the evaluation of preventive health, the following items were analyzed: availability of health professionals; medical exams offered to workers – admittance and periodical exams; work-related problems, and work-related accidents.

Only one of these items (health problems related to work) did not show a positive impact of socioenvironmental certification. Probably, one of the reasons for no apparent difference between certified enterprises and non-certified enterprises with respect to this item is the high quality found in the control enterprises (Table 13).

Table 13. Summary of items related to preventive health

Medical item	Certified group	Control group	Quality	Impact	FSC requirement
Medical care provided by company health professionals ^b	72%	45%	★★★★	😊	-
Admittance medical exam ^b	98%	87%	★★★★★	😊	✓
Regular medical exams ^b	94%	64%	★★★★★	😊	✓
Absence of work-related health problems ^b	91%	83%	★★★★★	😐	✓
Medical assistance in case of work-related health problems ^b	100%	23%	★★★★★	😊	-

The research team evaluated the existence of documents such as the Environmental Risk Prevention Program - ERPP (for each enterprise and also for subcontractors) and the use of full PPE by each worker, comparing his/her activities with the need of such equipment according to NR31. However, it was not always possible to

observe the worker performing his/her most specialized tasks; thus, again, the data was based on statements.

There was no positive impact with regard to the existence of ERPP at enterprises or subcontractors, since it is a legal requirement. However, the data show that a significant number of certified enterprises had this document.

There was a positive impact of socioenvironmental certification on the use of PPE by workers of certified enterprises, thus confirming the effect of certification on forest workers safety (Table 14).

Table 14. FSC certification impact on the existence of ERPP and on the use of PPE by forest workers

ERPP and PPE	Certified group	Control group	Quality	Impact	FSC requirement
Use of PPE - general ^b	74%	44%	★★★★	☺	✓
ERPP enterprises ^b	86%	72%	★★★★★	☹	✓
ERPP subcontractors ^d	71%	36%	★★★★	☹	✓

The photos presented on the following pages (Photo 1 to 4) show the use of PPE by chain saw operators - an activity with a high rate of accidents - and also by workers in charge of applying agrochemicals - substances of varying degrees of toxicity.

Photo 1. Correct use of PPE by agrochemical applicator (herbicides and insecticides) in certified enterprises



Photo 2. Correct use of PPE by chain saw operator in certified enterprises



Photo 3. Incorrect use of PPE (A) without safety pants and safety gloves, and correct use (B) by chain saw operators in control enterprises



Photo 4. Incorrect use of PPE by worker applying agrochemicals (insecticide against leaf-cutting ants) in control enterprises



There was a positive impact on one aspect related to the specific knowledge required in applying agrochemicals (knowledge about the safety interval), but there was no impact with respect to the knowledge about the label indicating the highest toxicity level. When asked about this subject, only slightly more than half of the workers of certified enterprises gave the right answer. With regard to good practices in the use of PPE, all workers of certified enterprises interviewed declared that, after use, it was properly washed and put away.

However, the declarations about materials available in the field during the application of agrochemicals showed that there was no impact with respect to this item; therefore, there is a deficiency to be corrected in this aspect.

Table 15. Knowledge and good practices in agrochemical application

Item	Certified group	Control group	Quality	Impact	FSC requirement
Knowledge about safety interval ^b	67%	0%	★★★★	😊	-
Knowledge about the color of the most dangerous label ^b	56%	33%	★★★	😐	-
Correct washing of PPE ^b	100%	40%	★★★★★	😊	✓
Correct storage of PPE ^b	100%	80%	★★★★★	😐	✓
Materials at the moment of application (water, soap and paper) ^b	15%	8%	★	😐	✓

Training and capacity building of workers was evaluated under the hypothesis that well trained workers perform their tasks with a higher level of safety and, therefore, are less prone to accidents.

The positive impacts of socioenvironmental certification on workers' training and capacity building were apparent in the declarations about their participation in training programs for all tasks, and initial orientation/integration activities soon after they were hired. There was a positive effect of certification on chain saw operators, who were able to describe the correct lubrication practice, i. e., crankcase spent oil is not recommended. However, there was no positive

impact on how to handle hung-up trees² (Table 16), when felling trees with a chain saw.

Table 16. Training and capacity building of forest workers

Item	Certified group	Control group	Quality	Impact	FSC requirement
Orientation/integration activities ^a	87%	47%	★★★★★	😊	✓
Training programs for all workers ^b	74%	54%	★★★★	😊	✓
Spent crankcase oil used in chain saws ^b	13%	65%	★★★★★	😊	✓
Correct procedure in case of hung-up trees ^b	64%	41%	★★★★	😊	✓

² When trees are felled with chain saws often happens that, after being cut, the tree does not fall to the ground and remains entangled with other trees that have not been cut yet. This is known as “hung-up” trees or “widow makers.” When this happens, workers must walk away to a safe distance from the tree and remove it with cable winch. However, sometimes workers remain near the hung-up tree carrying out other activities, such as trying to remove the other trees that remain entangled or cutting the hung-up tree into small bolts. Both procedures are highly dangerous.

Photo 5. Hung-up trees in control enterprise



Photo 6. Hung-up tree being removed with a winch in a control enterprise



The availability of written material explaining the correct way to perform forest activities was considered an important source of information to workers and the positive impact of certification on this subject was quite clear. The importance of such texts was also recognized in the declarations obtained during the interviews with workers (Table 17).

Table 17. Impact s of socioenvironmental certification on written material offered to workers

Item	Certified group	Control group	Quality	Impact	FSC requirement
Availability of written material to workers ^f	100%	14%	★★★★★	😊	✓
Perception of the importance of written materials made available by the enterprise ^b	100%	94%	★★★★★	😊	-

The main subjects addressed by the written material offered to workers were (most frequent first): i) work health and safety; ii) education and the environment; iii) mechanics and forest equipment; iv) application of agrochemicals; v) newsletter and internal rules and regulations; vi) chain saw operation; vii) silvicultural treatments; viii) certification, and ix) others (recreational opportunities, nutrition tips, and wood processing).

The positive impacts of socioenvironmental certification with regard to meals provided to working crews and to support structure in the field were quite evident. All declarations related to food (meals served in the field, perception of food quality, basket of basic staples, and nutritional information) and to the support infrastructure in the field (availability of water, vehicle permanently available for emergencies, trained personnel to care for emergencies, and availability of means of communication in the field) indicate a positive impact. Similarly, field observations and workers' declarations with regard to first-aid kits, bathroom facilities (Photo 10 e Photo 11) and adequate installations for serving

meals in the field (Photo 7, Photo 8 and Photo 9), although not in full compliance with the legislation, confirm the positive contribution of certification to the well-being, and to the health and safety of these workers in forest activities (Table 18).

