

Economic And Social Benefits In FSC Certified Companies Located In Brazil

Camila Fagundes^{1,*}, Dusan Schreiber¹, Moema Pereira Nunes¹,
Maria Eduarda Fernandes² and Claudio Damacena³

¹Universidade Feevale

²Instituto Politécnico de Leiria

³University of Santa Cruz do Sul

ABSTRACT:

Among the largest and most recognized forest certifications, the Forest Stewardship Council (FSC) deserves special mention. Its objective is to certify forest-origin products that come from socially fair, environmentally adequate, and economically viable management. This study aimed to investigate whether the duration of certification and the organizational size influence the perception of economic and social benefits of FSC Certification from the perspective of managers of Brazilian companies holding this seal. To achieve this objective, a quantitative survey was conducted with 54 Brazilian companies. Regarding the economic and social dimensions of sustainability, the "Certification Time" appears to influence the perception of FSC benefits, as indicated by p-values lower than 0.05 in the Kruskal-Wallis test. Furthermore, Dunn's test revealed that companies with a longer certification period, on average 10 years, perceive more benefits. Based on the presented results, it can be concluded that the "Certification Time" can influence the perceptions of economic and social benefits of FSC Certification, while the organizational size did not demonstrate significant influence on the generation of benefits. One of the main contributions of this study, both in academia and for organizations in the agroforestry sector, is providing insights to support the design of actions and strategies aimed at rapidly enhancing the benefits of FSC Certification and encouraging companies to adopt it.

Keywords: time of certification; organizational size; FSC certification; benefits; survey.

Date of Submission: 14-07-2023

Date of Acceptance: 24-07-2023

I. INTRODUCTION

With each passing year, companies have noticed an increase in the socio-environmental awareness of their stakeholders. This growth has been impacting the way companies have been managing their businesses, seeking more and more to impact their stakeholders, that is, meeting their expectations. Many of these expectations meet norms and standards that seek to positively impact the environment and society as a whole. In this way, organizations around the globe have been adhering to new procedures in order to meet the requirements required to obtain certification, and thereby demonstrate their socio-environmental responsibility to their target audience (Tuppura et al., 2016).

There are numerous forest certifications that attest to the commitment of organizations with the Planet (*Food Agric. Organ. United Nations*, 2020). In global terms, the Forest Stewardship Council (FSC) and the Program for the Endorsement of Forest Certification (PEFC) stand out, which together account for approximately 10.4% of the global forest area, more specifically, 424 million certified hectares (Charnley et al., 2022; Frey et al., 2022; Garzon et al., 2020). However, the FSC is one of the most respected and influential systems in existence, as it incorporates the interests of economic, social and environmental groups into its evaluation criteria (Piketty & Garcia Drigo, 2018; Rafael et al., 2018). In the 1990s, the high rates of global deforestation, mainly in the Amazon region (Brazil), considered the largest tropical forest in the world and famous for its biodiversity, attracted the attention of several activist players in which they directly influenced the creation of mechanisms of control able to formally ensure that the activities carried out in a specific forest area meet a series of sustainable criteria guaranteeing the perpetuity of the ecosystem (Ehrenberg-Azcárate & Peña-Claros, 2020; Michal et al., 2019).

Although the FSC was created in 1993, the first publications on the subject appeared only in the early 2000s and since then, they have multiplied intensely. However, even so, there is still a low number of publications developed by Brazilian institutions and researchers, for example (Fagundes et al., 2022a, 2022b). Institutions located in North America and Europe, especially those located in countries such as the United States of America, Canada and Sweden, stand out when the subject is the FSC (Fagundes et al., 2022b).

Furthermore, the benefits and challenges of the FSC are the most discussed topics regarding certification in the national and international literature (Fagundes et al., 2022a, 2022b). In addition, data collected mainly through documentary research using a qualitative approach is the most used methodology, demonstrating the need for a deeper understanding of the theme through quantitative studies (Fagundes et al., 2022a, 2022b).

When evaluating the benefits and challenges of the FSC, some variables need to be taken into account due to divergences that were evidenced through the theoretical review (Ehrenberg-Azcárate & Peña-Claros, 2020; Michal et al., 2019; Wing So & Lafortezza, 2022). A specific benefit, such as, for example, an increase in the unit sales price or improvements in the relationship with the local community, does not necessarily manifest itself in all locations in the same way, due to the particularities of each region. In many cases, both the certification implementation process and the evaluation process can be shaped in different ways depending on the knowledge, skill and attitude of the professionals involved, and also due to the type of methodology used (Hälälışan et al., 2021; Maletz & Tysiachniouk, 2009; Romero & Putz, 2018).

In addition to the specificities of research, with emphasis on the geographical location of the investigated companies, the methodology used, the lack of standards in defining the characteristics of the teams involved, two variables little explored in the international literature were identified, namely: (i) length of certification and (ii) organizational size. Some studies (Francisco Ehrenberg-Azcárate & Peña-Claros, 2020; Girolami & Arts, 2018) report the need for longitudinal studies to identify the benefits and challenges of the FSC. In addition, certified companies that have been carrying out forest management for a longer time, larger and located mainly in the northern hemisphere of the planet tend to realize the benefits of certification, unlike smaller companies located in the southern hemisphere (Michal et al., 2019; Tricallotis et al., 2019; Xu & Lu, 2021). The economic and social effects of certification, for example, depend on long-term monitoring of selected indicators (Michal et al., 2019; Nebel et al., 2005).

In this way, aiming to contribute to the debate on the subject, exploring the mentioned theoretical gap, the general objective of this article is to verify if the certification time and the organizational size influence the perception of economic and social benefits by the FSC Certification in companies Brazilian. To achieve this objective, a survey was conducted in 54 FSC certified companies, operating in different market segments located in Brazil, such as: Pulp and Paper; Forestry; Processed Wood among others between March and September 2022 (6 months). The data obtained were submitted to multivariate statistical analysis (Hair et al., 2005).

In addition to this introduction, this article is organized into four other components, namely: (I) the theoretical framework where the hypotheses linked to the objective to be solved are presented; (II) description of the methodology used; (III) the results achieved; and finally, (IV) final considerations and bibliographical references close the present study.

II. LITERATURE REVIEW

One of the most recognized forest certifications is the FSC (Piketty & Garcia Drigo, 2018). The main objective of a forest certification is to ensure that a certain activity carried out in a forest area meets the sustainability standards stipulated by the certification and has also undergone a third-party verification process, that is, an audit (Frey et al., 2022; Garzon et al., 2020; Michal et al., 2019; Xu & Lu, 2021).

The FSC is a non-profit, non-governmental international organization (NGO). It was founded in Germany in 1993 with the aim of curbing high rates of global deforestation and recognizing products from sustainably managed forests. Gradually, certification gained space and notoriety, reaching more than 89 countries, including Brazil. Currently, FSC certification has four types of certification, as shown in Table 01. Within this scenario the FSC has 205,079,124 hectares certified in forest management, a total of 53,310 in chain of custody and 49 certifications in ecosystem services. In Brazil, 8,160,267 certified hectares, 1,187 chain of custody (CoC) certificates and no ecosystem service (FSC, 2022).

