MSc Thesis

The environmental, social and economic impact of different certification programmes of coffee in Santander, Colombia

A case study on smallholder producers certified with Organic, Fairtrade and Rainforest Alliance

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Abstract

In the last decade the trade of sustainable coffee registered an exponential growth. More and more smallholder farmers in developing countries are producing their coffee following strict standards and requirements elaborated by different international certification organizations. Certifiers offer price premiums to farmers employing more sustainable practices, claiming that their standards help producers' household to have benefits in several areas. Despite the broad presence of these interventions, there is still a lack of scientific evidence on the real impact these programs are having on the socioeconomic and environmental conditions of the farmers adhering to them. Literature on the impact of certification has mainly focused on the economic side of the programmes, with discordant results.

This thesis focused on the assessment of the environmental, social and economic impact of three different certification programmes, the most important for coffee, Fairtrade, organic and Rainforest. Furthermore the study focuses on the strategies, visions and drives of the producers in relation with their expectations and experiences with these programmes. Two localities were selected in the Santander Department of Colombia and the research focused on smallholder coffee producers, with farms less than 3 hectares of surface. A total of 120 farmers were surveyed, divided into two control groups and three study groups. Through the matching approach, farmers from the control group were selected in order to have the most similar, if not identical, observable characteristics of the selected certified producers. Furthermore, farmers selected in the control group presented geographical proximity and accessibility similarity in respect with the selected sample. Through a household survey data was collected to measure the impact of certification on several indicators for each sustainability pillar.

Results show that certification programmes have significant positive impacts on the socioeconomic life and environmental conditions of smallholder producers. Positive impacts are particularly evident for the areas and topics that each certification has as core strategies. This research also highlighted the fundamental role played by local environment and historical agricultural development. These factors are highly relevant in easing or enabling the diffusion of specific certification programmes, especially the ones with strict environmental requirements, and play and equally important role in their effectiveness. The study found out that not all of the certifications manage to provoke deeper changes in the vision of certified smallholders. Official certification standards and requirements are comprehensive and extended documents, but in reality they are seldom directly accessed by certified smallholders. Thus some certified farmers have a vague idea of what the certification and the organization behind it are in terms of core concepts, mission and vision. Finally, success of certifications around the world depends not only on the list of standards proposed but also on local conditions and on the presence of a strong apparatus of technicians bringing support and bridging the divide between certifications and smallholder farmers.

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Contents

1. Introduction

In the last decade an increasing number of voluntary private certification programs emerged in the global food production sector for a diverse range of crops such as coffee, cocoa, tea, banana and flowers. Some labels as Organic and Fair-Trade were developed from the 1980s or earlier for some products, but only in the last ten years certification has become an important and mainstream concept for both producers and consumers around the world. This process had produced a proliferation of new schemes with their own specific focus and strategy. These increasingly popular initiatives are adopted by producers around the world, especially in developing countries, that adhere to environmental, social and labour standards to distinguish their products from the rest of the market. Sustainable certification labels provide an important service: by signalling the adherence to determinate programs to the consumers they generate important benefits such as the access to new markets and the payment of premium prices. Consumers in industrialized and emerging countries are increasingly willing to pay more for products that respect the environment and that foster the social and economic conditions of producers. Certifications are provided by private organizations as NGOs, firms or alliances of stakeholders setting a number of standards that producers have to comply to receive the label. Furthermore they carry on, directly or through independent agencies, regular audit in the certified farms to assess the respect of these standards during time. In case of verifying unmet requirements, different strategies are implemented by the programs, from support and consultancy to reintegrate the producers into the scheme up to the complete withdrawal of the accreditation.

To have an idea of the dimension of the phenomenon, suffice to say that by 2008 there were more than 400 sustainability standards, with the number still growing (Giovannucci, 2008). All sustainability standards refer to the three acknowledged pillars of sustainability – people, planet, profit – but by weighting them in different way and traducing them in different visions and requirements they diversify in front of the producers and the consumers. The four major sustainability standards in the world are: Fair Trade, Organic/Bio Standard, Rainforest Alliance and UTZ Certified. Each of them have a different focus: Fair Trade focus his action on the socioeconomic and labour conditions of the producers, Rainforest Alliance has a strong focus on the environmental side of the production and biodiversity preservation, UTZ Certified prioritize the sustainability of all the supply chain while Organic Standard emphasize the standardization of the on-farm agricultural practices.

Despite the broad presence of these interventions, there is still a lack of scientific evidence on the real impact these programs are having on the socioeconomic and environmental conditions of the farmers adhering to them. Proponents of certification programs have produced numerous efforts to assess the real short and long term impacts of their programs, but results have been contradictory and quality research is still needed.

Among the different products usually certified, coffee – the crop selected for this research – is one of the most important in terms of number of specific certification programs involved, numbers of households directly depending on its production and total annual market value for many developing countries.

1.1 Certified coffee production

Coffee is the second most traded commodity in the world after oil, produced in more than 70 developing countries and consumed mainly in developed countries with over US$ 21.6 billion of total export value. Over 60% of the world coffee is produced by just four countries: Brazil (34%), Vietnam (14%), Indonesia (8%) and Colombia (7%) (ICO, 2013). At least 14 countries depend on coffee for 10% or more of their export earnings. It is also important for rural livelihoods, since more than 70% of the production worldwide is on farms less than 10ha in size (Consumer International, 2005). Commercial coffee presents two main varieties, arabica and robusta, with the latter being more expensive, both in terms of cost production and price, and presenting more taste variety compared to the former.

The international coffee market registered two periods of major crisis in the last decades. First, in 1989, the end of the coffee quotas regulated by the International Coffee Agreement caused a dramatic fall in prices for coffee producers around the world, from S$1.34 per pound, to US$0.77 per pound (Daviron and Ponte, 2005). After a brief recovery of prices in the mid-90s caused by high yield losses due to drought and frost in Brazil, between 1997 and 2001 coffee prices fell by 70% in nominal terms and to below the costs of production in many producing countries with drastic implications for rural livelihoods (FAO, 2005). A role in this major price fall was played by the subsidized entry of new producers from South East Asia, like Vietnam and Indonesia, as well as a substantial increase in production in traditional Latin American producing countries like Brazil (Kilian and alt, 2004). The market crisis stimulated the rise of certificated sustainable coffee as an opportunity for coffee producers to access into a new niche market stimulated by consumer demand in developed countries (Giovannucci and Koekoek, 2003). In a short period of time, sustainable coffee registered an incredible growth and by 2009, 8% of all green coffee exported had some form of certification of credible claim of sustainability (ITC, 2011). The substantial growth on the production side is not been completely matched by the demand one. In a document published this year by the International Coffee Organization (ICO, 2014) it is reported that "production of certified coffee generally exceeds demand, with many certified producers unable to sell all their coffee in any given programme. It therefore remains to be seen whether the certified sector has sufficient capacity to expand beyond a niche market".

The surplus of production over consumption has been registered also for conventional coffee around the world, dropping the international prices of the commodity by the end of 2013 to their lowest levels in six and a half year. This fall was caused by the exceptionally high prices in 2011 that provided incentives to producers to invest and expand their cultures, resulting in two consecutive years of record world production in 2012/13 and 2013/14 (ICO, 2014).

Organic, Fairtrade and Rainforest Alliance, the labels focus of this thesis, are the three most important certifications in terms of worldwide coffee sales. Organic and Fairtrade have dominant market positions in most of industrialized countries while Rainforest Alliance, in a relatively short period, have become stronger in several markets, for example Japan, where business alliances have catapulted the label to prominence (Pierrot et al., 2010).

1.2 The coffee sector in Colombia

Colombia, the country selected for this study, is the fourth producer of coffee in the world, surpassed by Vietnam and Indonesia only in the last years, producing 7% of the total world production in 2011/2012 (ICO, 2013). Coffee production has always played an important role in the country's export revenue, rural employment and agricultural GDP. Nowadays there are around 900,000 hectares dedicated to coffee and more than 500,000 coffee producers. The production is mainly operated by smallholder farmers: the average size of a coffee farm in Colombia is 1.8 hectares and only 5% of producers hold more than 5 hectares (Volcafe, 2012).

Fig. 1.1: Colombia coffee map (Volcafe, 2012).

Colombia has traditionally grown arabica beans in some of the highest quality varieties and its unique geography makes it perfectly suited for producing a high quality brew. The Colombian coffee is mostly produced in 12 departments (see Fig. 1.1) of the country, along the three mountain range, East, Central and West Andes, crossing the country from south-west to north-east. This is due to the fact that most of the coffee trees varieties grow at altitudes ranging from 1,000 to 2,100 meters. Due to the diverse climatic and ecological conditions, coffee practices vary through the country and it is not possible to say that Colombia has a fixed harvesting period, differently from other producing countries (Giovannucci, 2002). In the most famous productive area, called *Eje Cafetero* and declared by UNESCO a World Heritage site in 2011, the local conditions allow two harvest per year (October and April), while in other areas like Nariño and Santander, coffee growers harvest only once a year (April-July the former and October-December the latter). The weather conditions also affect the way coffee plantations are designed. In some areas like Cauca and Santander, coffee trees have always been covered by shade trees to balance the intake of rain and sun. Other regions, mostly in the plains, grow coffee under

direct sunlight, a practice requiring more intense work force and higher inputs as chemical fertilizer in return of higher yields.