Table 18. Food and support infrastructure in the field

Item	Certified group	Control group	Quality	Impact	FSC requirement
Meals offered in the field ^b	58%	37%	★ ★ ★	☺	✓
Quality of meals ^b	82%	76%	★ ★ ★ ★ ★	☺	✓
Nutritional information (for those not receiving meals in the field) ^b	36%	5%	★ ★	☺	-
Basic staples basket (for those not receiving meals in the field) ^b	49%	2%	★ ★ ★	☺	-
Availability of water in the field ^b	99%	89%	★ ★ ★ ★ ★	☺	✓
Trained person in case of emergency ^b	63%	16%	★ ★ ★ ★	☺	✓
Permanently available vehicle ^b	86%	75%	★ ★ ★ ★ ★	☺	✓
Means of communication in the field ^b	83%	59%	★ ★ ★ ★ ★	☺	✓

cont. Table 18

Item	Certified group	Control group	Quality	Impact	FSC requirement
First-aid kit available in the field ^f	43%	0	★ ★ ★	☺	✓
Place for having meals in the field (with deficiencies to be resolved) ^f	43%*	0	★	☺	✓
Bathroom facilities in the field ^f	57%	0	★ ★ ★	☺	✓

* None of the certified or control enterprises were in total compliance with legislation requirements. For this reason, quality classification was not based on 43% but, rather, on a floor value zero (0)

Photo 7. Field installations for serving meals in certified enterprises



Photo 8. Best case field installations for serving meals in control enterprisesⁿ



Photo 9. Worst case field installations for serving meals in control enterprisesⁿ



Photo 10. Field (portable) toilets in certified enterprises



Photo 11. Field (portable) toilet in control enterprises



The positive impact of certification was again observed with respect to the adequate transportation of forest workers. Table 19 shows data collected in the field with regard to the quality of transportation offered by the forest enterprises. Situations deemed inadequate referred to: a) riding on top of tractors or on the bed of trucks and pick-ups; b) passenger cabin in bad state of repair, and c) transporting fuel in the cabin occupied by workers. Situations considered adequate were: a) vehicles in good state of repair, and b) transportation of tools in closed compartments, separate from passengers.

Photo 12 to 15 illustrate the worst and best situations found with respect to workers' transportation during the survey of certified and non-certified enterprises.

Table 19. Adequate transportation offered to workers and transportation of tools in the same compartment

Item	Certified group	Control group	Quality	Impact	FSC requirement
Transportation offered by the company ^b	65%	39%	★★★★	😊	✓

cont. Table 19

Item	Certified group	Control group	Quality	Impact	FSC requirement
Transportation offered by the company is adequate ^b	98%	87%	★★★★★	😊	✓
Transportation of tools in separate compartment ^b	96%	61%	★★★★★	😊	✓

Photo 12. Best situation found with regard to transportation of workers in certified enterprises (separate closed compartment reserved for tools)ⁿ



Photo 13. worst situation found with regard to transportation of workers in certified enterprises (tire being transported in the passenger cabin)ⁿ



Photo 14. Best situation found with regard to transportation of workers in control enterprises (open compartment reserved for tools)ⁿ



Photo 15. Transportation of workers in control enterprises (makeshift seat in the passenger cabin)ⁿ



The conditions of forest equipment, which included farm tractors, track tractors, skidders and front-end loaders, and of chain saws was evaluated on the basis of field observations. The following items were analyzed with respect to the safety of forest equipment: safety belt, steel structure protecting the operator in case of overturning, and protection of power take-offs. Other items related to safety were also analyzed, such as headlights, back-up lights and sound alarms, horns, and rear-view mirrors.

The data presented in Table 20 show a stark contrast between certified enterprises and non-certified enterprises with regard to conditions of forest equipment and workers' safety, confirming once more the positive impact of socioenvironmental certification. On the other hand, there was no difference with respect to chain saw safety features items (manual chain brake, right-hand protection, left-hand protection, accelerator safety lock and chain safety latch), since in both groups some chain saws were lacking the chain safety latch.

Table 20. Forest equipment safety structures and elements and chain saw safety features

Item	Certified group	Control group	Quality	Impact	FSC requirement
Equipment with all safety structures ^c	100%	0	★★★★★	😊	✓
Equipment with all safety elements ^c	80%	0	★★★★★	😊	✓
Chain saw safety features ^c	60%	71%	★★★	😐	✓

4.3.2 Income

Two indicators were used to assess worker's income: the salary itself and the perception of how adequate this salary and accompanying fringe benefits - such as medical and dental assistance, and baskets of staple goods - are in

comparison with salaries of the region.

The information obtained confirms that forest workers of certified enterprises are better paid than workers of non-certified enterprises. The data presented in show that, according to the declarations obtained during the interviews with workers, only 3% of the workers of certified enterprises earn minimum-wage salary, whereas for workers of non-certified enterprises the corresponding figure is 27%; in addition, 34% of the workers of certified enterprises receive between two and four times the minimum wage, as compared to 12% for non-certified enterprises.

Table 21. Salaries of all forest workers interviewed in certified and control enterprises

Salary	Certified group	Control group
One minimum wage <i>b</i>	3%	27%
Between 1 and 2 (and up to 2) minimum wages <i>b</i>	62%	60%
Between 2 and 3 (and up to 3) minimum wages <i>b</i>	31%	7%
Between 3 and 4 (and up to 4) minimum wages <i>b</i>	3%	5%

In order to verify whether the positive impact of certification was limited to company workers, the variable salary was also analyzed with regard to subcontractor workers. As shown in Table 22, there is a significant difference between the salaries of subcontractor workers of certified enterprises and those of non-certified enterprises, along the same proportions observed for all company workers (Table 21).

Table 22. Positive impact on the salary of subcontractor workers in certified enterprises

Salary	Certified group	Control group
One minimum wage ^b	6%	36%
Between 1 and 2 (and up to 2) minimum wages ^b	71%	53%
Between 2 and 3 (and up to 3) minimum wages ^b	21%	6%
Between 3 and 4 (and up to 4) minimum wages ^b	3%	4%

The hypothesis that the use of subcontractors leads to poor working conditions, in the specific case of lower salaries in certified forest enterprises, was not confirmed. Therefore, the impact of socioenvironmental certification was maintained for company workers, as well as for subcontractor workers.

Again, when fringe benefits were considered, the impact of socioenvironmental certification was positive. Among others, the main benefits reported by workers were: medical and dental care, and basket of staple goods. Two of the certified enterprises had their own clinics that provided medical assistance at the company premises; one of them also provided on-site dental care (Photo 16 e Photo 17).

Photo 16. Medical clinic in certified enterprise



Photo 17. Dental office in certified enterprise



In general, workers of certified enterprises as well as those of non-certified enterprises considered their salaries as adequate when compared with salaries paid in the region (Table 23).

Table 23. Income of forest workers interviewed

Salary	Certified group	Control group	Quality	Impact	FSC requirement
Salary recorded in worker's Official Work Booklet ^b	96%	72%	★★★★★	😊	✓
Salary of subcontractor workers ^b	98%	59%	★★★★★	😊	✓
Perception of salary compatibility with salaries paid in the region ^b	82%	77%	★★★★★	😐	✓

4.3.3 Hiring procedures

The assessment of hiring procedures was concerned mainly with the ability of workers to obtain their official Work and Social Security Register Booklet (Carteira de Trabalho e Previdência Social). This document guarantees some basic rights to workers, such as unemployment benefits, regular monthly salary, paid vacation, 13th salary, paid weekends, retirement benefits and unemployment insurance (Ensured Fund for Length of Time Worked, FGTS). Additional indicators, according to the Brazilian Work Law (Consolidação das Leis Trabalhistas, CLT), were the maximum weekly work load for regular shifts and the recording in the Work Booklet of all benefits received by the worker.