Table 1: Type of FSC Certifications.

Type	Description
Forest Management	Forest Management certification is granted to enterprises or producers whose forests are managed responsibly, in accordance with the Principles and Criteria of the FSC system.
Chain of Custody	The Chain of Custody (CoC) certification evaluates traceability from the production of raw materials in forests to the product delivered to the final consumer.
Wood Controlled	Controlled wood certification is intended for materials that are not certified, but originating from sources considered acceptable and that can be mixed with FSC certified material in products with the 'FSC Mixed' label.
Ecosystem Services	This certification is intended to recognize the ecosystem services that can be obtained in forest areas and provide society with a wide range of uses such as sources of drinking water, soil productivity and carbon fixation.

To achieve FSC certification for forest management it is necessary to follow ten principles and criteria stipulated by the FSC, which are: (1) Compliance with the Law; (2) Workers' Rights and Working Conditions; (3)

Rights of Indigenous Peoples; (4) Community Relations; (5) Benefits of the Forest; (6) Environmental Values and Impacts; (7) Management Planning; (8) Monitoring and Evaluation; (9) High Conservation Values; and (10) Implementation of Management Activities. Within this perspective, of the 10 principles stipulated by the FSC, three are linked to the social dimension of sustainability (Principles 2, 3 and 4), one to the economic dimension (Principle 5) and two to the environmental dimension (Principles 6 and 9). Of the four remaining principles, one is directed exclusively towards compliance with legislation (Principle 1), while principles 7, 8 and 10 deal with operational issues of forest management (Hain & Ahas, 2011; Halalisan et al., 2018; Moore et al., 2012; Piketty & Garcia Drigo, 2018).

In order to achieve all the principles, a series of criteria and indicators are implemented by the organization interested in achieving the seal. If the indicators are not achieved, non-conformities are generated, requiring the company to resolve them (Frey et al., 2022; Garzon et al., 2020; Piketty & Garcia Drigo, 2018; Rafael et al., 2018). Based on these ten principles, the FSC believes it can succeed in promoting the responsible management of Brazilian forests, reconciling social, environmental and economic aspects (FSC, 2022; Garzon et al., 2020; Xu & Lu, 2021).

Implementing a certification of the size of the FSC is not an easy task. In Brazil, several companies are still in the early stages when it comes to sustainable forest management, which represents an obstacle in the implementation phase, raising the perception of the level of complexity, as everything ends up becoming new to those involved (Chen et al., 2020). During the process of adaptation to the indicators, several investments are necessary, among which the following stand out: investment in consultancy; costs with audits and training of employees due to the new organizational processes; implementation of systems to document and store procedures; development of projects and actions aimed at approaching stakeholders and hiring qualified people (Galati et al., 2017; Moore et al., 2012; Paluš et al., 2018).

As the internalization of the principles takes place and their management takes place, several benefits are perceived. Among the main ones, we highlight: increased environmental awareness; improvements in working conditions and respect for labor laws; improvements in the relationship with the local community, including indigenous peoples; preservation of cultural aspects of the local community; job and income generation; strengthening of the organizational brand, access to new markets and increase in the unit price of certified products (premium price) (Fagundes et al., 2021; Halalisan et al., 2018; Tricallotis et al., 2018; Wing So & Laforteza, 2022). However, such benefits are not always present in the same way in all certified companies.

The location of the certified company is a variable already explored by the literature, reaching specific results. Several studies (Michal et al., 2019; Tricallotis et al., 2019; Xu & Lu, 2021) report that companies located in the northern hemisphere of the planet tend to perceive the benefits of certification more concretely. One of the main justifications for this is the lack of recognition by consumers located in the south when a product is certified or not (Kameyama & Sugiura, 2021). In parallel, in Brazil in particular, the country constantly suffers from high rates of deforestation, favoring the insertion of illegal wood at a price below market. Developing countries suffer from a lack of responsible governance and public policies in favor of sustainable development (Xu & Lu, 2021).

Due to the different certification needs, mainly the availability of resources, some companies may have an advantage over others, as is the case of small companies in relation to medium and large ones. Among the main difficulties faced by this type of business, the following stand out: lack of time; cash; flexibility; strategic thought; networking among others, which complicates the process of obtaining certification (Boström, 2012; Di Lallo et al., 2016; Hoang et al., 2019; Wibowo et al., 2019). Harada and Wiyono (2014) also comment that without external support (national and international NGOs) and also from the government, some certifications are not possible. Some authors (Gafo Gomez-Zamalloa et al., 2011; García-Montiel et al., 2017; Lidestav & Lejon, 2011), report the need for more research involving small companies in order to understand the scenario.

Although the FSC manages to generate several benefits, a series of challenges are also evidenced in the literature, among the main ones identified, the following stand out: low demand in the Brazilian market; lack of knowledge about certification; absence of government incentive; excessive bureaucratization and high costs (Fagundes et al., 2021, 2022a, 2022b). When faced with challenges or even the non-generation of benefits, many companies end up giving up on the certification process (Frey et al., 2022). For obstacles to be overcome, the FSC requires continuous improvement of organizational processes, which contributed to a longer delay in overcoming challenges (Piketty & Garcia Drigo, 2018).

Every year, certified companies go through a process of monitoring the principles and criteria and every five years, that is, they need to go through recertification. Audits are considered essential processes within a certification mechanism, as they ensure that certain criteria are met or not. In this way, it is understood that with each new certification, companies can improve their processes with the aim of meeting identified non-conformities. However, (Cook et al., 2021) pointed out that companies can get used to being audited instead of improving forest management practices over the years.

Within this perspective, it is inferred that two variables, still little explored in the scientific literature, which are (1) Organizational Size and (2) Time since Certification, can be decisive for the perception of benefits resulting from the FSC seal.

- H1. Organizational size influences the achievement of economic benefits;
- H2. Organizational size influences the achievement of social benefits;
- H3. The certification time influences the achievement of economic benefits;
- H4. The certification time influences the achievement of social benefits;

III. METHODOLOGY

This chapter aims to describe the methodology used to achieve the proposed objective. Using a quantitative approach, the construct variables were tested, as well as the relationships established in the theoretical model.

Data Collection Instrument

The construction process of the data collection instrument was carried out with the help of the bibliographic review carried out. Initially, a set of observable variables was identified for each defined analysis category. Observable variables are those to which the researcher can assign a measurable attribute, facilitating the data tabulation process for this phase and subsequent interpretation. Once this was done, the questionnaire in its entirety was formed by three blocks (Appendix A). In the first, questions to characterize both the respondent and the company was the objective. The second block presented the observable variables with a focus on the social benefits of FSC certification. For this, a 5-point Likert-type agreement scale was constructed. This scale was chosen due to its ease in carrying out statistical analyses. And finally, the last block, presented the variables in relation to the economic benefits, following the same logic of scale.