Coffee production in Colombia is special also because of the post-harvest activities. In fact, producers in the country only use a wet process (*beneficio humedo*) to transform the harvested berries into the final green coffee bean before selling the product for further processing (roasting and grinding). This method requires the access to preparation facilities and abundant water supply but it is one of the main factors contributing to the excellent quality of Colombian coffee. The berries are passed through a pulping machine on the same day they are harvested to separate the majority of the pulp from the bean (the seed of coffee berry). Consequently the beans are placed in a tank with water for a period varying from 12 hours to 2 days to allow natural enzymes to ferment the mucilaginous pulp. After the fermentation is complete, the coffee beans are washed in special canals to completely remove the remaining pulp. The last step consist in the drying of the coffee bean, done under direct sun in patios and rooftops, or with the help of mechanical driers, mainly employed on large farms. The dried coffee is known as parchment coffee and is often sold in this form by coffee cultivators (Giovannucci, 2002).

1.2.1 Environmental issues in Colombian coffee sector

Coffee production in Colombia presents several environmental issues, the more important being water pollution, deforestation and loss of biodiversity.

As seen in the previous paragraph, in the country the coffee berry processing involves the use of considerable amounts of water. In accordance with the *Manual del Cafetero Colombiano*[1](FNC, 1979) for each kilo of parchment coffee produced, 40 litres of water are used for the washing and fermentation processes. The by-products of the wet process, mainly the fermented pulp, are highly pollutant agents (for more details see 5.1.3) and if not treated properly on the farm they are directly released in natural water bodies. Furthermore, intensive cultivation led to coffee plot adhering to water streams, causing erosion and release of particulate, consequently decreasing water quality. Furthermore the overuse of chemical fertilizers release high amount of phosphorus and nitrogen that run off into natural water bodies decreasing the oxygen levels.

The percentage of coffee produced under tree shade or natural forest is between 16% and 40% in the country (Giovannucci, 2002; ME Assesment, 2004) meaning that the majority of coffee is produced under direct sun. These areas were occupied by natural forest that had been continuously cleared, with a peek during the 1980s, to plant new coffee varieties not requiring shade. The shifting towards a more intensive style of farming is one of the main cause of “coffee driven” deforestation. Coffee grown under direct sun requires higher levels of non-natural input as pesticides and fertilizers, since the beneficial effects of natural shade are lost (Jha et al., 2014).

[1] Manual of the Colombian coffee producer

Colombia is one of the most biodiverse countries in the world, with 1.870 species of birds, a fifth of the overall known species, 55,000 plant species (2nd in the world), 697 amphibians (1st in the world), 517 reptiles (3rd in the world) and 456 mammals (4th in the world). Loss of forest coverage has direct impact on the country biodiversity, because it directly affects the equilibrium of complex and fragile ecosystems. In this sense, even coffee grown under shade can be harmful to biodiversity. In fact, in most of the cases the natural forest is cleared to make place for technifed shade consisting of only one or few tree species.

Soil erosion due to loss of vegetation and heavy rainfalls has also been a major issue in Colombia. Precipitations volatility in the last years is increasing and the effects of El Niño, large climate disturbances causing higher temperatures in the Pacific Ocean, could greatly enhance the environmental problem caused by climate change. Suffice to say that La Niña, the positive phase of El Niño, in 2011 was responsible of economic losses for the country of approximately US$ 7.8 billion, related to destruction of infrastructure and flooding of agricultural lands (Hoyos et al., 2013).

1.2.2 Social issues in Colombian coffee sector

Smallholder farmers in Colombia rely for most of the year on the workforce available from their family members. During the harvest though, even small producers employ daily or seasonal workers to avoid losing the ripe fruits. Working conditions on coffee farms are in general unfavourable, due to the almost complete lack of mechanization, lack of safety equipment and the long working hours. Most of the times, workers are hired on a daily basis with few social protection as a guaranteed minimum wage or fixed working hours. Due to the considerable high labour supply, formed by national and international immigrants and poor local farmers, producers have strong contract power and daily workers are not organized in any form of syndicate. Furthermore in some areas of the country there is lack of proper access to sanitation facilities and drinking water, for both coffee producers and the daily working force.

In Colombia child labour is a serious issue involving more than 1.7 million minors. A study from the Colombian Ministry of Labour (2012) highlighted that 25% of all minors working in Colombia are employed in agriculture and that coffee is by far the rural sector employing the highest amount of children. The phenomenon presents both unpaid work, minors belonging to the farmers' households, and paid work, mostly children carried along by older family members in search of daily opportunities during the harvest season.

Health related problems in workers of the sector are several. Respiratory and skin problems due to the exposition to chemical herbicides and fertilizers not applied or stored correctly are common (Lekei et al., 2014). Furthermore, occupational diseases may result from exposure to solar ultraviolet radiation; cutaneous conditions may range from a simple erythema to skin cancer. Post-harvest activities, especially the use of pulping machine, can result in different injuries, from cuts and sprains to fractures and finger amputations (Bedrikow and da Rocha, 2011).

1.2.3 Economic issues in Colombian coffee sector

One of the most pressing economic issues for smallholder coffee producers in Colombia is the price of the coffee. As coffee producers from all over the world, they have to face the high price volatility of the commodity they produce (see Fig. 1.2), since coffee is traded in financial markets internationally. Because of this reason, producers in Colombia will see the profitability of their activity highly influenced by causes that are out of their reach, as the rose in production in South-East Asian countries, Vietnam and Indonesia, or a period of drought in Brazil. Furthermore, since coffee is traded in dollars, farmers' revenues are also strongly influenced by the exchange rate between US dollars and Colombian Peso.

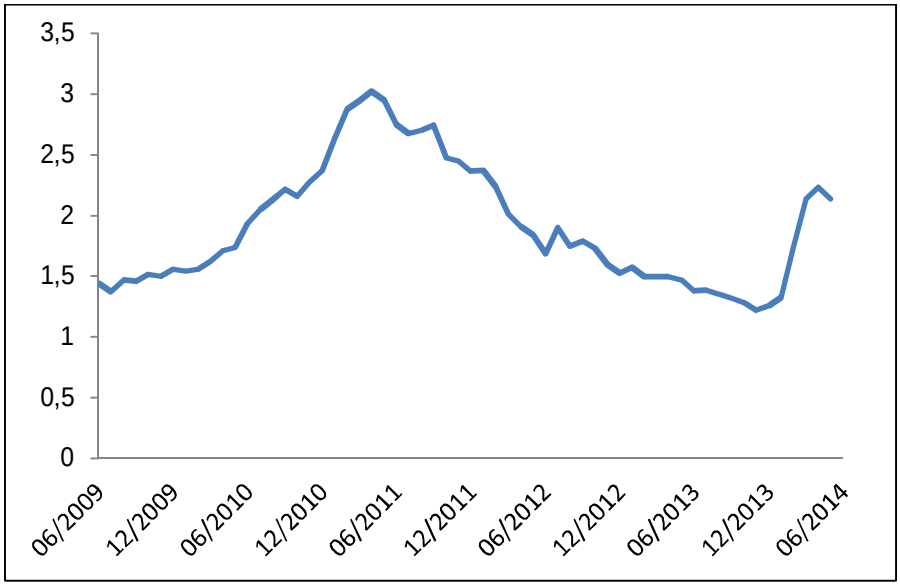


Fig 1.2: International price of arabica coffee in the last 5 years (USD/lbs)

The best way to offset the price volatility is increasing the coffee plantation productivity, which in turn reduces the marginal cost of production. Productivity in Colombia has always been a critical issue, with countries as Brazil and Vietnam capable of producing an average of 30 and 40 bags of green coffee per hectare respectively (Volcafe, 2013), and the South American country struggling to reach 10 bags per hectare. It is important though to highlight that since 2008 the government and the *Federación Nacional de Cafeteros de Colombia* (FNC) have been actively pursuing a campaign to increase the average productivity in the country. Renovation of coffee plantation, pest control and intensified crop density are the key strategies of the institutional effort that accomplished to boost productivity from 11 bags per hectare in 2012 to 14 bags in 2013 (FNC, 2014). Nonetheless, these productivity levels were the same registered in 2002, and since the FNC back in those days was estimating that productivity, in the mid to long-term, had the potential of reaching 20 bags per hectare (Giovannucci, 2002), there are still major improvement to make.