Taking into consideration that all workers of certified enterprises were holders of an official Work Booklet, where their respective work contract had been formally recorded, one can affirm that certification prevented the presence of informal workers. There was also a positive impact of socioenvironmental certification with regard to formal recording in the Work Booklet of all benefits received by workers, but not with regard to the work load of regular shifts (maximum allowed by the work legislation). Such practices still occur in certified enterprises, although at a lower frequency as compared to control enterprises (Table 24). Once more, the hypothesis that subcontracting leads to poor working conditions was not confirmed in certified enterprises, as the positive impact of recording all benefits in the Work Booklet occurred for both groups, company workers and subcontractor workers.

Table 24. Summary of items related to hiring procedures

Item	Certified group	Control group	Quality	Impact	FSC requirement
Contract recorded in the Work Booklet ^a	100%	95%	★★★★★	😊	✓
Weekly work load in regular shifts ^b	92%	82%	★★★★★	😐	✓
All benefits received are recorded in the Work Booklet ^b	91%	54%	★★★★★	😊	✓

4.3.4 Relation with subcontractors

As already mentioned, subcontracting is a common procedure in most forest enterprises. Subcontracting may lead to poor working conditions, since subcontractors are normally small family or individual companies with limited infrastructure, which makes it difficult for them to comply with the requirements of work and environmental legislation. Socioenvironmental forest certification requires monitoring the activities of subcontractors, so that the rights of company workers as well as of subcontractor workers are protected.

Some of the analyses already described in the previous sections, such as those concerning training and capacity building and salaries in certified enterprises, confirm that subcontracting did not result in poor working conditions. Therefore, monitoring the activities of subcontractors probably plays an important role in ensuring workers' rights.

Qualitative information on monitoring of subcontractor

activities was also obtained from the persons responsible for hiring the subcontractors and from subcontractors themselves. The frequency and type of monitoring reported by certified enterprises were more robust than those of the control enterprises (Table 27).

Table 25. Positive and negative impacts of FSC certification on the basis of qualitative information provided by subcontractors

Positive impacts	Negative impacts
Requirement and control of aspects related to worker's health and safety (use of PPE, field and dormitory infrastructure, and quality of meals)	High capital investment to comply with requirements not directly linked to adequate financial returns
Compliance with environmental legislation	Quality standards too high for providing meals to workers
Compliance with work laws	Unnecessary documentation
Better discipline, organization, and accountability	-
Improved communication and better care with subcontractors and workers	-
Better salaries, paid on time	-
Daily, weekly or monthly controls for monitoring subcontractors	-

The findings of the qualitative analysis of the socioenvironmental certification provided subsidies for considering a positive impact that had not been demonstrated by the quantitative analysis, probably due to the small size of the samples. The research team concluded that there is a positive impact of socioenvironmental certification on the monitoring of subcontractors when the qualitative analysis is also taken into account (Table 26).

Table 26. Results of the combined analysis in subcontractor monitoring

Finding	Certified group	Control group	Impact
Monitoring of subcontractors is carried out ^f	85%	57%	😊
Monitoring of subcontractors is carried out, but with deficiencies ^f	14%	14%	-
There is no monitoring of subcontractors ^f	0	29%	-

Considering the fact that subcontractors working for certified enterprises, which offered better working conditions, would tend to work for them for longer periods as compared to non-certified enterprises, the research team also looked into this aspect. However, there was no apparent positive impact in this case (Table 27).

Table 27. Summary of items of relation with subcontractors

Relation with subcontractors	Certified group	Control group	Quality	Impact	FSC requirement
Monitoring of subcontractors ^a	85%	57%	★★★★★	☺	✓
Working for the forest enterprise for more than one year ^b	75%	92%	★★★★	☹	-

4.3.5 Participation in labor unions and length of time worked at the enterprises

Historically, the labor union movement has played an important social role, taking decisive actions as the institution representing rural workers and fighting for their rights. Through the labor union movement, rural workers have obtained a number of important benefits, such as health care and the official confirmation of the number of years worked in farm activities, which is the main document needed to request retirement pay (BRUMER, 2002).

Despite the importance of labor unions, there was no difference between the declarations of workers of certified enterprises and those of non-certified enterprises with respect to their participation in rural labor unions of the region. Similarly, there was no declaration about restrictions imposed by enterprises, either certified or non-certified, against workers joining unions.

Normally, these variables are linked to local issues

and they must be evaluated within the regional context and also on the basis of collective agreements.

The length of time worked at the enterprise was considered to be a sort of commitment to the work place and of the recognition of benefits received by the worker. No positive impact was detected with regard to this issue, either for company or subcontractor workers (Table 28).

Table 28. Participation in labor unions and length of time worked at the job for company's own workers

Item	Certified group	Control group	Quality	Impact	FSC requirement
Labor union affiliation/participation ^b	22%	28%	-	☹	-
Company workers with more than 1 year at the job ^b	81%	96%		☹	-
Subcontractor workers with more than 1 year at the job ^b	64%	67%	-	☹	-

4.3.6 Formal Education

Company workers that lived in the rural estates and that had not finished high school were interviewed in order to verify whether they attended school. With respect to this issue, certification did not show any impact, although there were workers of certified enterprises who were attending school. However, there was a positive impact in relation to their children, even though not all school-age children living at the

site attended school (Table 29).

Table 29. Survey of resident workers and their school-age children

Item	Certified group	Control group	Quality	Impact	FSC requirement
Workers ^b attending school	16%	0	-	☹	-
School-age children of resident workers ^b attending school	85%	15%	★★★★★	☺	-

4.3.7 Housing facilities offered by the enterprise

It was difficult to establish comparisons among variables involving housing facilities due to the variation in the number of residents from one enterprise to another. The situation of houses and dormitories found in the various enterprises surveyed in this study varied according to the enterprise considered. In most cases, the number of resident workers and workers living in the dormitories was quite small. Therefore, due to the small size of the sample, it was difficult to identify any impact by means of statistical analysis. For this reason, the tables relating to this issue present relative frequencies, and not percentages as in the previous tables.

4.3.7.1 Housing conditions

Workers that lived in houses provided by the company

were asked about quality and treatment of their drinking water, payment of rent, access to and payment of electric illumination, and availability of hot water for bathing. The only variable that showed a positive impact of certification was water treatment for human consumption (Table 30).