The data collection instrument was validated by professionals in the area. In a non-random way, for convenience and intentionally, 5 PhD professors were chosen to validate the questionnaire (Malhotra, Naresh, 2018). The profile of experts in the area can be seen in Table 02.

Table 2: Experts Profile.

<i>Expert n°</i>	Education and Experience
<i>Expert 1</i>	Doctor in Administration. He is a professor and researcher in the areas of Administration and Environmental Sciences.
<i>Expert 2</i>	Doctor in Administration. She is a researcher in the field of Administration.
<i>Expert 3</i>	PhD in Environmental Quality. She is a researcher in the areas of Administration and Environmental Sciences.
<i>Expert 4</i>	Doctor in Education. He is a researcher in the field of Environmental Sciences.
<i>Expert 5</i>	Doctor in Education. She is a researcher in the areas of Administration and Environmental Sciences.

After the validation, with the purpose of verifying the internal consistency of the elements of the data collection instrument, an analysis of the Cronbach's Alpha coefficient was carried out, with the questionnaires obtained in the pre-test stage, through the statistical program SPSS® version 20.0.0 (Statistical Software for Social Sciences). Cronbach's alpha coefficient measures the correlation of questions (Hair et al., 2005). Its reliability has 5 stages, they are: very low, low, moderate, high and very high. For a questionnaire to have acceptable reliability, the Alpha value must be above 0.70. Below this value, consistency is considered low (Hair et al., 2005). Within this perspective, the questionnaire applied to certified companies was considered satisfactory as the alpha value was 0.891.

Data Collection

According to the (FSC, 2022), there are more than 215,562,304 hectares certified in 89 countries. Of this total, almost 30% is located in North America, followed by 28% in the CIS (Commonwealth of Independent States) and 25% in Europe. Latin America, Africa and Asia correspond respectively to 8%, 4% and 3%. In the Brazilian scenario, in more than 25 years of existence of the FSC, Brazil went from 5 to 150 certified forests, reaching a total of 8,017,740 certified hectares, being the sixth country with the most certified area, second only to Canada, Russia, United States United States, Sweden and Belarus (FSC, 2022).

A complete list of companies certified with the FSC seal for forest management in Brazil was extracted from the institution's website. With the names of all of them in hand, the search for the respective contact telephones and e-mail for forwarding the questionnaire began. For this, by consulting the google search platform (www.google.com), each company was individually searched so that the query data could be found. As one of the limitations of this process, of the total of 150 companies that have FSC certification in Brazil, 15 organizations could not be contacted, as the telephone number in the register did not work.

Of the remaining 135 companies, through the contact phone, between the months of May and July 2022, all listed companies were contacted, requesting e-mail and possible contribution to the study, explaining the central objective of the research and also highlighting their anonymity, so that accurate data could be collected (Cervo, Amado Luiz; Bervian, Pedro Alcino; Silva, 2011). Using Microsoft Excel 2016, a control spreadsheet was structured, detailing the contact date and key information about the companies.

The use of the internet, and especially e-mail for data collection, has some advantages, among which the following stand out: lower costs, speed and the ability to reach specific populations in different locations. In addition, the respondent can return when it is more convenient for him, not requiring a momentary return as in physical questionnaires applied in person. However, this method also has some disadvantages, and among the main ones is the low adherence to the questionnaire (Malhotra, Naresh, 2018).

In total, 405 emails were sent between August and September 2022. Each company received the questionnaire 3 times. It is important to mention that the research was approved by the ethics committee. This volume of e-mails resulted in a response from 54 responding companies. To facilitate the process of interpreting the results, the questionnaire was structured with the tool called Question Pro. At the end of the data collection process, the platform generated a spreadsheet with Microsoft Excel 2010 showing the survey results.

Scale Used

The instrument constructed in its version before factorial validation contained ten items for the social dimension and eight items for the economic dimension. It is worth mentioning that the two dimensions were chosen for specific reasons, namely: (I) when analyzing the 10 FSC principles, one perceives a predominance of issues related to the environmental dimension, therefore, a greater number of benefits are expected for this dimension; (II) when performing a search in the main databases, Fagundes, Schreiber, Nunes, et al., (2022) noticed the predominance of studies aimed at the environmental dimension. In a total of 5,206 scientific articles found, 4,486 were linked to the environmental area, thus demonstrating the need for further studies focusing on the social and economic dimensions; (III) Furthermore, the same happened with the research by (Wolff & Schweinle, 2022), in which only 45 articles were found reporting economic issues and forest certifications, in general.

For factorial validation, the principal components method was used to extract factors, with a minimum eigenvalue equal to 1.0, following the recommendations of (Hair et al., 2005). For the author, the initial factors derived using the principal component analysis are constituted mainly of the common variance and a much smaller portion of the unique and error variance. Also, principal component factorial solutions tend to be more stable. For factor rotation, the Oblique method was applied in the Oblimin option, stipulating a minimum factorial load of 0.35 for each of the items (Hair et al., 2005; Pasquali, 1999).

The results of the scale for the economic dimension can be seen in Table 03, which presents the factor loads. In short, the scale consisted of eight items distributed into two factors in its final version, which represented a total variance of 75% and no item with a load lower than 0.738 (Hair et al., 2005). Regarding the reliability of the factors, Pasquali (1999) attests that alphas (α) above 0.70 are considered reliable, and above 0.80, very reliable. Moreover, following the recommendations of Hair et al., (2005), 60% is the ideal level of explained variance.

Table 3: Economic Dimension Factor Analysis.

Variables	Mean	Standard Deviation	Economic Viability	Competitive Advantage	Cronbach's Alfa
Access to new markets	4.111	0.604		0.916	0.824
Increased sales in the international market	4.056	0.834		0.916	
Increase in sales within Brazil	2.944	1.017	0.806		0.914
Price Premium	3.111	1.093	0.794		
Profit	2.981	1.037	0.825		
Reduction of direct and indirect costs	2.259	1.102	0.933		
Return on investment	2.593	0.836	0.727		
Productivity	2.852	0.979	0.835		

N=54 companies.

The results of the scale for the social dimension can be seen in Table 04, where the factorial loads are presented. In short, the scale consisted of eight items divided into three factors in its final version called "Corporate Image", "Trust" and "Credibility", which represented a total variance of 76.5% (Hair et al., 2005; Pasquali, 1999). Regarding the reliability of the groups, the three presented values above 0.70, considered, therefore, reliable as well as in the economic dimension (Pasquali, 1999).

Table 4: Social Dimension Factor Analysis.

Variables	Mean	Standard Deviation	Corporate Image	Confidence	Credibility	Cronbach's Alfa
Increase in consumer/customer confidence	3.870	1.047	0,871			0.771
Increased communication with stakeholders	4.093	0.784	0,768			
Increased engagement with stakeholders	3.907	0.896	0,736			
Increase in infrastructure projects for the local community	3.667	0.911		0.880		0.783
Increase in social services to the local community	3.772	0.834		0.830		
Increased compliance with local, national and international legislation	4.278	0.738			0,906	0.785
Increase in job creation for the local community	3.630	0.938			0,684	
Increased respect for the customs and culture of the local community	3.833	0.795			0,599	

N=54 companies.