In previous decades the development of the sector tended to be technologically oriented, focusing on promoting highly productive coffee varieties associated with increase of agrochemical inputs use and

plantation densities. In turn this meant an intensification of labour on the plantations, and while the cost of rural labour in the country have increased and accounts for almost 70% of final production costs, its productivity has not experienced the same increase (Giovannucci, 2002).

Another important factor restraining the potential growth in productivity is the peculiar landscape of smallholder farmers. Most of the time the small scale combined with traditional practice and lack of innovation, has been the main obstacle to enhance production and shift the coffee sector towards a more entrepreneurial and sustainable one. Usually, in fact, small producers are risk averse and less inclined to adopt radical technological changes in their agricultural practices especially when additional investment are required and the short term benefit are low.

Smallholding, though, presents also positive aspects. The coffee sector in Colombia registers the lowest Gini index for land distribution, 0.7, compared to the 0.86 index for general distribution of rural property in Colombia (FNC, 2012). Since Colombia is one of the most unequal countries in South America with Brazil, the contribution by the coffee sector to a more equitable rural property concentration is particularly relevant.

1.3 The FNC: a unique model

The Colombian Coffee Grower Federation (FNC in its Spanish acronym) was founded in 1927 by coffee producers as a no profit organization in order to be represented nationally and internationally and to ensure their welfare and improve their quality of life. The Federation nowadays is the largest rural non-profit organization in the world, representing more than 560,000 producers, most of them being smallholder families. FNC'S main mission is to guide, organize, promote and regulate Colombian coffee production in order to promote farmers' welfare through collaborative economic, scientific, technological and commercial mechanisms (FNC, 2013). One of the strengths of the federation is its capillarity: with more than 500 centres located throughout the country, FNC is directly present in 95% of the 588 municipalities producing coffee in the country (Rueda and Lambin, 2013a).

Coffee producers have the chance, but not the obligation, to sell as much of their parchment coffee as they choose to one of the 500 purchasing centres of the Federation that are managed by fifty autonomous cooperatives. The most significant advantage provided by these centres is a guaranteed minimum price, equal or higher than the international one of the New York C contract and that keeps into account the exchange rate between US dollars and Colombian Peso. This price constitutes a minimum bench for the entire domestic market and it is published daily. The Federation is partially funded through an export tax retained from every transaction equal to US$ 0.06 per pound sold to the cooperatives. Thanks to this system Colombian farmers can sell their products with no amount restriction, close from their farms and all year long at a guaranteed and public price that is paid immediately at the moment of the transaction, after a quality control. Furthermore, since there is no selling obligation, each farmer can individually decide to

sell its production or part of it to private traders at usually higher prices. Through this efficient system FNC exports more than 30% of all the coffee produced in Colombia, being the largest exporter of Colombian coffee (FNC, 2012). In this way the Federation succeed in protecting farmers from the large contract power of domestic and international trader while ensuring and homogenous and high quality supply of Colombian coffee, assuring the intrinsic value of the origin (Ramirez et al., 2002).

Another core activity of FNC consists in providing direct technical assistance to all the affiliates in order to improve their economic, social and environmental conditions. In 1938 FNC founded *Cenicafé* as its research centre to develop appropriate, competitive, profitable and sustainable technologies to contribute to the welfare of Colombian coffee farmers. Counting on 66 researchers and 8 research centres, the institution is constantly creating strategic knowledge in terms of new agricultural practices, varieties of coffee and processing technologies to increase production while respecting both the environment and the farmers involved in the coffee sector (Cenicafé, 2014). The body of knowledge produced is then shared directly to farmers by the Extension Service, created by FNC in 1959. The service is formed by 1,669 technicians, mostly agricultural engineers, regularly visiting, assisting and communicating with all the 500,000 members of the Federation. The Extension Service's objective is to constantly seek to improve the producer's quality of life through the adoption of appropriate practices for coffee production, and to find ways to stimulate the relationship with coffee growers in social, infrastructure, and environmental projects that contribute to their families' well-being (FNC, 2014).

Lastly, FNC carries on other activities for the direct benefit of its members. They vary from selling agricultural inputs as young coffee plants or natural pesticides at discount prices, to providing technical assistance to facilitate access to credit - 90,000 only during 2012 (FNC, 2013) - up to implement structured development projects in fields as health, education and infrastructures.

1.3.1 The rise of certification programs in Colombia

In 2002 the FNC started a new national strategy to respond to the falling international prices of mainstream coffee (as seen from Chapter 1.1). Being aware of the increasing demand for sustainable and quality coffee, the Federation launched the "*café especiales*" programme aiming to generate greater revenues for farmers by producing and selling the coffees for which consumers are willing to pay a higher price (Reina and Silva, 2008). The programme developed along three main axes: fomenting the production and marketing of third party certified and verified sustainable coffees[2], foster the quality of specific coffees originated within Colombia and producing specific blend to conform to specific client's requests (Rueda and Lambin, 2013a). The year of the launching, FNC managed to sell with some level of differentiation the 8% of its total exports, equal to little more than 200,000 bags. After only seven years, in 2009, exports of speciality coffee

[2] Third party certified coffee programmes: Organic, Fair Trade, Rainforest Alliance, UTZ.
Global verification programme: 4C.
Company promoted verification programmes: Nespresso's AAA, Starbuck's CAFÉ Practices.

accounted for almost half of the total FNC exports, one million bag, with an incredible growth in both sustainable coffee, 150 times more than in 2002, and the origin coffee, three times more (FNC, 2011). Nowadays, five year after, the speciality coffee accounts for 67% of all FNC exports, guaranteeing US$ 8.5 million of price premiums transferred to the 129,000 farmers involved in the production of speciality coffee, for a total area of 365.528 hectares (FNC, 2013). The incredible result of reaching and involving 25% of the producers into some kind of speciality coffee had been achieved by FNC and the Extension Service that provided the farmers with the adequate information and technical support to adhere to the different and stringent standards of certification and verification programmes.

2. Research aim and questions

2.1 Research aim

The present thesis aims to two precise goals. First, it aims to expand the evidence base for environmental, social and economic impact of different certification programmes by using sound methods in order to avoid bias and undesired selection effects, while producing credible results. Second, it aims to understand a specific aspect of certification programs that still lack extended research: how smallholder coffee producers choose among various certification programs with different characteristics and deployed via different strategies. Hence, the study has two parallel lines of analysis: from one part it focuses on the differences, of various natures, between smallholder farmers participating into certification programs and farmers that are not. From the other part the study focuses on the strategies, visions and drives of the producers in relation with their expectations and experiences with these programmes. The two parts of the research are strictly connected. A synthesis of them help to shed light on a mechanism only sometimes cited in previous researches but that has never been directly investigated. In fact, the effectiveness of certification in terms of positive socioeconomic and environmental impacts is never linked with the views and culture of farmers and their ability, or inability, to make changes and to adopt new form of agricultural practices and mind-set towards their activities. The objective of this study is to assess whether and how certification programmes impact both the socioeconomic and environmental farmer's condition and the vision and strategies of the farmers. Hence, the quantitative analysis measuring the impacts is done and used to support the information collected through qualitative analysis about drives, visions and strategies.

To study the three selected certification programmes, two distinct municipal areas were selected in the Santander Department, one presenting farmers certified with organic and Fairtrade (Ocamonte) and the other with Rainforest (Socorro). In both places, to create a credible counterfactual - an estimate of what would have happened in the absence of the certification programmes - non certified farmers, with similar observable characteristics of the certified ones, were included in the study.

To achieve the multiple objectives previously presented, the research was guided by two main questions and three sub questions that will be presented in the following paragraph.

2.2 Research questions

The first main research question guiding the thesis is:

> *What are the environmental, social and economic impact of different sustainable certification programmes for smallholder coffee producers in rural areas of Santander, Colombia?*

The second main research question guiding the thesis is:

> *Which are the strategies and visions of farmers that joined a sustainable certification and to what extent are they aligned with those of the certification organization(s)?*

To better guide the research and to expand its scope of analysis, the following three sub questions will be addressed:

> *What are the differences in agricultural practices recorded on certified farms and what are the environmental consequences?*
>
> *What are the barriers preventing certification programmes to be extended to other smallholder farmers?*
>
> *Are there differences between strategies and visions of certified and non-certified farmers? Are these differences a result of the involvement in specific certification programmes?*

2.3 Institutional partner

The research on which this thesis is based on had been developed in collaboration with the Colombian organization NaturaCert, a direct initiative of the NGO Fundación Natura, member of the Sustainable Agriculture Network (SAN). NaturaCert provides certification and verification services for sustainable agricultural products in Colombia and is the certification body for the SAN Rules. Furthermore it provides verification services for organizations as the Union for Ethical BioTrade, Nespresso's AAA Programme and Starbuck's CAFÉ Practices and the provisional certification body for Florverde Sustainable Flowers. The aim of the Foundation is to contribute to the conservation and sustainable use of biodiversity resulting in a better quality of life for rural people. Furthermore it aims to provide a better national and international positioning for the products meeting standards and sustainable codes. NaturaCert currently provides audit services for the acquisition of Rainforest Alliance certification due to the fact that Fundación Natura is the partner and representative of Rainforest Alliance in Colombia (NaturaCert, 2014). While NaturaCert collaborated during the design phase of the research, providing major insights about the topic of certification and accurate indications about the most suitable research area, the implementation of the field research was facilitated by the Extension Service of FNC.