Table 30. Housing conditions for certified and control enterprises

Housing conditions	Certified group	Control group	Quality	Impact	FSC requirement
Availability of water treatment for human consumption ^b	11/14	2/9	★★★★	😊	✓
Perception that water for human consumption is free of contamination ^b	13/14	9/9	★★★★★	😊	-
Workers do not pay for housing ^b	6/14	2/9	★★★★	😐	-
Workers have electricity in their houses provided by the enterprise ^b	14/14	8/9	★★★★★	😐	✓
Workers are not charged for electricity ^b	11/14	7/9	★★★★	😐	-
Workers with hot water in their houses for bathing ^b	14/14	8/9	★★★★★	😐	✓

4.3.7.2 Dormitory conditions

Here again the small size of the samples led to the

identification of only a few positive impacts of certification on dormitory conditions. These positive impacts included treatment of drinking water and the hiring of a person to clean the dormitories.

Table 31. Dormitory conditions in certified and control enterprises

Dormitory conditions	Certified group	Control group	Quality	Impact	FSC requirement
Good condition of dormitories with respect to cleanliness ^b	10/14	14/18	★★★★	☹	✓
The enterprise hired a person to clean the dormitories ^b	3/14	10/18	★★★★	☺	-
Availability of water treatment for human consumption ^b	9/14	4/22	★★★★	☺	-
Perception that water for human consumption is free of contamination ^b	14/14	22/22	★★★★★	☹	✓
Dormitories with individual places to store personal belongings ^b	9/14	14/22	★★★★	☹	-
Dormitories without food storage ^b	9/14	16/22	★★★★	☹	✓
Dormitories with electricity available to workers ^b	9/14	5/22	★★★★	☹	-
Dormitories with hot water available for bathing ^b	9/14	11/22	★★★★	☹	-

cont. Table 31

Dormitory conditions	Certified group	Control group	Quality	Impact	FSC requirement
Workers having basic electrical appliances ^b	0/5	12/22	★	☹	-

* Not counting workers whose dormitories had kitchen equipped with refrigerator and stove (total of 5 certified and 22 control)

Photo 18. Best situation found in dormitories of certified enterprisesⁿ



Photo 19. Worst situation found in dormitories of certified enterprisesⁿ



Photo 20. Best situation found in dormitories of control enterprisesⁿ



Photo 21. Worst situation found in dormitories of control enterprisesⁿ



4.3.7.3 Sanitary conditions

The items analyzed under this topic were garbage and sewage disposal in houses and dormitories of forest workers. The replies given with respect to sewage disposal were classified according to the environmental degradation potential and the sanitary conditions of its final destination: good (septic tanks and public sewer system); reasonable (cesspool), and unacceptable (discharge in the outdoors or into water bodies – rivers, lakes and springs).

No impact of certification was found with regard to sewage disposal, either in houses or dormitories, as standard cesspools were common features in certified and control enterprises (Photo 22 and Photo 23).

The ways garbage was disposed of were classified as adequate and inadequate. The adequate ways were garbage collection by the forest enterprise and by public sanitation services. Ways of disposal considered inadequate were: garbage left in the outdoors, rivers and streams, and garbage burned or buried into the ground. In this case certification brought an important contribution, as all replies about garbage disposal given by workers of certified enterprises, living in houses or dormitories, were classified as adequate (Table 32).

Field observations confirm this positive impact of certification – six out of seven control enterprises had inadequate ways of disposing of their garbage, while only one was recorded for certified enterprises (Photo 24 and Photo 25).

Table 32. Sewage and garbage disposal in houses of forest enterprises

Item	Certified group	Control group	Quality	Impact	FSC requirement
Sewage disposal (good and reasonable) in houses ^b	12/12	8/9	★★★★★	😊	✓
Inadequate disposal of garbage generate in houses ^b	14/14	6/9	★★★★★	😊	✓
Sewage disposal (good and reasonable) in dormitories ^b	10/12	15/18	★★★★★	😊	✓

cont. Table 32

Dormitory conditions	Certified group	Control group	Quality	Impact	FSC requirement
Adequate disposal of garbage generated in dormitories ^b	14/14	15/22	★★★★★	☺	✓

Photo 22. Sewage disposal found in certified enterprises (biological treatment and cesspool)



Photo 23. Best (cesspool) and worst (outdoors) ways of disposing of sewage found in control enterprises ⁿ



Photo 24. Worst situation found with regard to garbage disposal in certified enterprises (open burning) ⁿ



Photo 25. Worst situation found with regard to garbage disposal in control enterprises (garbage left out in the open in a small patch of trees near the dormitory) ⁿ



4.3.8 Preservation of native forests and conservation of water resources

4.3.8.1 Preservation of native forests

In this study, conservation of natural resources was evaluated by analyzing the following actions on the part of participant enterprises: environmental licensing, officially

recording Legal Reserve (LR) areas on the land title, environmental legislation monitoring, control of invasive species in Permanent Preservation Areas (PPAs), reforestation with native species, and wildlife studies. In addition, the research team looked for indications of forest conversion (clearing forests to provide for agricultural land, cattle raising, reforestation, etc.) and took note of the proportion of native forests present in the rural estate.

The impacts of FSC certification on the conservation of natural resources at the enterprises surveyed were quite evident. Certified enterprises did control invasive species in PPAs, carried out flora and fauna studies and, in contrast with control enterprises, did not show any sign of forest conversion. The best and worst situations found in PPAs during field observations are shown in Photos 27 to 30.

Moreover, certified enterprises had established mechanisms to be kept abreast of the frequent changes of environmental legislation and either had or were in the process of obtaining environmental licenses and recording LR areas on their land titles. All these facts were positive impacts of certification. Only the item reforestation with native species did not show positive impact, although there are other techniques for restoring native forests that were not considered in this evaluation (Table 33).

Table 33. Conservation of natural resources in forest enterprises

Item	Certified group	Control group	Quality	Impact	FSC requirement
Plan for controlling invasive species ^a	100%	33%	★★★★★	☺	✓

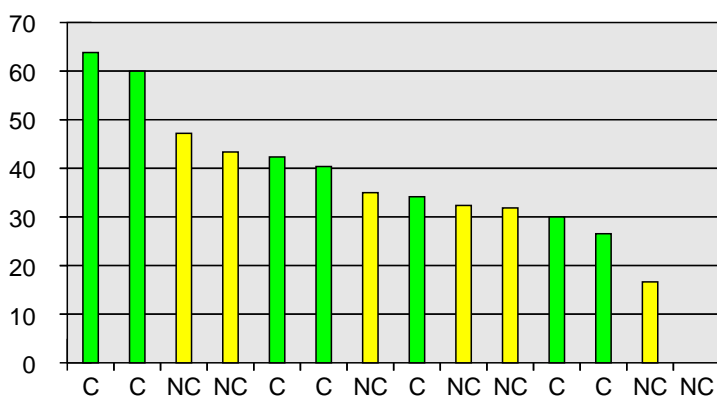
cont. Table 33

Item	Certified group	Control group	Quality	Impact	FSC requirement
Flora and fauna studies ^a	71%	29%	★★★★	☺	✓
Reforestation with native species ⁱ	71%	50%	★★★★	☹	-
Monitoring of environmental legislation ^a	100%	29%	★★★★★	☺	✓
Environmental licensing of rural estates ^a	86%	14%	★★★★★	☺	✓
Rural estates with Legal Reserve officially recorded on land title or in the process ^a	100%	57%	★★★★★	☺	✓
Average percentage of native forests in the enterprises ^a	42%	34%	-	-	-
Signs of forest conversion ^f	0	57%	★★★★★	☺	-

The research team considers this effect on the conservation of natural areas of the forest enterprises to be extremely important, since they are located in the Atlantic Forest. This biome has a high priority for the conservation of biodiversity, is considered a “hot-spot” and has been reduced to 7% of its original cover. According to data presented in the publication Atlas of Forest Remnants of the Atlantic Forest (Atlas de Remanescentes Florestais de Mata Atlântica) issued

jointly in 2008 by the SOS Atlantic Forest Foundation (Fundação SOS Mata Atlântica) and by the National Institute for Space Research (Instituto Nacional de Pesquisas Espaciais, INPE), the percentage of native forests conserved by the enterprises surveyed in this study (an average of 42% for certified enterprises, Table 33) is much higher than the average conservation areas in their two respective states (7,4% for the state of Rio Grande do Sul and 23,8% for the state of Santa Catarina).