By validating the factors and naming them, new hypotheses were incorporated. In total, four main hypotheses form the subdivided study, unfolding, in this way, into 10 hypotheses.

H1. Organizational size influences the achievement of economic benefits;

H1a: Organizational size influences economic viability;

H1b: Organizational size influences competitive advantage;

H2. Organizational size influences the achievement of social benefits;

H2a: The organizational size influences the corporate image;

H2b: Organizational size influences trust;

H2c: Organizational size influences credibility;

H3. The certification time influences the achievement of economic benefits;

H3a: The certification time influences the economic viability;

H3b: The certification time influences the competitive advantage;

H4. The time since certification influences the achievement of social benefits;

H4a: The certification time influences the corporate image;

H4b: The time since certification influences confidence;

H4c: The time since certification influences credibility;

Data Analysis

For the analysis of quantitative data, initially, descriptive statistics were performed, which consists of calculating and identifying the central tendency and dispersion measures (Hair et al., 2005). Central tendency measures are used to characterize the mean value of responses provided by respondents in each analysis category. Dispersion measures describe how much the data varies from the mean value of the set. Furthermore, based on the percentages provided by descriptive statistics, it was possible to characterize the sample of this research (Hair et al., 2005).

To compare the groups, that is, "Certification Time" and "Organizational Size", we started with the analysis of variance better known as ANOVA, a statistical test used to test the statistical differences between two or more populations taking into account the values of averages (Hair et al., 2005). However, prior to that, the Shapiro-Wilk normality test was performed. Upon finding a p-value greater than 0.05 in the Shapiro Wilk test for all groups, the data were submitted to the Kruskal-Wallis test, followed by Dunn's post-hoc test, due to the non-normal distribution of the data, requiring a test not -parametric (Hair et al., 2005).

Kruskal-Wallis is a test that uses numerical values transformed into ranks and grouped into a single data set. Comparison of groups is performed using the simple arithmetic mean of ranks and seeks to test two hypotheses: i) H0: groups have the same distribution of values; ii) H1: the groups do not have the same distribution of values. When identifying differences between groups, the Dunn test was applied to find out which means are significantly different (Hair et al., 2005).

All statistical analyzes were performed using the Jasp 0.16.3.0 statistical program. The software was chosen because it offers free access to statistical procedures considered basic, such as t test, ANOVA, linear regression models, among others. In addition, it presents an easy-to-understand interface, especially in the presentation of results and their manipulation.

IV. RESULTS

Respondents Characterization

In total, 54 companies from different segments participated in the study. Among the main economic activities, the following stand out: Processed Wood (29.5%) and Wood Panels (25.5%). However, 31.1% of respondents marked the alternative “other” in which they reported activities, such as: Silviculture; Oil Extraction; Wooden packaging; Production of Yerba Mate; Paper And Cellulose.

Of the total companies participating in the study, 37% of the companies were small, followed by medium (35%) and large (27%). Small companies are those with less than 1000 certified hectares. Organizations with more than 80,000 hectares are considered large and those between the two values are characterized as medium-sized.

In addition, the vast majority of the study's responding companies were located in the state of Rio Grande do Sul (44.4%), followed by Santa Catarina (20.3%), São Paulo (11.1%), Bahia (7.4%) and Paraná (5.5%). However, companies located in states such as Minas Gerais, Goiás, Mato Grosso and in the state of Amazonas also participated in the survey, corresponding to 1.8%. Of the total companies that responded to the survey, 35.1% have had the certification for less than 5 years, followed by 24% that have the seal for 5 to 10 years, 22.2% for 10 to 15 years and more than 15 years. with 18%.

In addition to characterizing the companies participating in the study, data regarding the respondent's profile was also requested. Of the 54 companies, 29.6% of respondents held analyst positions, followed by others (18.5%), managers (16.6%) and supervisors (16.6%). However, positions of directors, technicians, assistants and assistants were also identified, corresponding respectively to percentages of 9.2%, 3.7%, 3.7% and 1.8%. With regard to education, 75% of respondents have at least a degree, also reaching specializations. In addition, it is worth mentioning the presence of 11 respondents with training between master's and doctorate. And finally, most of them worked in the companies for less than five years, followed by between 5 and 10 years.

Hypothesis Test

The objective of the study to be achieved is to find out whether the “Certification Time” and the “Organizational Size” influence the perception of economic and social benefits. For this, due to the non-normality of the data presented by the Shapiro-Wilk test, the Kruskal-Wallis test was used. For the groups in which the p-value appeared to be statistically significant, that is, with values lower than 0.05, Dunn's post hoc test was applied for both the economic and social dimensions of sustainability.

At first, for the economic dimension of sustainability, the “Certification Time” showed a difference between the groups due to the p-value lower than 0.05 for the independent variable “Economic Feasibility” (p-value 0.004). However, for “Competitive Advantage”, it was not statistically significant, as can be seen in Table 05. Thus, the alternative hypothesis was partially accepted.

With regard to “Organizational Size”, no variable was statistically significant, thus rejecting the alternative hypothesis. That is, being a small, medium or large company, its size does not influence the perception of benefits in relation to FSC certification, differently when the variable is “Certification Time”.

Table 5: Kruskal-Wallis Test for Economic Dimension.

H3: The certification time influences the achievement of economic benefits;		
Variables	Kruskal-Wallis Statistic	p-value
Competitive advantage	1,946	0,584
Economic Viability	13,086	0,004
H1: Organizational size influences the achievement of economic benefits;		
Variables	Kruskal-Wallis Statistic	p-value
Competitive advantage	0,363	0,834
Economic Viability	0,413	0,812

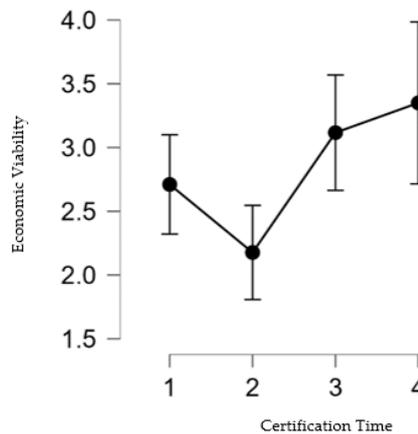
As the p-value was less than 0.05 for “Economic Feasibility” in “Certification Time”, the Dunn test was used, seeking to carry out a multiple comparison between the groups, identifying where the difference signaled by the Kruskal-Wallis test was. With Dunn's test, when analyzing Table 06, p-values of 0.039, 0.032, 0.002, 0.001 can be seen in four different time comparisons, namely: (1) less than 5 years with 5 to 10 years; (2) less than 5 years old more than 15 years old; (3) 5 to 10 years with 10 to 15 years; and (4) 5 to 10 years over 15 years.

Results like these demonstrate that companies with different certification times can perceive the benefits of certification in a different way. The other two comparisons showed no significant difference.

Table 6: “Dunn” Test for Certification Time and Economic Viability.