PROHIBIDA
LA CAZERIA
CUIDEMOS LA
NATURALEZA

3. Theoretical background

3.1 Sustainable agriculture and sustainable certifications

Agriculture has been one of the foundations of human society and a major activity at the human-environment interface (Lélé, 1991). Although industrialized countries registered a shift in terms of the importance of agriculture compared to other sectors, in most developing countries it is still the most important sector both in terms of output and occupational levels. In fact there are almost 1.2 billion people in developing countries relying on agro forestry and farming systems to help sustain agricultural productivity and generate income (Bredberg, 2010). The drive to increase agricultural productivity to sustain a growing population, led to the rise of modern agriculture. Mono-cropping, chemical fertilizers, high yielding varieties, irrigation, and high mechanization characterize modern agriculture, a system widely spread from the aftermath of the Second World War in the developed countries. In the mid-sixties this trend was adopted by many developing countries and called Green Revolution by William Gaud in 1968. Modern agriculture short circuits the evolution process of crops, and traditional systems of cultivation to adapt to local conditions. Furthermore the glamorized benefits of monoculture in terms of yield are misleading as increases are only in one crop, whereas mixed cropping gives a low yield of multiple crops but a high output of food (Madeley, 2002). Unsustainable practices, like the ones fostered by modern agriculture, coupled with poverty forces many farmers to expand their cultivable land at the expenses of forests, soils and fisheries. Deforestation poses a serious threat to both the global environment, in terms of substantial losses of carbon oxide storage as one of the tools for combating global warming (Todaro and Smith, 2006), and for local livelihoods: smallholder farmers are highly dependent on property resources and they often don't have enough assets to adapt to the effects of degradation (Bredberg, 2010). Therefore increasing pressure has been mounting on the global and local scale to reverse the undesired effects of modern agriculture. It is in this framework that sustainable agriculture gained increasing importance. A unified definition of sustainable agriculture is still missing, but it is usually referred to as an environmentally sound, productive, economically viable, and socially desirable agriculture (Schaller, 1993; Yunlong and Smit, 1994). In this regard, sustainable agriculture requires resource conservation, protection and maintenance of the environment, production efficiency, resilience of ecosystems, appropriate technology, cultural diversity, and satisfaction of the basic needs (Praneetvatakul et al. 2001). Hence sustainable agriculture has to provide for the food production needs while promoting the preservation of natural environment and the social wellbeing, respecting and keeping a healthy balance among the three pillars of sustainability: people, planet and profit.

The need and willingness of producers to signal their sustainable ways of producing, coupled with an increasing demand in industrialized countries of "sustainable" goods, led in the last decades to a rise of

private sustainability standards. Following, the three main sustainable standards in coffee production, the one selected for the thesis, will be described in order to show their focus, vision and the type of standards and rules they require to achieve their promoted goals.

3.2 Organic IFOAM certification

The International Federation of Organic Agriculture Movement (IFOAM) was founded in 1972 as the umbrella organization for the organic agriculture movement. Its role is to guide, unite and assist the organic movement worldwide in its full diversity. The IFOAM published in 2008 the definition of organic agriculture: "Organic Agriculture is a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic Agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved" (IFOAM, 2014).

In a process of several decades, the international organic community, led by the IFOAM, established four main principles of organic agriculture that serve to inspire the organic movement in its full diversity. The four principles are: Principle of Health, Principle of Ecology, Principle of Fairness, and Principle of Care. These principles guide IFOAM's development of positions, programs and Basic Standards (IFOAM, 2012). IFOAM's Basic Standards provide a framework of minimum requirements from which private certification bodies or governments can elaborate and refine their own organic standards to particular country needs or consumer demands. Because of this approach, in the world there is a great variety of organic labels and certifications, although all of them share the same principles and framework. Organic certification is the only one that is publicly regulated by laws in many countries - in Europe by the EU Organic Directive of 1991, in the United States by the Department of Agriculture (USDA) and in Japan by the Agricultural Standards (JAS) regulated by the government (ITC, 2011).

In general, farmers that want to be certified organic have to comply with the following broad guidelines of production (Van der Vossen, 2005):

• Nutrient management: use of composted organic matter instead of chemical fertilizers to maintain soil quality, mineral fertilizers only to be used as supplement;

• Plant protection: use of natural preventive methods for controlling disease, pests, and weeds instead of synthetic pesticides and herbicides, botanical pesticides only to be used as supplement;

• Soil management: use of soil conservation practices, including contour planting, terracing, planting cover crops, mulching, and planting shade trees;

• Reduced pollution: minimum use of fossil fuels in the production process and minimum pollution during postharvest handling;

• Record keeping: documentation of all the administrative, productive and commercial documents.

The detailed Basic Standards have few and non-stringent social and economic requirements, majorly focusing on environmental and food quality criteria. The core of the organic certification is the avoidance of any synthetic input, from fertilizers to pesticides, and of genetically modified organisms. From a sustainability perspective organic certification places his focus on the environment through the ban of any kind of synthetic agrochemicals.

Organic certification can be obtained by individual farmers with no restriction on the farm size, but they have to wait a buffering time of three years before being formally certified. During the three years of transaction, in which it is forbidden to use synthetic chemical input, farmers have to pay the cost connected to certification audit but they will not receive the price premium (Blackman and Naranjo, 2012). It is then clear that for farmers using high levels of agrochemicals there is little incentive to obtain organic certification since they face high risks in converting to organic production through potential falls in yield, building fertility and adapting to new pest and disease management methods (Midmore et al. 2001). Plant nutrition is really critical when shifting to organic agriculture because organic fertilizers release slowly their nutrients and not necessarily when they are required by crops, resulting in a poor synchronization between nutrient availability and crop demand (Valkila, 2009). This problem is amplified in a crop as coffee, where plants has a productive cycle varying between 8 to 13 years and suffer higher problems if the shift happens during their lifetime.

Cost wise, organic production usually implies for one side the reduction of inputs costs, as long as farmers are able to produce their supply of organic fertilizers on their farms, but higher labour intensity. On the other side coffee organic certification, due to the rigorous requirements, is the one paying the highest price premiums for farmers (Leibovich, 1999; Valkila, 2009; ITC, 2O11; Blcakman and Naranjo, 2012; and see 5.3.2). Furthermore, organic coffee is the most important category of sustainable coffee both in terms of quantity and value, guaranteeing constant available demand in international markets. This data is reflected also in the results of a survey conducted in the United States, stating that more than half of the consumers interviewed were recognizing this certification, placing organic certification has the label with the highest awareness among coffee consumers (NCA, 2008).

3.3 Fair Trade (FLO) certification

Fair trade is an alternative approach to conventional trade based on a partnership between producers and traders, businesses and consumers. The international Fairtrade system - made up of Fairtrade International (FLO) and its member organizations - represents the world's largest and most recognized fair trade system. Fairtrade’s vision is a world in which all producers can enjoy secure and sustainable livelihoods, fulfil their potential and decide on their future. To achieve this, the organization aims at directly link disadvantaged

producers with consumers to promote fairer trading conditions and empower producers to combat poverty, strengthen their position and take more control over their lives (Fairtrade, 2014).

Although the Fairtrade movement can be traced back to the 1940s, the movement began to expand and spread only in 70s (Moore, 2004). In 1988, the Dutch development agency Solidaridad launched the first fair trade certification label, Max Havelaar, in order to differentiate fair traded coffee from the conventional one. The same initiative was recreated in numerous countries during the following years by several members of the Fairtrade movement. Only in 1997 Fairtrade Labelling Organizations International FLO was established in Bonn, Germany to unite the national Fairtrade organizations under one umbrella and harmonize worldwide standards and certification (Fairtrade, 2014). Among several crops, Coffee is the product most commonly certified by FLO, both in terms of number of producers and workers involved and in total amount of price premium paid (Dragusanu et al., 2013).

FLO certification can be obtained by individual producers which employ hired labour permanently, with the standards requesting for workers to be organized and for the producer to pay decent salaries, guarantee the workers the right to join unions, and provide lodging when relevant. Smallholder farmers, that principally employ their own and their family's labour, can obtain the FLO certification only collectively when organized in a cooperative or a smallholder producers organization with a democratic and participatory structure. It is also required for smallholders' organizations that all members have a voice and vote in the decision-making process (Kilian et al., 2004). FLO applies Common principles to small scale producers and workers organization, plus a set of different specific principles for the two categories.