Photo 26. Areas set aside for conservation purposes in enterprises considered in this study (% in relation to total area)



C: Certified enterprise; NC: Non-certified enterprise

Photo 27. Best situation found with regard to PPA in certified enterprises (preservation)ⁿ



Photo 28. Best situation found with regard to PPA in control enterprises (preservation)ⁿ



Photo 29. Worst situation found with regard to PPA in certified enterprises (predominance of invasive species and silting of stream)ⁿ



Photo 30. Worst situation found with regard to PPA in control enterprises (accidental forest fire in PPA caused by the use of fire in plantation areas) ⁿ



4.3.8.2 Protection of PPAs

Following the recommendations of the Forest Code, during the field observations the research team looked for signs of possible utilization of PPAs and of the special care that must be taken by forest managers when using their neighboring areas (Photo 31 and Photo 32).

According to the declarations offered by the representatives of the forest enterprises, there was an impact of certification with regard to the special treatment adopted when managing areas near the PPAs. This special treatment consisted of marking the limits of sensitive natural areas, pre and post-harvesting evaluations of buffer zones, directional felling (away from the PPAs), and identification of nest trees for conservation of local avifauna.

When combined declarations of workers and enterprise representatives were analyzed, there was no statistical difference with regard to forest equipment keeping adequate distances from PPAs or wood being stored in these

areas. This finding may be again a consequence of the small number of enterprises included in the sample (Table 34).

Table 34. Protection of PPAs in forest enterprises

Item	Certified group	Control group	Quality	Impact	FSC requirement
Special care with regard to buffer zones ^a	100%	43%	★★★★★	☺	✓
Distance from PPAs kept by forest equipment ^g	71%	29%	★★★★	☹	✓
Absence of wood stored in PPAs ^g	14%	43%	★★★★	☹	✓

Photo 31. Degradation of PPA in certified enterprises (Pine slash in PPA in certified enterprise)



**Photo 32. Degradation of PPA in control enterprises
(forest equipment came too close to the PPA)**



4.3.8.3 Forest Management

When carried out according to good practices and oriented to minimize impacts on the watershed where the forest enterprise is located, forest management can become a strong ally in the conservation of natural resources. The variables used in the assessment of forest management were: existence of a Management Plan with public summary, existence of a Plan for Forest Fire Prevention and Control, and records of forest fires and of wood volumes left in the field.

The Management Plan is an important document that contains the description of forest resources and environmental limitations, silvicultural systems based on the ecological characteristics of the forest under consideration, mechanisms for monitoring growth and dynamics of the forest, and environmental safeguards based on environmental assessment. Table 35 illustrates the quality of certified enterprises, not only with respect to the Management Plan, but also in relation to all the items evaluated in this study; therefore, this table shows the positive impacts of socioenvironmental certification on forest management.

Table 35. management practices observed at participant enterprises

Item	Certified group	Control group	Quality	Impact	FSC requirement
Fire Prevention and Control Plan ^g	100%	28%	★★★★★	😊	✓
Records of forest fires ^a	100%	86%	★★★★★	😐	✓
Forest Management Plan ^a	100%	57%	★★★★★	😊	-
Public Summaries of the Management Plan ^a	100%	0	★★★★★	😊	✓
Wood waste in forest production ^h	0	29%	★★★★★	😐	✓

During the field observations, the research team was able to confirm the existence of equipment and infrastructure to control forest fires, such as fire swatters, water tank trucks, portable manual pumps, observation towers, power pumps, fire brigades and fire breakers (Photo 33 and Photo 34).

Photo 33. Fire control equipment (fire swatters in certified enterprise)



Photo 34. Water tank for fire control in non-certified enterprise



4.3.8.4 Threats to biodiversity

The following factors were considered as threats to the biodiversity of natural areas of forest enterprises: hunting activities, use of fire for land clearing, and oil leaks in the field.

Hunting wild animals is a cultural trait in southern Brazil and was mentioned in the declarations of workers of both certified and control enterprises. Similarly, all representatives of the forest enterprises surveyed in this study informed that they had taken appropriate measures to curb, to a greater or

lesser extent, this practice. These measures included delation, educational and warning signs, notification and punitive measures, surveillance and forest guards, gates in strategic locations, communication of environmental law violations to local environmental agencies. Therefore, no positive impact with respect to diminishing or eradicating hunting activities was observed.

The analysis of the impact of certification on the the use of fire in forest plantations and in the prevention of oil leaks in the field, which was also based on declarations, showed a positive impact and confirmed the adoption of conservation practices. In contrast, signs of fire use or oil leaking were observed in non-certified enterprises (Table 36).

Table 36. Threats to biodiversity in certified and control enterprises

Item	Certified group	Control group	Quality	Impact	FSC requirement
Fire use ⁱ	0	43%	★★★★★	☺	✓
Hunting activities ^f	57%	71%	★★★	☹	✓
Measures taken by the enterprise to control hunting ^f	100%	100%	★★★★★	☹	✓
Care to avoid oil leaks in the field ^a	100%	28%	★★★★★	☺	✓

4.3.8.5 Control of agrochemicals

The items analyzed with regard to the control of agrochemicals used by forest enterprises were the toxicity class of these chemicals, FSC permission to use them, shed for storing toxic products, and the disposal of empty containers. Agrochemicals are classified into four classes according to their toxicity, from the most toxic (Class I) to the least toxic (Class IV). The research team recorded the number of enterprises, both certified and control, that had products of Class I to IV, and the number of different products in each class.

Despite the small size of the sample, only 14 enterprises, it became evident that the use of agrochemicals in control enterprises was more intense than in certified enterprises. This statement refers not only to a greater use of more toxic products but also to the number of enterprises and the amount of products involved (Table 37). However, pesticides included in the "List of Pesticides Banned by FSC, 2007" were found in some certified enterprises (atrazina+simazina, fipronil and clorpirifos) and in control enterprises (fipronil, lambdanacialotrina and deltametrina).