Certification Time and Economic Viability		p-dunn
Less than 5 years	More than 15 years	0,039
Less than 5 years	From 10 to 15 years	0.085
Less than 5 years	More than 15 years	0.032
From 5 to 10 years	From 10 to 15 years	0.002
From 5 to 10 years	More than 15 years	0.001
From 10 to 15 years	More than 15 years	0.304

The result in Table 06 can also be seen in Graph 01 (Flexpot Graph), in which the 95% confidence interval was used. When analyzing the medians in the four different points, that is, in the four certification times stipulated for this research in question, one perceives a difference between them, but mainly, that point four has the highest median. This value can also be confirmed by descriptive statistics (Appendix B). In addition, in Graph 01 it is possible to see the significant difference between points three (From 10 to 15 years) and four (More than 15 years) with point two (From 5 to 10 years). This result demonstrates the influence that the certification time has on the perception of economic benefits in relation to FSC certification.



Graph 1: Chart of quartiles highlighting the median (Economic Viability and Certification Time).

- *1- Less than 5 years
- 2- From 5 to 10 years
- 3- From 10 to 15 years
- 4- More than 15 years

For the social dimension of sustainability, it was noticed that the time since certification influences the perception of benefits in relation to the dependent variables “Corporate Image” and “Credibility” in terms of p-values of 0.003 and 0.002 respectively. This result contributed to partially accept the alternative hypothesis. With regard to “Organizational Size”, no variable was statistically significant, rejecting the alternative hypothesis. The results can be viewed in Table 07.

Table 7: Kruskal-Wallis Test for Social Dimension.

H4: The certification time influences the achievement of social benefits;		
Variables	Kruskal-Wallis Statistics	p-value
Corporate Image	13,844	0.003
Confidence	4,047	0,256
Credibility	14,850	0.002
H2: Organizational size influences the achievement of social benefits;		
Variables	Kruskal-Wallis Statistics	p-value
Corporate Image	4,627	0,099
Confidence	1,971	0,373
Credibility	5,267	0,072

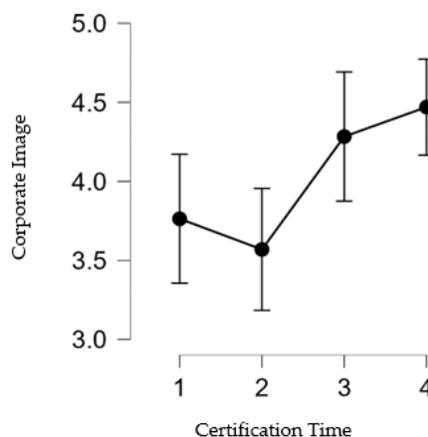
In view of the values that presented a significant difference, the Dunn test was used, seeking to carry out a multiple comparison between the groups present in this research and find out where the difference presented by the Kruskal-Wallis test was. When analyzing Table 08, p-value below 0.05 is noticed again in four different comparisons for “Corporate Image”, they are: (1) less than 5 years with 10 to 15 years; (2) less than 5 years old more than 15 years old; (3) 5 to 10 years with 10 to 15 years; and (4) 5 to 10 years over 15 years. The p-values are respectively 0.025; 0.007; 0.003; 0.001.

Regarding the independent variable “Credibility”, the results were very similar. The Dunn test demonstrated four differences, namely: (1) less than 5 years with 10 to 15 years; (2) Less than 5 years old over 15 years old; (3) 5 to 10 years with 10 to 15 years; (4) 5 to 10 years old over 15 years old. The p-values are respectively 0.023; 0.001; 0.047 and 0.001.

Table 8: “Dunn” Test for Certification Time and Corporate Image and Credibility.

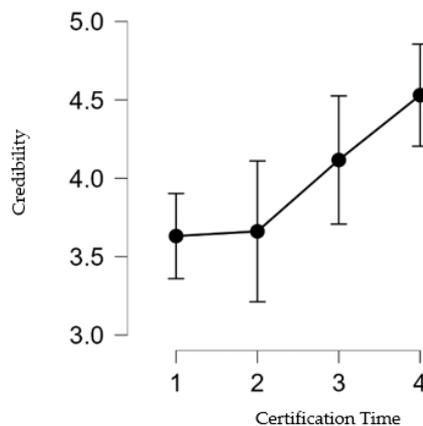
Certification Time and Corporate Image		p-dunn
Less than 5 years	From 5 to 10 years	0,158
Less than 5 years	From 10 to 15 years	0,025
Less than 5 years	More than 15 years	0,007
From 5 to 10 years	From 10 to 15 years	0,003
From 5 to 10 years	More than 15 years	0,001
From 10 to 15 years	More than 15 years	0,284
Certification Time and Credibility		p-dunn
Less than 5 years	From 5 to 10 years	0,429
Less than 5 years	From 10 to 15 years	0,023
Less than 5 years	More than 15 years	0,001
From 5 to 10 years	From 10 to 15 years	0,047
From 5 to 10 years	More than 15 years	0,001
From 10 to 15 years	More than 15 years	0,075

The result shown in Table 08 can also be seen in Graphs 2 and 3 in which the 95% confidence interval was used. When analyzing the medians at the four different points (Certification Time) in both Graphs, the highest value can be seen at point four, which corresponds to the variable “More than 15 years”. Furthermore, in Graph 2 in particular, it is possible to clearly see the significant difference between points 1 (Less than 5 years) and 2 (Between 5 and 10 years) with point 4 (More than 15 years). The same applies to Graph 3, where the significant difference between points 1 and 2 and point 4 can be seen. Such results demonstrate the influence that the certification time has on the perception of social benefits in relation to FSC certification.



Graph 02: Chart of quartiles highlighting the median (Corporate Image and Certification Time).

- *1- Less than 5 years
- 2- From 5 to 10 years
- 3- From 10 to 15 years
- 4- More than 15 years



Graph 03: Chart of quartiles highlighting the median (Credibility and Certification Time).

- *1- Less than 5 years**
- 2- From 5 to 10 years**
- 3- From 10 to 15 years**
- 4- More than 15 years**

V. RESULTS DISCUSSION

This study aimed to investigate whether the certification time and organizational size influence the generation of economic and social benefits by FSC Certification in Brazilian companies. Throughout the survey with Brazilian companies, it was possible to perceive that FSC certification is capable of generating benefits, something confirmed by p-values below 0.05 in the Kruskal-Wallis test, both in the economic and social dimensions. However, they take time to be felt, on average 15 years, something confirmed by the Dunn test followed by the analysis of the median values (descriptive statistics).

The mission of the FSC on a global scale is to promote responsible management of Brazilian forests, reconciling social, environmental and economic aspects (FSC, 2022; Garzon et al., 2020). Although the FSC is concerned with developing specific indicators for each country in which it operates due to the particularities of each location, care must be taken when recognizing the benefits related to the FSC. In general, many divergences are found in the literature on a worldwide scale, requiring local studies to ascertain the real benefits of certification (Michal et al., 2019).