To accomplish the goal of Fairtrade the following requirements are set for the FLO certification (Dragusanu et al., 2013; Fairtrade, 2012; and Moore, 2004):

• Price premium and minimum price: Certified producers' organizations receive social price premium designated for social and economic development. Furthermore, producers are guaranteed a Fairtrade Minimum Price aiming at covering the costs sustainable production. If the market price is higher than the minimum price then producers will receive the higher one. Both price premium and minimum price are individually set by Fairtrade for each product.

• Working conditions: smallholder farmers and workers must have freedom of association, adequate occupational safety and sanitation conditions, and wages at least equal to the legal minimum or to the regional average when it is not regulated by law. Furthermore, child labour is strictly prohibited.

• Institutional structure: as already mentioned, farmers must be organized in an organization or cooperative, with transparent and democratic decision making process involving mainly the administration of the premium paid to the organization in an accountable manner.

• Environmental conservation: a series of environmental rules that promote sound agricultural practices focusing on minimised and safe use of agrochemicals, proper and safe management of waste, maintenance of soil fertility and water resources, no use of genetically modified organisms.

• Stability and access to credit: Fair Trade buyers agree to long-term contracts, at least one year, and to provide financial advance on contracts, called pre-financing, if it is requested by producers.

The Price minimum is a practical and efficient tool to contrast one of the most pressing economic issues for coffee production, the price volatility (see Ch. 1.2.2). As shown in Fig. 3.1 below, from the early 90's the price minimum almost always stayed above the international price, guaranteeing to certified producers a decent income for them and their families.

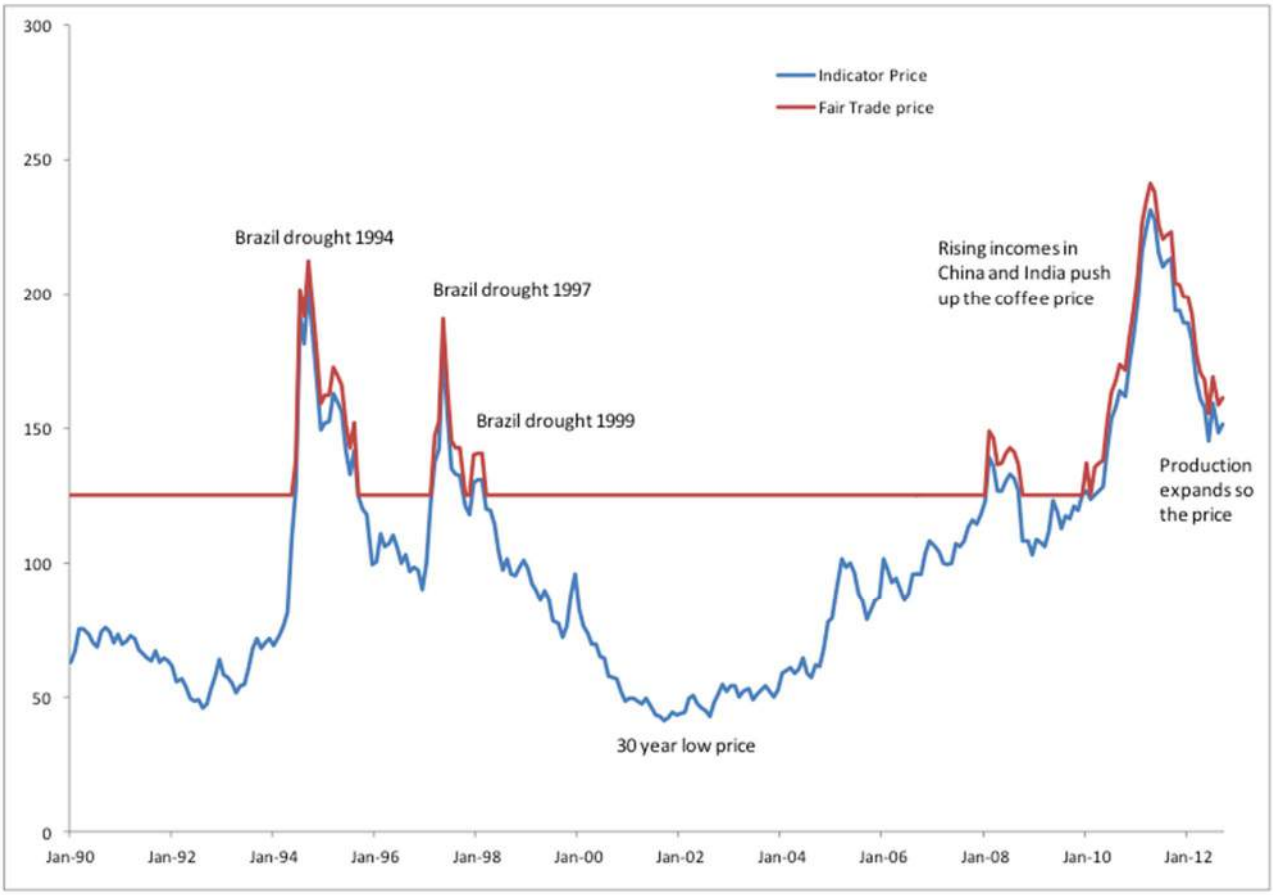


Fig. 3.1: Fairtrade and market price for coffee (US cents/lb) (own elaboration from: Dragusanu et al., 2013)

The social price premium is used by the cooperatives to implement specific development projects to improve the life quality of the members through education, health, infrastructures, or other social facilities. Literature shows though that there could be problems with the distribution of profit among the members of the cooperative, especially when the number of participants is high. For example, Bacon (2002) explains how large organizations usually pool the payment received by Fairtrade with other sources as conventional markets or direct sales, with no individual tracking for producers. Hence in organizations in which Fairtrade price benefits are retained at the association level, individual farmers are seldom aware of the premium or price minimum offered by the certification (Raynolds, 2002). This in turn will create positive impact on price volatility and on production incentives at the farmer level (IIED, 2000).

It is though widely recognized how one of the major benefits of participation in Fairtrade certification is the organizational capacity building (Hopkins, 2000; Raynolds, 2002; Valkila, 2009).

3.4 Rainforest Alliance (RFA) certification

Rainforest Alliance is a non-profit organizations founded in 1987. Its mission is to conserve biodiversity and ensure sustainable livelihoods by transforming land-use practices, business practices and consumer behaviour (RFA, 2014). Rainforest Alliance, to manage the certification program in the field and provide technical guidance, created with a group of environmental NGOs the Sustainable Agriculture Network (SAN). The San is responsible to set a series of standard for producers to be awarded with the Rainforest Alliance certification (Rueda and Lambin, 2013a). The certification issued is based on the three pillars of sustainability, with a strong focus on the environmental side. In fact Rainforest Alliance does not promise a fixed price premium as other organization as Fair Trade, but the seal of certification for the producers is a way of accessing a segment of the market where environmental and social consideration is rewarded by a higher price. With the possibility of receiving higher returns, economic incentives to practice a more sustainable farm management are created. The organisation works with farmers to incorporate environmental considerations into their activities while paying attention to economic and social aspects as well. The structure of the certification standard consists of ten principles, each of which is composed of various criteria and indicators. These criteria and indicators form the standards to be met by producers to be awarded with the certification (SAN, 2014). The broad areas covered by the ten principles are:

• Social and Environmental Management System: implemented by farmers for auditors to assess whether farms are managed in compliance with SAN standards and national laws.

• Ecosystem Conservation: farmers must conserve existing ecosystems and aid in the ecological restoration of critical areas, by protecting waterways and wetlands, prohibit logging and maintain live barriers among others.

• Wildlife Protection: wildlife, both plants and animals, has to be actively monitored and protected on farms, especially for endangered species and their habitats. Measures to do so include training to workers, forbidding hunting, and protecting nesting places.

• Water Conservation: water has to be conserved through keeping track of water sources and consumption. Agricultural practices have to be modified to reduce water consumption and avoid contamination of springs and rivers on and near the property.

• Fair Treatment and Good Working Conditions for Workers: good working conditions have to be ensured for all the workers, using the protocols contained in the International Labour Organization Conventions. Child labour and forced labour are hence strictly forbidden.

• Occupational Health and Safety: workers must receive safety training and that farmers provide the necessary protective gear and ensure that farm infrastructure, machinery and other equipment is in good condition and poses no danger to human health.

• Community Relations: SAN standard requires farmers to be good neighbours and inform surrounding communities and local interest groups about their activities and plans.

• Integrated Crop Management: although there is no restriction to the use of synthetic fertilizers, and most low-toxicity pesticides are permitted, SAN encourages the elimination of chemical products that pose dangers to people and the environment. Farmers must monitor pests and use biological or mechanical alternatives to pesticides where possible.