Table 37. Toxicity classes of agrochemicals found in forest enterprises

Toxicity Class	Certified Group		Control Group	
	Enterprises	Products	Enterprises	Products
Class I ^c	0	0	2	2
Class II ^c	1	2	2	2
Class III ^c	2	5	3	9
Class IV ^c	6	7	6	10

Storage of agrochemicals was considered correct when they were placed in exclusive and specific areas, without any contact with other materials, tools or utensils. Storage in inadequate areas (barns, silos, garages, machine shops), or in contact with tools, equipment, fuel and food was considered incorrect storage. The positive impact of certification with respect to this topic was confirmed by field observations, which demonstrated the good care taken by certified enterprises in storing these products (Photo 35 to 38).

Two ways for the disposal of empty containers were considered correct: collection points or returning them to their distributors. Incorrect ways: reutilization or recycling, discarding in the field, burning, burying or leaving them to be collected by the public sanitation service. There was no difference in the data collected for the two groups with respect to this issue. Probably, the sample was not large enough to allow for the detection of the impact of certification (Table 38).

Table 38. Control of agrochemicals

Item	Certified group	Control group	Quality	Impact	FSC requirement
Correct disposal of agrochemical empty containers ^f	83%	50%	★★★★★	☺	✓
Correct storage of agrochemicals in adequate places ^c	71%	14%	★★★★	☺	✓

Photo 35. Best situation found with regard to the storage of agrochemicals found in certified enterprises (area used exclusively for agrochemicals)ⁿ



Photo 36. Worst situation found with regard to the storage of agrochemicals found in certified enterprises (tight space and pesticide in direct contact with the pavement)ⁿ



Photo 37. Best situation found with regard to the storage of agrochemicals found in control enterprises (tools kept in the same area)ⁿ



Photo 38. Worst situation found with regard to the storage of agrochemicals found in control enterprises (very low ceiling and no ventilation)ⁿ



4.3.9 Relation with stakeholders

The research team met with stakeholders in the areas of influence of each enterprise that took part in this study in order to learn about the type of relation maintained with neighboring communities with regard to social and environmental issues. These stakeholders were also asked about FSC socioenvironmental certification and the impacts it

made on the region. By and large, the stakeholders consulted were: local unions of rural workers, municipal environmental councils, research institutions, and local associations.

Some conflicts between the community and certified enterprises and non-certified enterprises were identified (non-compliance with the company social obligations, such as PPE not supplied to forest workers, inadequate transportation, informal labor and lack of social assistance to workers with regard to medical care and health plan).

The stakeholders assessment of the enterprises in their respective geographical regions shows a positive effect of certification, as none of the certified enterprises was classified as having poor performance (Table 39).

Table 39. Relation of enterprise with stakeholders

Item	Certified group			Control group		
Problems/conflicts with stakeholders ^e	22%			17%		
Performance of the enterprise in the region ^e	Good 78%	Average 22%	Poor 0	Good 66%	Average 17%	Poor 17%

With respect to the last item of the survey on the relation with stakeholders, which was about their knowledge and opinion about the FSC socioenvironmental certification, the majority (70%) informed that they knew about FSC certification and added that it brings positive impacts to the civil society. The main impacts mentioned were: better working conditions, a higher degree of professionalism in the administration, work safety (more frequent use of PPE), formal labor contracts (contract recorded in the worker's official Work Booklet), and a higher degree of compliance with environmental legislation.

4.4 Qualitative Data

For most of the items surveyed, the impacts of socioenvironmental certification on forest enterprises were positive. No negative impacts were detected when quantitative data were analyzed. However, when analyzing qualitative data, some negative impacts were identified mainly by the persons responsible for the enterprises. These negative impacts were: mandatory compliance with very rigorous federal laws that are out of touch with the reality of forest production systems, high direct cost of certification (felt even more now, due to the current economic crisis) resulting in a less favorable net cost/benefit ratio for this tool, bureaucracy involving additional documentation with the need to re-enter records into the system, and the difficulty faced by subcontractors in adapting themselves to the certification standards.

However, even in qualitative analyses, positive impacts exceeded negative impacts in frequency and complexity. The answers obtained from open questions submitted to workers, persons responsible for the enterprises, and stakeholders about changes brought about by certification confirm the positive impacts evaluated during the quantitative analysis (Chart 1).

Chart 1. Positive and negative impacts of FSC certification

Positive impact of FSC certification	Negative impact of FSC certification
Worker's quality of life	Mandatory compliance with unrealistic federal laws
Compliance with work laws	High direct cost of certification

cont. Chart 1

Positive impact of FSC certification	Negative impact of FSC certification
Work health and safety	Bureaucracy involving additional documentation and redundant records
More sustainable forest management	Difficulty faced by subcontractors in complying with certification standards.
Change of mindset on natural resource preservation	-
Community relations	-
Better access to foreign markets	-
Closer relation with clients	-

4.5 Economic aspects

The qualitative analysis explored the motivation of forest enterprises in adopting FSC certification and also economic advantages and disadvantages.

Only one forest enterprise mentioned that the main reason for adopting FSC certification was streamlined administration. All other arguments in favor of certification were related to market, as a market requirement or a new avenue to get access to more profitable market niches. In addition, two enterprises declared that the main reason for joining FSC was to improve their corporate image (FSC certification would be a way of breaking the paradigm of “forest villains” or “forest enemies”), proving that they had social and environmental responsibility. Finally, one of the participant enterprises declared that certification was a way to diminish the risk perceived by foreign investors, who see certification as a guarantee of the quality of the processes involved in production and of the respect to socioenvironmental principles.

Only one of the representatives of the control group declared that he had received a request from his clients to obtain certification for his products. However, he did not comply with that request because of the high costs involved in implementing the improvements needed to get certification. He also felt that his clients would keep buying from his company due to the high quality of the products and guaranteed wood supply. Other control enterprises were not really interested in certification because there was no demand from their clients, normally representing the domestic market, with respect to FSC certification. On the other hand, some representatives of non-certified forest companies expressed the opinion that they might adopt certification in the future, in case there is enough market demand.

It is worth mentioning that this study was carried out in the middle of a financial crisis faced by the export sector due to the devaluation of the American dollar. Some enterprises added that, during this difficult period, the cost/benefit ratio of FSC certification might not be all that favorable. Moreover, due to the drastic changes in their market strategy, shifting from export markets (where the importance of FSC certification is greater) to the domestic market, some enterprises showed concern with their economic viability. Along this line, it is interesting to note that, during the preliminary phase of this study, three enterprises declined to participate because they had filed for bankruptcy, and eight more declared that they were facing administrative difficulties or did not have interest in it.

Considering this scenario, and taking into account that market plays a decisive role in maintaining the positive effects of certification, there is an urgent need for strategies to ensure that the demand for certified products is kept at reasonable

levels even in times of crisis. In turn, consumers must be aware of the results of their actions and of the their respective positive impacts with regard to the environment and to the quality of life of the people involved in this process.

These strategies include establishing a proportion between the direct costs of certification and the volume of wood sold as certified, and even adapting certification standards to be applied to small enterprises, without compromising compliance with critical criteria.