In addition to the location of the companies, two other variables little explored in the literature called attention, they are: (i) certification time and (ii) organizational size. Unlike organizations located in Nordic countries, companies in Brazil are still in the process of learning about and internalizing responsible forest management practices. Carrying out changes in management planning, involving and sensitizing stakeholders and even training all people involved in order to achieve the FSC principles and criteria is something that takes time to accomplish and requires financial investment (Frey et al., 2022).

When internalizing a certification of the size of the FSC, on average, companies carry out between 15 and 30 modifications in order to achieve the expected indicators. Among the changes made, the following stand out: the development of projects and actions aimed at the well-being of employees and communities surrounding certified companies and the need for constant training and qualifications (Fagundes et al., 2021). In general, companies take about eleven years to achieve the return on investment made in adaptations for certification (Kongmanee et al., 2020; Wing So & Laforteza, 2022). As described by Fagundes et al., (2021) in a study developed in Brazil, on average, it takes 7 years for the return on investment to occur, after the first harvest of wood in the forests and the start of sales with the certified product in case of economic benefits. In addition, after these seven years, it is also possible to perceive a change in attitude towards the employees involved, in which they realize the importance of certification and, naturally, begin to follow the principles and criteria of certification. As an example, Fagundes et al., (2021) cites the case of the use of Personal protective equipment (PPE) by forest operators and the opening of a dialogue with local communities promoting social projects.

In view of this, studies (Fagundes et al., 2021; Kongmanee et al., 2020; Wing So & Laforteza, 2022) corroborate the findings of this research in which the “Certification Time” influences the generation of benefits, mainly those linked to “Economic Feasibility”. Although the FSC was created in 1993 and is already consolidated in developed countries, the seal is still little recognized in South America, making it difficult to return on the investment made to obtain certification. This finding is in line with other studies that bring the challenges of certification (Fagundes et al., 2021, 2022a, 2022b).

Although the present research does not present a significant difference for the variable “Competitive Advantage”, many companies, when certified, end up achieving some specific benefits, mainly, access to new markets and especially those located in an international context (Fagundes et al., 2021, 2022a, 2022b).

Over the years, the internalization of constant feedback from auditors, as well as the development of new skills and capabilities in the face of FSC challenges, have been improved, something highlighted in other studies (Ehrenberg-Azcárate & Peña-Claros, 2020; Frey et al., 2022; Galati et al., 2017; Paluš et al., 2018; Piketty & Garcia Drigo, 2018). Linked to this, green marketing practices directly contribute to raising awareness and demonstrating to stakeholders what the company has achieved over the years of implementing and managing the FSC principles, contributing to establishing trust between those involved, something demonstrated by the study by (Wing So & Laforteza, 2022). Companies have already realized the need to adapt to this new reality of certification due to the possibility of boycotting their products when they are not produced responsibly (Tuppura et al., 2016). In addition, investors have conditioned their participation in some companies by demonstrating principles aimed at sustainability. Along with trust, other studies also bring the improvement in corporate image as one of the benefits of certification (Halalisan et al., 2018; Paluš et al., 2018).

With regard to organizational size, although some previous studies (Rafael et al., 2018; Tricallotis et al., 2018; Wing So & Laforteza, 2022) indicate a greater impact on certification performance in large companies, the results evidenced cannot be considered conclusive. A study carried out in the Czech Republic (Mikulková et al., 2015) identified that small companies tend to view certification as less effective, that is, not perceiving its benefits. Small companies often receive help from NGOs such as the World Wild Fund for Nature (WWF) with financial and technical difficulties in order to internalize FSC certification. However, this advice is not always sustained over the years, and from the moment it is closed, some companies are unable to maintain the required standards, not realizing the effects of certification (Scudder et al., 2018; Xu & Lu, 2021). One study even suggests the development of new research seeking to understand the driving factors for the sustainability of certification in small companies (Ehrenberg-Azcárate & Peña-Claros, 2020).

Complementarily, some companies in Brazil are certified with a significant number of non-conformities linked to FSC principles and criteria. A study carried out in cooperatives in northern Brazil identified that over 15 years, the vast majority of them lost their certification because they were unable to meet the stipulated deadlines to overcome non-conformities (Frey et al., 2022). Although some studies (Piketty & Garcia Drigo, 2018) emphasize the transparent certification process, it is known that it can be shaped according to the skills of the auditors involved (Hälälışan et al., 2021; Maletz & Tysiachniouk, 2009). In addition, the auditors themselves can define the deadline for compliance with a non-compliance, directly influencing the return time on the planned improvement (Piketty & Garcia Drigo, 2018). Among the main non-conformities found in Brazil, those linked to Principles 2 and 4 (Workers' Rights and Working Conditions; Community Relations) stand out (Rafael et al., 2018).

VI. CONCLUSION

The objective of the study was to find out if the certification time and the organizational size influence the generation of economic and social benefits of the FSC Certification for the companies that hold this seal. So that the objective could be achieved, a quantitative study with 54 organizations from different segments located in Brazil was carried out between March and September 2022 (6 months). Through a previously validated construct with 18 statements, it was possible to understand the perception of the benefits of FSC certification.

The analyzes carried out based on the results of this study allowed testing four hypotheses, two specific to the economic dimension of sustainability and two to the social dimension, namely: H1: Organizational size influences the generation of economic benefits; H2: Organizational size influences the generation of social benefits; H3: The certification time influences the generation of economic benefits. H4: The certification time influences the generation of social benefits.

Hypotheses H1 and H2 were rejected. That is, the organizational size does not seem to influence the generation of economic and social benefits in the Brazilian scenario. Although some studies bring organizational size as an essential variable for the success of certification, it was not significant in this research, that is, it does not appear to be significant in Brazil. This conclusion was reached through p-values greater than 0.05 for the dependent variables “Competitive Advantage”, “Economic Viability”, “Corporate Image”, “Trust” and “Credibility” in the Kruskal-Wallis test.

For hypotheses H3 and H4 the result was different. Hypothesis H3 was partially accepted due to the variable “Economic Feasibility” presenting values with a proven difference for the independent variable “Certification Time”. A similar context happened with hypothesis H4, but it presented two p-values below 0.05, they are: “Corporate Image” and “Credibility”, allowing the acceptance of the hypothesis.

Over the last few years, a growing concern regarding the negative and positive impacts caused by companies has driven a change in organizational posture. Currently, companies do not want their processes and products to cause negative impacts on society, but positive impacts. Despite the various obstacles pointed out by the FSC Certification, the internalization of its principles has generated concrete benefits, however something to be noticed

in the long term, on average, more than 15 years of certification. In this way, an additional question is required: Is it worth the waiting time to reach the benefits?

While waiting for the return on investment, that is, in achieving the benefits expected with certification, it is believed that companies need to avoid discontinuing projects and actions seeking to consolidate their responsible forest management practices in the market. Achieving FSC certification does not seem to be just a modification of processes, but rather a new commitment by the company to its stakeholders. Linked to this, it is recommended the intense dissemination of the results achieved with the projects and actions aimed at sensitizing a greater number of people to the results achieved. With this, over time greater economic viability, as well as improvements in the corporate image and credibility of the company before its stakeholders is achieved. It is worth remembering that companies have already noticed an eco-conscious behavior of their consumers. Additionally, care is recommended when selecting the people and especially the auditors involved in the certification process. After all, some indicators can be evaluated according to knowledge, skill and attitude.