• Soil Management and Conservation: to improve the quality of soils, farmers must take steps to prevent erosion, base fertilization on crop requirements and soil characteristics, and use organic matter to enrich soil.

• Integrated Waste Management: certified farms must be and enforce programs for managing waste through recycling, reducing consumption and reuse. Waste must be segregated, treated and disposed of in ways that minimize environmental and health impacts.

Compared to other sustainable certifications, Rainforest Alliance puts much attention into agricultural practices. These are seen as the key tool to preserve biodiversity, reduce the agricultural impact on the environment and avoid deforestation. The organization's strategy focuses on the provision of information and knowledge in order to help the farmers to increase productivity and reduce costs (RFA, 2014).
Although Rainforest is the sustainable certification that focuses the most on the preservation of environment, even outside of the production activities, higher productivity levels and good agricultural practices have been registered in certified farms (Lee et al., 2010; Rueda and Lambin, 2013b). Differently to organic certification, RFA seems to assure environmental conservation without hampering productivity levels and product quality. It is also true that price premiums for this certification are not fixed and tended to be higher in the past, 0,17 US$/lb in 2002 (Rueda and Lambin, 2013b) and decreased sensibly in the last years responding to an higher saturation of this niche market.

3.5 Previous studies on the impact of certification programmes

Previous research has been conducted regarding certification programs around the world. One line of research has been the assessment of the impact of certifications on the socioeconomic and environmental conditions of the certified producers. This focus on impact assessment is not a surprise. According to proponents of certification, labels create financial incentives and opportunities for farmers to improve their environmental and socioeconomic performance (Rice and Ward, 1996). Certification bodies have produced numerous efforts to assess the real short and long term impacts of their programs, but results have been contradictory and quality research is still needed. An important study performed by Blackman and Rivera (2010) reviews the evidence collected through different researches on the impact of various sustainable certification of agricultural products. In the case of coffee they found 26 researches of which only six,

Arnould et al. (2009), Blackman and Naranjo (2010), Bolwig et al. (2009), Fort and Ruben (2008), Lyngbaek et al. (2001), and Sáenz Segura and Zúñiga-Arias (2008), construct a reasonably credible counterfactual for the impact study. All these studies attempt to identify certification impacts by comparing certified and matched noncertified entities using cross-sectional data, but no one compare certified and noncertified entities both before and after certification (Blackman and Rivera, 2010). The analysis of the results shows that farm-level studies of coffee certification do not provide compelling evidence that certification has positive socioeconomic or environmental impacts. From the six valuable studies it is not possible to draw strong conclusions. In fact, two—Arnould et al. (2009) and Bolwig et al. (2009)—find that certification has significant socioeconomic benefits, and one—Blackman and Naranjo (2010)—finds that certification has a significant environmental impact, while the other three did not register any significant impact. The authors of the paper found a strong focus on the Fair Trade certification, followed by organic ones, hence research is still missing for other important programs such as Rainforest Alliance, UTZ Certified, 4C or AAA Nespresso. Another important element is that most of the previous studies on the topic have focused on socioeconomic impacts and, as stated by different authors (Blackmand and Naranjo, 2010; Barham and Weber, 2012), there is an almost complete lack of studies on environmental outcomes of certification using representative random samples.

4. Methodologies

4.1 Research area – the Santander Department

The research was conducted in the Santander Department of Colombia, precisely in the two municipalities of Ocamonte (presenting producers certified with organic and Fairtrade labels) and Socorro (presenting producers certified with Rainforest Alliance label).

The Santander Department is located in the oriental zone of Colombia, 350 km away from the capital Bogota, and it is crossed by the Eastern Andean range. Coffee farming is the mayor employment in the agricultural sector, with farms characterized by their small to medium size, as in the rest of the country. For the particular regional features in terms of solar exposition and rain precipitation, coffee producers are able to harvest only once per year, in the period going from October to December. Due to the nine months long dry season going from June to February most of the coffee in the region is grown under some form of shade.

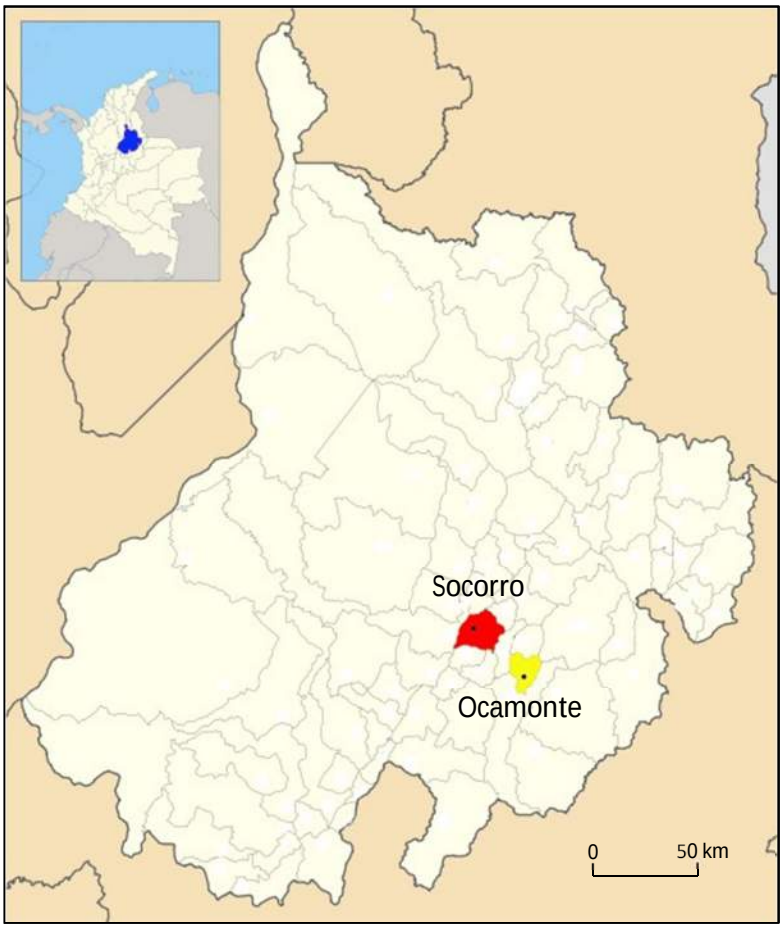


Fig. 4.1 Map of the Santander Department divided in its 87 municipalities. Socorro (in red) and Ocamonte (in yellow) are highlighted.

The Department has been historically one of the enclaves of coffee production in the country. Coffee beans arriving from Venezuela started to be produced in the area since the early 19th century (Parsons 1968; Palacios, 1980). In the late nineteenth century and early twentieth century the majority of the Colombian coffee production came from Santander and its large haciendas, with the department accounting for 60% of the total national production for the year 1900 (Palacios, 1980). Nonetheless, in the last century the situation changed drastically, with large haciendas being less profitable and making space for the proliferation of small scale farms (Parsons, 1949). Nowadays the Department presents more than 46.000 hectares of coffee plantation managed by 31.753 coffee producers, representing 5% of coffee productive area and coffee producers of Colombia. 90% of the producers are smallholders possessing less than 3 hectares. These producers usually have low schooling levels, which

makes difficult to access to credits to support productive investments, depends on family labour and generate most of their revenue from coffee production (FNC Santander, 2014).

Coffee plantations in Santander present important strengths and weaknesses compared to the rest of the country. From one side, the coffee area established in the department of Santander is characterized by having the highest percentage of coffee varieties that are resistant to coffee rust, one of the most devastating pests for coffee. Of the total planted area, 74.15% presents rust resistant varieties (Colombia, Castillo and Tabi) and only the remaining 25.85% is planted with non-resistant ones (Caturra and Tipica). On the other side, more than 30% of the area planted in Santander presents coffee trees older than 10 years, the period from which productivity levels drop drastically. The Departmental section of FNC in Santander is been implementing several projects aiming at promoting the renewal of aged coffee trees with new coffee of the rust resistant type, to both improve the productivity of coffee plantations and reduce risks faced by farmers (FNC Santander, 2014).

4.1.1 Ocamonte Municipality

Ocamonte is a small rural municipality with less than 5,000 inhabitants (DANE, 2005). To access to Ocamonte there is only one paved road connecting it to San Gil in approximately one hour, other two connections are with the towns of Charalá and Valle de San Jose, both on unpaved roads. The climate of the municipality varies due to height difference going from 1,200 to 1,700 meters of altitude.

The main crop produced in the area is the sugar cane and various small-scale sugar mills can be found around the fields. The sugar production and refinery had attracted the highest investments and workforce, representing the most important rural activity paired with cattle raising. Only 2.4% of the land is dedicated to coffee production (FNC Santander, 2013). Due to the intensive production of sugar cane, counting on high levels of agrochemical use and slash and burn systems to prepare the fields, the majority of the natural forest of the area has been cleared out. Coffee production for many families of the area had represented only a small fraction of the income, determining low levels of investments in agrochemical inputs.