5. Conclusions

This research showed that FSC certification brought important socioenvironmental contributions in forest enterprises in the states of Santa Catarina and Rio Grande do Sul. Its positive impacts are related to all socioenvironmental aspects evaluated: workers' health and safety, training and capacity building, agrochemical use; preservation of natural resources, forest management, and relation with local communities. We arrived at the conclusion that the FSC certification is complying with its role as a market tool to introduce changes towards a more sustainable forest management, preserving wildlife and water resources of natural ecosystems, and caring for the worker's health, safety, and quality of life.

Therefore, as already determined by ARAÚJO (2008), this study found that the option for FSC certification has its main motivation on access to new markets, leaving higher financial returns of certified wood as a second priority. What happens in most cases is that certified wood does not fetch higher prices. However, when equally available, clients prefer to buy certified wood, leaving behind products without socioenvironmental labels. In contrast, price oscillations and market crises may act as a terrible threat to certification systems. In the context of this study certified enterprises, which are mainly oriented to foreign markets where FSC certification is recognized and valued, were going through a difficult crisis due to the overvalued real in comparison to the American dollar. In many of these enterprises, the profit margin of certified products had fallen below acceptable levels.

In the end, some alternatives may be able to attenuate such weaknesses related to the market. For example, the

inclusion of certification in social and environmental public policies could lead to broader changes and decrease the dependence of certified products on markets. Another initiative could be the promotion of certification in markets that have not been receptive to its advantages, focusing on the positive impacts of planted forests. The promotion of certification in the domestic market and making Brazilian consumers more aware of the advantages of certification could be a good example. Of course, the alternatives above present some roadblocks, such as the need to mobilize government agencies and the impossibility of controlling markets. Notwithstanding, they must be duly considered in order to guarantee that the objective of certification will be reached in the long run.

Recent studies, such as the Atlas of Forest Remnants of the Atlantic Forest mentioned earlier, have shown that the destruction of native forests is still going on, albeit at a slower pace. There is a pressing need to adopt measures, like FSC certification, to encourage the preservation of these forests so that they are not valued only as an economic asset. The environmental issue points to the need of adapting the certification process according to the region where it is being implemented. This adaptation to the local reality is highly important and must be supported by studies like the present one.

Some occasional deficiencies still remain in the certified enterprises surveyed in this study, but they are limited to items where no positive impact had been detected and to items receiving one, two or three stars in the quality classification system. These items were: Pine regeneration control in PPAs, control of hunting activities, worker's knowledge about the color of labels indicating degree of

toxicity, and presence of extraneous materials (water, soap and paper) at the moment agrochemicals were being applied. The large proportion of male workers in all forest activities was also considered a deficiency of the certification process and incentives are recommended to encourage enterprises to hire more women. Despite the fact that good results are plentiful, with many enterprises receiving good quality classification (four stars) and many positive impacts being identified, it is obvious that there is room for improvements. These improvements are related to: disposal of home sewage (changing from cesspool to septic tanks), dormitory conditions (availability of hot water for bathing and adequate storage of food), workers' formal education, and officially recording the Legal Reserve areas on the land title.

The research team does not see that a better adaptation of the certification system to the reality of each region is a weakness of the system, since this premise is not part of its conception. However, such adaptation could promote changes in a more independent way from the criteria standardization adopted in certified enterprises. Emphasis on improving specific critical criteria could guide the efforts in situations where certified enterprises could advance faster than non-certified enterprises. Taking into account that part of the message of socioenvironmental certification refers to differentiating certified situations from those that are not certified, more specific actions could bring out these differences more quickly.

Another suggestion of the research team is to make unscheduled visits, which can make certification even more effective. None of the certified enterprises had ever received an unscheduled visit, despite the fact that this practice is described by FSC standards. A number of enterprises reported

the problems involved in this type of visit. However, some certified enterprises presented non-compliances that could be better identified and eliminated by means of unscheduled visits.

An important issue to be discussed is the sparse presence of FSC certification among smaller forest enterprises. The reasons why these enterprises are not being certified must be determined in order to make this tool more democratic and to expand the socioenvironmental benefits promoted by certification. Some changes proposed by the players involved in this research are: reduction of certification costs for small producers, production of material providing additional explanation on certification standards and its bureaucracy, and formulation of specific standards for such cases.

The positive impacts of certification on the participating enterprises are related to the objective of sustainable forest management, promoting conservation of natural resources and the quality of life of forest workers. Probably, in forests of industrialized countries where there are other actors working along the same lines recommended by certification standards, the impacts of certification are lower.

However, it is in these countries that most of the socioenvironmental certification initiatives are concentrated. Therefore, the research team suggests that consumers must become aware of the need to further expand the FSC label in developing countries in order to make socioenvironmental certification a better and stronger tool, which is one of the driving forces towards sustainability.

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7. Appendix I

f - Combined analysis between the following sources: interview with the person responsible for the enterprise, interview with forest workers and field observations. The criteria used in the evaluation of special care with PPAs: wood stock, forest conversion and hunting activities (criterion I) are listed in Table 40. The criterion used in the evaluation of written material made available to workers is presented in Table 41. The criteria used in the analysis of garbage disposal and disposal of empty agrochemical containers are listed in Table 42

Table 40. Criterion I for combined analysis

SPECIAL CARE WITH PPAs: WOOD STOCK, FOREST CONVERSION AND HUNTING ACTIVITIES				
Enterprise	Field observations	Number of workers (n) and % workers (P)		Result
No	Indifferent	Indifferent	=	Yes
Indifferent	Yes	Yes	=	Yes
Yes	No	P>0 (of those replying)	=	There are indications
Yes	No	P=0	=	No

Table 41. Criterion II for combined analysis

WRITTEN MATERIAL MADE AVAILABLE TO WORKERS				
Enterprise	Field observations	Number of workers (n) and % workers (P)		Result
No	No	Indifferent	=	No
Indifferent	Yes	Indifferent	=	Yes

cont. Table 41

WRITTEN MATERIAL MADE AVAILABLE TO WORKERS				
Enterprise	Field observations	Number of workers (n) and % workers (P)		Result
Yes	No	P>0 (of those replying)	=	There are indications
Yes	No	P=0	=	No
Yes	No	P>50%	=	Yes

Table 42. Criterion IV for combined analysis

GARBAGE DISPOSAL, DISPOSAL OF EMPTY AGROCHEMICAL CONTAINERS				
Enterprise	Field observations	Number of workers (n) and % workers (P)		Result
Incorrect	Indifferent	Indifferent	=	Incorrect
Indifferent	Incorrect	Indifferent	=	Incorrect
Correct	Correct	P= 100% Correct	=	Correct
Correct	Correct	50%<P<100% Correct	=	There are indications of deficiencies
Correct	Correct	P<50% Correct	=	Incorrect

g - Combined analysis between the following sources: interview with the person responsible for the enterprise and interview with forest workers. The criteria used in the evaluation of special care with PPAs were: distance kept by forest machines, community projects FISHING WAS REMOVED (criterion V) are listed in Table 43. The criterion used for evaluating fire prevention and control is listed in Table 44.