One of the main contributions of this study is the standardization of results based on a previously validated scale. Due to differences in information found in international publications regarding the benefits of the FSC, this study can serve as a basis for future research in other regions of the world and even within Brazil, allowing the comparison of results in a safe and reliable way. After all, Brazil has several peculiarities, making it impossible to compare results with other locations in a superficial way.

For the FSC itself, this study serves as a warning that new strategies can be developed to generate benefits in a faster and more practical way. Otherwise, many companies may give up the implementation of certification or even lose the right to use the certification seal, further reducing the visualization of the possible benefits involved, but mainly to contain the high rates of deforestation. In a complementary way, due to the delay in generating the benefits of the FSC, it is necessary to have a greater follow-up on the part of NGOs and the FSC itself together with small companies, aiming to contribute to the sustainability of the certification in the long term and with that, the visualization of its benefits.

Although the organizational size does not influence the generation of benefits in Brazilian companies, it is believed that further research seeking to understand the real reason is necessary. After all, a number of variables may be influencing such a perception. Small companies often do not have human resources capable of knowing the role of the FSC within the organization, and consequently, do not perceive the benefits generated by its implementation. In this way, standardizing the respondent's profile, as well as understanding their knowledge of the FSC principles and criteria, can help resolve this issue.

Another suggestion for future studies is related to the region covered by the research. As can be seen throughout the results chapter, most of the companies studied were located in the southern region of Brazil. In this way, increasing the reach in other regions, such as the North and Northeast, would allow the generalization of the results, as well as the comparison of results between regions.

Among the main limitations found in this study, one in particular deserves to be highlighted. The low number of responses in surveys serves as a warning so that certified companies can take advantage of these moments and expose their differentials, contributing to a greater awareness of their stakeholders.

The low number of responses also made it impossible to delve deeper into the statistical tests. However, this does not diminish the quality and innovation present in this article, motivating new researchers to continue researching this extremely important topic for society as a whole.

REFERENCES

- [1]. Boström, M. (2012). The problematic social dimension of sustainable development: The case of the Forest Stewardship Council. *International Journal of Sustainable Development and World Ecology*, 19(1), 3–15. <https://doi.org/10.1080/13504509.2011.582891>
- [2]. Cervo, Amado Luiz; Bervian, Pedro Alcino; Silva, R. da. (2011). *Metodologia científica* (S. P. P. P. Hall (Ed.); 6th ed.).
- [3]. Charnley, S., Humphries, S., Engbring, G., & Frey, G. (2022). Supporting Community Forestry Certification in Tropical Countries by Increasing Actor Engagement across Scales. *Small-Scale Forestry*. <https://doi.org/10.1007/s11842-022-09518-8>
- [4]. Chen, J., Wang, L., Li, L., Magalhaes, J., Song, W., Lu, W., Xiong, L., Chang, W.-Y., & Sun, Y. (2020). Effect of Forest Certification on International Trade in Forest Products. *FORESTS*, 11(12). <https://doi.org/10.3390/f11121270>
- [5]. Cook, W., Turnhout, E., & van Bommel, S. (2021). Performing an FSC audit. *Journal of Organizational Ethnography*. <https://doi.org/10.1108/JOE-10-2020-0039>
- [6]. Di Lallo, G., Maesano, M., Masiero, M., Mugnozza, G. S., & Marchetti, M. (2016). Analyzing Strategies to Enhance Small and Low Intensity Managed Forests Certification in Europe using SWOT-ANP. *Small-Scale Forestry*, 15(3), 393–411. <https://doi.org/10.1007/s11842-016-9329-y>

- [7]. Ehrenberg-Azcárate, F., & Peña-Claros, M. (2020). Twenty years of forest management certification in the tropics: Major trends through time and among continents. *Forest Policy and Economics*, 111. <https://doi.org/10.1016/j.forpol.2019.102050>
- [8]. Fagundes, C., Schreiber, D., & Nunes, M. P. (2022a). A produção acadêmica sobre o forest stewardship council em dissertações e teses do Brasil. *Revista Capital Científico - Eletrônica*, 20(1). <https://doi.org/10.5935/2177-4153.20220006>
- [9]. Fagundes, C., Schreiber, D., & Nunes, M. P. (2022b). FSC certification in international scientific publications available from Science Direct and Scopus. *Desenvolvimento e Meio Ambiente*, 59, 296–318. <https://doi.org/10.5380/dma.v59i0.74509>
- [10]. Fagundes, C., Schreiber, D., Nunes, M. P., & Fernandes, M. E. (2021). Perception of Brazilian companies on the potential and concrete benefits resulting from the FSC certification. *Forests*, 12(12), 1–14. <https://doi.org/10.3390/f12121622>
- [11]. *Food and Agriculture Organization of the United Nations*. (2020). Food and Agriculture Organization of the United Nations. <https://www.fao.org/home/en>
- [12]. Frey, G. E., Charmley, S., & Makala, J. (2022). *The costs and benefits of certification for community forests managed by traditional peoples in south-eastern*. 24, 360–379.
- [13]. FSC. (2022). *FSC - Facts and Figures*. <https://connect.fsc.org/impact/facts-figures>
- [14]. Gafo Gomez-Zamalloa, M., Caparros, A., & San-Miguel Ayanz, A. (2011). 15 years of forest certification in the European union. Are we doing things right? | 15 años de certificación forestal en la unión Europea ¿estamos haciendo las cosas bien? *Investigacion Agraria Sistemas y Recursos Forestales*, 20(1), 81–94.
- [15]. Galati, A., Gianguzzi, G., Tinervia, S., Crescimanno, M., & La Mela Veca, D. S. (2017). Motivations, adoption and impact of voluntary environmental certification in the Italian Forest based industry: The case of the FSC standard. *Forest Policy and Economics*, 83, 169–176. <https://doi.org/10.1016/j.forpol.2017.08.002>
- [16]. García-Montiel, E., Cubbage, F., Rojo-Alboreca, A., Lujan-álvarez, C., Montiel-Antuna, E., & Corral-Rivas, J. J. (2017). An analysis of non-state and state approaches for forest certification in Mexico. *Forests*, 8(8). <https://doi.org/10.3390/f8080290>
- [17]. Garzon, A. R. G., Bettinger, P., Siry, J., Abrams, J., Cieszewski, C., Boston, K., Mei, B., Zengin, H., & Yeşil, A. (2020). A comparative analysis of five forest certification programs. *Forests*, 11(8). <https://doi.org/10.3390/f11080863>
- [18]. Hain, H., & Ahas, R. (2011). Impacts of sustainable forestry certification in European forest management operations. *WIT Transactions on Ecology and the Environment*, 148, 207–218. <https://doi.org/10.2495/RAV110201>
- [19]. Hair et al., 2005. (2005). *Fundamentos de Métodos de Pesquisa em Administração*.
- [20]. Hălălișan, A.-F., Popa, B., Saizarbitoria, I. H., Boiral, O., Arana-Landín, G., Nicorescu, A.-I., & Abrudan, I. V. (2021). Procedural factors influencing forest certification audits: An empirical study in Romania. *Forests*, 12(2), 1–13. <https://doi.org/10.3390/f12020172>
- [21]. Halalisan, A. F., Abrudan, I. V., & Popa, B. (2018). Forest management certification in Romania: Motivations and perceptions. *Forests*, 9(7). <https://doi.org/10.3390/f9070425>
- [22]. Hoang, H. T. N., Hoshino, S., Onitsuka, K., & Maraseni, T. (2019). Cost analysis of FSC forest certification and opportunities to cover the costs a case study of Quang Tri FSC group in Central Vietnam. *Journal of Forest Research*, 24(3), 137–142. <https://doi.org/10.1080/13416979.2019.1610993>
- [23]. Kameyama, S., & Sugiura, K. (2021). Does differentiation by certified raw wood change the average price at the tama roundwood market center in Tokyo, Japan? *Forests*, 12(3), 1–15. <https://doi.org/10.3390/f12030264>
- [24]. Kongmanee, C., Ahmed, F., & Longpichai, O. (2020). Cost-Benefit Analysis and Challenges of Implementing FSC Standards in Rubber Plantations in Southern Thailand. *Journal of Asian Finance, Economics and Business*, 7(12), 423–431. <https://doi.org/10.13106/JAFEB.2020.VOL7.NO12.423>
- [25]. Lidestav, G., & Lejon, S. B. (2011). Forest Certification as an Instrument for Improved Forest Management within Small-scale Forestry. *Small-Scale Forestry*, 10(4), 401–418. <https://doi.org/10.1007/s11842-011-9156-0>
- [26]. Maletz, O., & Tysiachniouk, M. (2009). The effect of expertise on the quality of forest standards implementation: The case of FSC forest certification in Russia. *Forest Policy and Economics*, 11(5–6), 422–428. <https://doi.org/10.1016/j.forpol.2009.03.002>