Several coffee producers families living in the municipal area of Ocamonte founded in 1994 APCO (Asociación de Pequeños Caficultores de Ocamonte), an organization of smallholder coffee producers with the goal of selling their coffee at better prices through fair trade markets.

When, in 2002, FNC started the *café especiales* project the municipality, for its peculiar landscape, presented fertile ground for the organic and FLO certification. Hence producers that used low level of synthetic input were supported to access to organic certification, while the 270 members of APCO officially gained the FLO certification as a group of smallholder producers. Nowadays half of the organization's members have the double certification FLO-organic providing them with even higher price premium, while several others are undertaking the transition period of three years to gain the organic labelling.

4.1.2 Socorro Municipality

The town of Socorro, founded in 1681, had a great influence on the history of Colombia and the constitution of the country, being the centre of important events in the struggle of Colombia's Independence, as the *Insurreción de los Comuneros* in 1781, and the sign of the first Act of Independence of Colombia. The municipal area of Socorro counts with almost 25,000 habitants (DANE, 2005) and presents morphological conditions similar to Ocamonte, with altitudes varying from 1,300 to 2,000 metres. Compared to Ocamonte it has a better access to the main national roads since it is located on the main paved road connecting Bogotá to Bucaramanga.

Socorro is regarded as the coffee capital of the Department, with 7.8% - 4,000 hectares - of the cultivated area of the municipality dedicated to coffee production, by far the highest share among all the municipalities in Santander (FNC Santander, 2013). The area presents both smallholder farmers with less than 3 hectares and medium size coffee farms with a productive area ranging from 10 to 20 hectares on average. Generally coffee production holds a rather entrepreneurial mentality with higher yields and coffee specialization compared to Ocamonte. The primary focus placed on coffee production make the landscape of the area homogenous with a continuous canopy of shaded coffee lands. Due to the characteristics in terms of exposure to sunlight - 2,142 hours per year -, rain precipitation and altitude Cenicafé (2009), recommends for coffee cultivated in Socorro a shade density of 41%, one of the highest in the country.

In Socorro, the seasonal climate has forced farmers to preserve traditional shade systems, dense and heterogeneous, which has led the area to become one with the largest current and potential area certificated under Rainforest (Gómez, 2006; FNC, 2007). A study conducted on coffee shade systems by Sánchez et al. (2007) identify the region of Socorro as the one with the highest diversification in terms of tree species, the highest tree density, the highest number of native species and the most equal distribution in terms of individual species. Thus the Socorro Municipality holds the premises for environmental preservation and certification, pretty stringent but rewarding in terms of diversification, market placement and environmental services. Starting from 2002, FNC supported coffee producers to access to Rainforest certification, first targeting larger farms and then approaching all farmers who would be willing and able to comply with certification requirements, regardless of size or tenure system (Rueda and Lambin, 2013b).

4.2 Methodological approach

To gain relevant data to reply to the research questions, both quantitative and qualitative methods have been used on the field. Mixed methods are the proper research tool when analysing a problem from different point of views since they combine the more in depth and contextualized insight of a qualitative analysis with the more efficient and objective information of quantitative analysis (Johnson and Onwuegbuzie, 2004). The choice of mixed method is supported by Hassell (2005), in a study commissioned by ISEAL alliance to propose methodology for studying impacts across the different certification schemes,

he wrotes: “The full basket methods that combine qualitative and quantitative methods are very useful to evaluate impacts in narrow case studies”. Through these methods it was possible to both assess the impact of three certification programmes (Organic, Fairtrade and Rainforest) in terms of environmental, social and economic impact and to study different strategies, drives and visions of smallholder coffee producers.
Following, the different methods used during the research will be presented.

4.2.1 Desk research and experts interviews

Desk research focusing on literature review was carried out to achieve both a more in-depth study of previous researches on the topic and a better understanding of the certification organizations’ - IFOAM, Fairtrade International and Rainforest Alliance - visions, standards and strategies in order to prepare for the field work period. The literature review consisted of previously published studies and papers retrievable on line and a series of documents, reports and studies provided by the institutional partner FNC to better contextualize the study on the areas and certifications selected. Furthermore unpublished studies on agricultural certification had been reviewed from local libraries in Colombia. Works in both English and Spanish had been taken in consideration.
To design the household survey and include the most important indicators and variables able to measure the impact of certifications, both desk research and experts interviews were conducted. Desk research focused on a number of previously published papers and articles on the agricultural practices in Colombian coffee production and on impact studies for certification programs. To expand this knowledge and better tailoring it to the local conditions, five experts interviews were conducted in Colombia. Interviews were organized with the Directors of FNC offices in Socorro and Charalá (the office serving Ocamonte), with the Chief of FNC Extension Service of Santander, with a senior researcher from Cenicafé and with the Director of NaturaCert.

4.2.2 Household survey

The main data collecting method employed for the research is a household survey divided in six different sections. Apart from the questions concerning the drives to certify or not to, the survey presents the same structure and questions for both certified and non-certified farmers. Rather than be tailored on the standards set by certification programmes, the survey aims to measure the actual farmers’ conditions in the three sustainability areas. In fact a critique almost move to impact studies on certification is that they enhance the positive effects of these programmes by using the required standards as outcome evaluator (Blackmand and Rivera, 2010).
The first section, General Information, collected basic data of the surveyed farmer’s household. This information has been used to check *a posteriori* whether the sample selection method had effectively controlled for possible selection bias. The second, third and fourth section gathered information on different indicators concerning the environmental, economic and social conditions of farmers. Through the

fifth section it was possible to survey differences in agricultural practices performed on coffee plantations. Because of the connection between agricultural practices and environment, the results acquired from this section were later incorporated in the environmental impact (see 4.3 Operationalization of variables). Lastly, the sixth section regarded farmers' strategies, drives and visions.

In total 120 surveys had been implemented, half in the Ocamonte municipality and half in the Socorro municipal area.

4.2.3 Participatory observation and informal interviews

Due to the limited amount of time for the field work the research unfolded through a rather participatory observation approach, consisting in long stays in the communities of producers and on the coffee farms to understand and live the daily life of the farmers. As van Donge (2006) points out this kind of research methods attempt to study social life as it unfolds in the practices of day-to-day life. These methods avoid as much as possible artificial research situations and are deemed fundamental to gather information regarding the second main research question about the vision and drives of the farmers.

The participatory observation approach was achieved by accompanying the FNC Extension Service technicians in their daily visits to farms, individual visits to previously contacted farms and staying in the FNC headquarters in Socorro and Charalá during the day dedicated by extensionists to office meetings with farmers. A total of more than 100 farms were directly visited, gathering important background and first-hand information about various components of the production system and the farms' characteristics. This allowed also getting first hand impression on environmental conditions of different coffee plantations and the diverse socioeconomic situations of smallholder coffee producers in the area.

To deepen the results obtained through quantitative methods on farmers' vision and strategy, informal interviews were conducted with 60 producers as a follow up of the survey. Through this method it was possible to access to information regarding the historic individual and local development of coffee production, the most pressing issues regarding coffee production in the area and farmers opinion about the certification programmes.

The fact that the research period coincided with a relatively calm part of the productive season also helped in terms of time availability conceded by farmers to respond to questions and to perform guided visits of the farms.

4.3 Sample selection

In order to broaden the scope and the reach of the research, two different areas were selected as case studies. The choice of two areas instead of one was not intended in order to make a comparison between the two, rather to expand the source of data remaining inside of the limited amount of time devoted to the field work. In this way it was possible to collect information, using the same framework, on the three

different selected certifications. The specific locality was selected, with support from the institutional partner NaturaCert, due to the diverse landscape of certification programs present in a rather limited area.

The process of sample and control group selection followed the same criteria in both areas with no distinction, so the following explanation is valid for both. The sample of certified farmer was selected using snowball sampling, allowing gathering in the sample a variety of producers with different characteristics. Since one of the main goals of the thesis is to assess the impact of certification, it was fundamental to have a credible counterfactual. The difference between the actual outcome, certified farmers, and the counterfactual outcome, non-certified farmers, in terms of different socioeconomic and environmental variables is to be considered as the actual impact of certification. Since this research project was not aiming at creating an experimental or randomized control, to avoid misleading options and selection bias, the matching approach was used to select an appropriate control group. With this method, farmers from the control group were selected in order to have the most similar, if not identical, observable characteristics of the selected certified producers. Furthermore, farmers selected in the control group presented geographical proximity and accessibility similarity in respect with the selected sample. The expert and in depth knowledge of extensionist technicians about the local coffee producers was used to ensure the validity of this selection process.