Table 43. Criterion V for combined analysis

SPECIAL CARE WITH PPAs: DISTANCE KEPT BY MACHINES, COMMUNITY PROJECTS, ACTIONS TO CURB FISHING			
Enterprise	Number of workers (n) and % workers (P)		Result
Yes	N=0	=	Não
Yes	P=100% (of those replying)	=	Yes
Yes	P 100% (of those replying)	=	Yes, with deficiencies
No	Indifferent	=	No

Table 44. Criterion VII for combined analysis

FIRE PREVENTION AND CONTROL PLAN (criterion # 9 - positive)			
Enterprise	Number of workers (n) and % workers (P)		Result
Yes	P<20%	=	No
Yes	P>=80% (of those replying)	=	Yes
Yes	20%>P>80%	=	Yes, with deficiencies
No	Indifferent	=	No

h - Combined analysis between the following sources: field observations and interview with forest workers. The criterion used for evaluating production residues is in Table 45 and for first-aid and toilet facilities in the field in Table 46. The criteria for evaluating the place where meals are served in the field are listed in Table 47 and for local storage of agrochemicals in Table 48.

Table 45. Criterion IX for combined analysis

PRODUCTION WASTE			
Field observations	Number of workers (n) and % workers (P)		Result
Yes	Indifferent	=	Yes
No	N = 0	=	There are indications
No	N=0	=	No

Table 46. Criterion X for combined analysis

FIRST-AID ASSISTANCE AND TOILET FACILITIES IN THE FIELD			
Field observations	Number of workers (n) and % workers (P)		Result
All sites with working crews	$P \geq 90\%$ ($=1$)	=	Yes
In some OR in all sites with working crews	$P \geq 85\%$ ($=1$)	=	Sim, com falhas
Indifferent	$20\% < P < 85\%$	=	Poor
Indifferent	$P < 20\%$	=	No

Table 47. Criterion XI for combined analysis

PLACE FOR SERVING MEALS IN THE FIELD			
Field observations	Number of workers (n) and % workers (P)		Result
In accordance	$P \geq 90\%$ (in accordance)	=	Yes
Indiferente	$P \geq 85\%$ (in accordance)	=	Yes, with deficiencies
Indiferente	$20\% < P < 85\%$ (in accordance)	=	Poor
Indiferente	$P < 20\%$ (in accordance)	=	No
Nor in accordance or not existent	$P \geq 90\%$ (in accordance)	=	Yes, with deficiencies

Table 48. Criterion XII for combined analysis

PLACE FOR STORING AGROCHEMICALS			
Agrochemicals	Field observations		Result
P>90%	Correct	=	Correct
Indifferent	Incorrect	=	Incorrect
P<90%	Correct	=	Incorrect

i - Combined analysis between the following sources: field observations and interview with the person responsible for the enterprise. The criterion used in the evaluation of fire as an agricultural practice is in Table 49 and for reforestation with native species in Table 50.

Table 49. Criterion XIII for combined analysis

USE OF FIRE AS AN AGRICULTURAL PRACTICE			
Enterprise	Field observations		Result
Yes	Indifferent	=	Yes
Indifferent	Yes	=	Yes
No	No	=	No

Table 50. Criterion XIV for combined analysis

REFORESTATION WITH NATIVE SPECIES			
Enterprise	Field observations		Result
Yes	No	=	Yes, without confirmation
Yes	Yes	=	Yes, without confirmation
No	No	=	No

j - Combined analysis between the following sources: interview with the person responsible for subcontracted activities and interview with the person responsible for the enterprise. The criterion used in the evaluation of how subcontractors are monitored is listed in Table 51.

Table 51. Criterion XV for combined analysis

MONITORING SUBCONTRACTORS			
Enterprise	Field observations		Result
No	Indifferent	=	No
Indifferent	P=0	=	No
Yes	P 0	=	Yes, with deficiencies
Yes	P=100%	=	Yes

k - Quality of the certified enterprises based on the percentage of positive results assigned to enterprises, according to the following scale:

★★★★★	★★★★	★★★	★★	★
81 to 100%	61 to 80%	41 to 60%	21 to 40%	0 to 20%

Observation: for combined analyses only totally positive results were used, i. e., when establishing the quality class, results such as “yes, with deficiencies” and “yes, but poor” were discarded.

I - Quality of the certified enterprises, for the variable salary, based on the percentage of positive results assigned to enterprises, according to the following scale:

★★★★★	★★★★	★★★	★★	★
81 to 100%	61 to 80%	41 to 60%	21 to 40%	0 to 20%

For analyses carried out independently of type of worker (company employees or subcontractor employees) and operators in charge of silvicultural treatments and nursery activities, the percentages related to workers earning more than one minimum wage were considered positive.

For analyses referring to more specialized jobs (machine operators, chain saw operators, workers in charge of agrochemical application, and workers responsible for transportation), the percentages related to workers earning more than two minimum wages were considered positive.

When comparing salaries paid by the enterprise with salaries paid in the region for the same jobs, salaries higher than those prevailing in the region were considered positive.

m - Quality of the certified enterprises, for the variable length of time worked at the enterprise, based on the percentage of positive results assigned to enterprises, according to the following scale:

★★★★★	★★★★	★★★	★★	★
81 to 100%	61 to 80%	41 to 60%	21 to 40%	0 to 20%

For analyses carried out for this variable, the percentages related to work periods greater than one year at the enterprise were considered positive.

n - The criteria used for classifying best and worst conditions in certified and control enterprises were based only on field observations as shown in the photos presented in this report. These criteria were:

i) Dormitories

Adequate: Roofs without leaking, windows that provided ventilation, closet or place for keeping personal belongings, bathroom with hot water, electric lighting, bedroom free of tools, food, fertilizers, fuel and/or agrochemicals.

Inadequate: Leaking roofs, rooms without windows, without closets for keeping personal belongings, without electric lighting, bedroom with tools, food, fertilizers, fuel and/or agrochemicals.

ii) Place for storing agrochemicals

Adequate: Exclusive place for storing agrochemicals; proper warning signs; products without contact with the walls or pavement; natural lighting to provide good visibility; enough ventilation to prevent odors.

Inadequate: Agrochemicals in the presence of tools,

food, fertilizers, fuel and other articles; absence of warning signs outside the shed; products in contact with walls or pavement; dark and unventilated space.

iii) Use of fire/Forest Conversion

Adequate: Forest management does not make use of fire and no indication of forest conversion.

Inadequate: Use of fire in forest management activities and indications of forest conversion.

iv) Garbage disposal at the enterprise

Adequate: Separation of recyclables and selective collection, public collection – enterprise without garbage left in the outdoors or burned.

Inadequate: Garbage left out in the open and/or burned at the enterprise's premises.

v) Transportation of Workers

Adequate: Vehicles in good conditions of repair and safety; tools carried inside the vehicle but in closed compartments (separate from the workers).

Inadequate: Vehicles in poor conditions, inadequate safety conditions; tools inside the same compartment used by workers.

vi) Common Use Areas

Adequate: Enterprises that do not provide meals to their workers (no company restaurant), but provide them with facilities in the field, such as benches, tables, cover against rain and direct sunlight, and garbage cans.

Inadequate: Enterprises that do not provide meals to their workers (no company restaurant) and without any structure to provide meals to their workers.

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