- [27]. Malhotra, Naresh, K. (2018). *Marketing Research: An Applied Orientation*. (P. Education (Ed.); 7th ed.).
- [28]. Michal, J., Březina, D., Šafařík, D., Kupčák, V., Sujová, A., & Fialová, J. (2019). Analysis of socioeconomic impacts of the FSC and PEFC certification systems on business entities and consumers. *Sustainability (Switzerland)*, 11(15). <https://doi.org/10.3390/su11154122>
- [29]. Mikulková, A., Hájek, M., Štěpánková, M., & Ševčík, M. (2015). Forest certification as a tool to support sustainable development in forest management. *Journal of Forest Science*, 61(8), 359–368. <https://doi.org/10.17221/16/2015-JFS>
- [30]. Moore, S. E., Cabbage, F., & Eicheldinger, C. (2012). Impacts of Forest Stewardship Council (FSC) and Sustainable Forestry Initiative (SFI) forest certification in North America. *Journal of Forestry*, 110(2), 79–88. <https://doi.org/10.5849/jof.10-050>
- [31]. Nebel, G., Quevedo, L., Bredahl Jacobsen, J., & Helles, F. (2005). Development and economic significance of forest certification: The case of FSC in Bolivia. *Forest Policy and Economics*, 7(2), 175–186. [https://doi.org/10.1016/S1389-9341\(03\)00030-3](https://doi.org/10.1016/S1389-9341(03)00030-3)
- [32]. Paluš, H., Parobek, J., Šulek, R., Lichý, J., & Šálka, J. (2018). Understanding sustainable forest management certification in Slovakia: Forest Owners' perception of expectations, benefits and problems. *Sustainability (Switzerland)*, 10(7). <https://doi.org/10.3390/su10072470>
- [33]. Pasquali, L. (1999). *Instrumentos psicológicos: manual prático de elaboração*. Brasília: Universidade de Brasília.
- [34]. Piketty, M.-G., & Garcia Drigo, I. (2018). Shaping the implementation of the FSC standard: the case of auditors in Brazil. *Forest Policy and Economics*, 90, 160–166. <https://doi.org/10.1016/j.forpol.2018.02.009>
- [35]. Rafael, G. C., Fonseca, A., & Jacovine, L. A. G. (2018). Non-conformities to the Forest Stewardship Council (FSC) standards: Empirical evidence and implications for policy-making in Brazil. *Forest Policy and Economics*, 88, 59–69. <https://doi.org/10.1016/j.forpol.2017.12.013>
- [36]. Romero, C., & Putz, F. E. (2018). Theory-of-change development for the evaluation of forest stewardship council certification of sustained timber yields from natural forests in Indonesia. *Forests*, 9(9). <https://doi.org/10.3390/f9090547>
- [37]. Scudder, M. G., Herbohn, J. L., & Baynes, J. (2018). The failure of eco-forestry as a small-scale native forest management model in Papua New Guinea. *Land Use Policy*, 77, 696–704. <https://doi.org/10.1016/j.landusepol.2018.06.023>
- [38]. Tricallotis, M., Gunningham, N., & Kanowski, P. (2018). The impacts of forest certification for Chilean forestry businesses. *Forest Policy and Economics*, 92, 82–91. <https://doi.org/10.1016/j.forpol.2018.03.007>
- [39]. Tricallotis, M., Kanowski, P., & Gunningham, N. (2019). The Drivers and Evolution of Competing Forest Certification Schemes in the Chilean Forestry Industry. *International Forestry Review*, 21(4), 516–527. <https://doi.org/10.1505/146554819827906870>
- [40]. Tuppura, A., Toppinen, A., & Puumalainen, K. (2016). Forest Certification and ISO 14001: Current State and Motivation in Forest Companies. *Business Strategy and the Environment*, 25(5), 355–368. <https://doi.org/10.1002/bse.1878>
- [41]. Wibowo, A., Pratiwi, S., & Giessen, L. (2019). Comparing management schemes for forest certification and timber-legality verification: Complementary or competitive in indonesia? *Journal of Sustainable Forestry*, 38(1), 68–84. <https://doi.org/10.1080/10549811.2018.1498359>
- [42]. Wing So, H., & Laforteza, R. (2022). Reviewing the impacts of eco-labelling of forest products on different dimensions of sustainability in Europe. *Forest Policy and Economics*, 145(October 2021).
- [43]. Wolff, S., & Schweinle, J. (2022). *Effectiveness and Economic Viability of Forest Certification : A Systematic Review*.
- [44]. Xu, L., & Lu, A. J. (2021). Forest Certification in Developing Countries: Current Status and Hindrances to Its Adoption within a Macro-Framework | Certification forestière dans les pays en voie de développement: statut actuel et obstructions à son adoption au sein d'un macro-cadre. *International Forestry Review*, 23(1), 105–126. <https://doi.org/10.1505/146554821832140376>