Via this method a total of 120 farmers were selected for the research, equally divided in the two research areas. In Ocamonte, of the total 60 farmers selected, 20 were certified Organic, 20 Fairtrade and 20 were not certified. In Socorro, of the total 60 farmers selected, 30 were certified Rainforest and 30 were not certified. As shown in the table below that resume farmers' observable characteristics, the control and study group are significantly similar. Furthermore a t-test[3] on farmers' observable characteristics was used to check the validity of the matching, confirming no significant differences between the control and study groups. It is hence possible to assert that the methods employed for the sample selection create a robust counterfactual to evaluate the impacts of certification.

Tab. 4.1: Selected farmers' characteristics (median values)

	Ocamonte			**Socorro**	
	Control	**FLO**	**Organic**	**Control**	**RFA**
	(n=20)	(n=20)	(n=20)	(n=30)	(n=30)
Age of household's head	49	49	50	52	52
Number of people in the household	4	4	4	4	4
Number of year of education of household's head	4	5	4	4	5
Number of hectares of land devoted to coffee	2	2	2	2,25	2,5
Number of farmers with land title	14	15	15	26	27
Number of household members working on the farm	2	3	3	2	2
Number of hired daily workers on the farm	3	2	3	6	6
Years of farming experience of the household's head	30	30	30	29	30

[3] Table with p-value in Appendix 1

4.4 Operationalization of variables

Each of the three area of impact study, environmental, economic and social were divided into main indicators, each of them composed by different variables to measure them.

4.4.1 Environmental impact

The environmental impact is measured on 7 macro indicators: Biodiversity, Wildlife protection, Water conservation, Soil conservation, Integrated pest management, Waste management, and Reforestation. The macro indicators are further divided into 17 specific variables.

Tab. 4.2 Indicators and operationalization of environmental impact

Indicator	Operationalization
Biodiversity	Number of tree species in the coffee plot
	Number of birds species in the coffee plot
Wildlife conservation	Hunting practiced
	Initiatives to protect wildlife
Water conservation	Protection of water bodies via live barriers
	Treatment of residual water
Soil conservation	Soil analysis
	Soil erosion
	Use of fertilizers
Integrated pest management	Use of biological control as insecticide (borer beetle)
	Pest management (coffee rust)
	Weed management
Waste management	Method of solid waste disposal
	Recollection of trash from coffee plot
Reforestation	Trees planted outside the coffee plot
	Areas of natural forest
	Coffee shade management

4.4.2 Social impact

The social impact is measured on 4 macro indicators: Record keeping, Producers network, Fair employment, and Occupational health. The macro indicators are further divided into 10 specific variables.

Tab. 4.3 Indicators and operationalization of social impact

Indicator	Operationalization
Record keeping	Extensive recording of agricultural and economic activities of the farm
Producers network	Participation in a producers organization or cooperative
Fair employment	Legal wage and working hour respected
	Training provided to workers
	No child labour
Occupational health	Provision of safe water
	Provision of sanitary facilities
	Presence of first aid kit
	Use of comprehensive protective equipment
	Presence of danger signs

4.4.3 Economic impact

Finally, the economic impact is measured on 7 macro indicators: Productivity, Price, Price information, Role of coffee in household's economy, Access to credit, Land intensification and Land expansion. The macro indicators are further divided into 9 specific variables.

Tab. 4.4 Indicators and operationalization of economic impact

Indicator	Operationalization
Productivity	Number of *cargas* (125kg) of parchment coffee sold per hectare
	Percentage of coffee sold as certified (only certified farmers)
Price	Price paid for *carga* of parchment coffee sold
	Premium price paid for *carga* of certified coffee sold (only certified farmers)
Price information	Frequency of access to price information
Role of coffee in household's economy	Importance of coffee production as share of household's income
Access to credit	Access to credit for renovation of coffee plot or farm's infrastructures
Land intensification	Renovation of coffee plantation by stumping or new planting in the last 3 years
Land expansion	Expansion of coffee plantation in the last 5 years

4.5 Data analysis

Different type of data requires different methods of analysis. Quantitative data about certification impact collected by survey were analysed using statistic tools able to capture the correlation between a dichotomous variable – being or not being certified – and a series of ordinal or continuous variables describing the impact of certification on several indicators. For ordinal variables chi-square test (difference in differences) was used to search for correlation between certification and positive – or negative – outcomes in the different categories. For continuous variables instead, a t-test was used. On the other side, qualitative data collected through interviews will be analysed through descriptive statistics, with population means and distribution frequency of the producers' responses along with open coding.

5. Results

The following chapter will present the results obtained during the field work, divided into six main sections. The first three are dedicated to the impact of certifications on the three pillars of sustainability. In these parts, the results obtained by the two control groups will be compared with their respective study groups (Contr 1 with FLO and Organic; Contr 2 with RFA) due to the fact that general environmental, social and economic conditions differ from Ocamonte to Socorro. The fourth, fifth and sixth parts will respectively show the results obtained in terms of farmers' strategies, drives and visions. In these sections, for most of the cases, noncertified farmers will be treated as a unite group, no distinction between Ocamonte and Socorro, since it is presumed that such topics are not location specific.

Tab. 5.1 shows a general resume of all the results of the impact assessment, divided by sustainability area, macro indicators and their respective specific variables. The variables are mainly dichotomous, observations that occur in one of two possible states, hence the numbers represented in the table correspond to the total number of farmers from one group performing the action described by the variable. The only non-dichotomous and continuous variables in the table are the ones corresponding to the indicators Biodiversity, Productivity and Price. Median values are shown in case of these variables.

Three variables require a brief explanation before being presented. For the variable *Number of bird species* the values are not taking into account the entire selected farmers. In fact, there is a lack of general recording of different bird species in the farms of the region, with reliable data provided by only some of the survey's respondents[4]. As well the variable *Protection of water bodies via live barriers* includes only the farmers for whom the question is relevant, since not all the surveyed farms presented water bodies in or adjacent to the property. In Ocamonte, only 13 farms for each of the three groups presented water bodies, while in Socorro 20 farms for each surveyed group presented them. Lastly, the *Price premium* variable only shows the amount of money received by farmers at the time of sale, not the total price premium to receive. In fact, at least for the Organic and FLO certification, the price premium paid for the certification is transferred to the certified farmers in more than one trance, with different scope and timing depending on the certification programme. A specific analysis of this variable is carried out at 5.3.2.

[4] Data provided/Total respondents: Control 1 (13/20); FLO (13/20); Organic (10/20); Control 2 (8/30); RFA (27/30).

Tab. 5.1 Difference in environmental, social and economic conditions between certified and non-certified farmers (n=120). Dichotomous and continuous variables.

		Ocamonte			Socorro	
		Contr 1	**FLO**	**Organic**	**Contr 2**	**RFA**
		(n=20)	(n=20)	(n=20)	(n=30)	(n=30)
Environmental Impact	**Biodiversity**					
	Number of tree species	8	5	10	5	15
	Number of bird species+	8	10	11	9	18
	Wildlife protection					
	Number of households practicing hunting	3	0	4	5	0
	Number of households taking measures to protect wildlife	8	20	11	2	29
	Water conservation					
	Number of farmers protecting water bodies via live barriers*	4(13)	12(13)	10(13)	8(20)	20(20)
	Residual water: number of households					
	Applying no treatment	9	2	3	13	0
	Using septic well	11	18	17	17	30
	Using grease tramp	2	12	10	9	27
	Using water-saving technologies for depulping	3	5	4	5	18
	Soil conservation					
	Number of farmers using soil analysis	4	14	12	9	23
	Fertilization: number of farmers applying					
	Only synthetic fertilizers	6	6	0	24	13
	Only organic fertilizers	1	2	18	1	1
	Both synthetic and organic fertilizers	13	12	2	5	16
	Integrated pest management					
	Number of farmers using biological control (*Beauveria bassiana*)	6	13	7	14	22
	Rust management: number of farmers					
	Applying synthetic fungicide	5	6	0	7	2
	Renovating coffee plantation/shade	7	7	11	4	2
	Planting rust-resistant varieties	11	14	6	7	22
	Taking no action	5	2	9	17	6
	Weed management: number of farmers					
	Manually weeding	15	17	20	25	27
	Applying synthetic herbicide	4	4	0	9	4
	Waste management					
	Number of households recycling	11	14	16	13	30
	Number of households burning or burying trash	7	2	6	19	0
	Number of households collecting trash from the field	12	14	15	18	30
	Reforestation					
	Number of farmers planting trees outside the coffee plot	8	14	10	6	20
	Number of farms with areas of non-productive forest	8	10	9	8	23
	Shade management: number of farms growing					
	Rustic shade	13	3	11	6	0
	Traditional Polyculture	6	5	6	4	30
	Technified shade	1	12	3	20	0

Social Impact	**Record keeping**					
	Number of households keeping complete records of farm's activities	4	18	13	7	30
	Producers networks					
	Number of farmers belonging to organizations besides FNC	5	20	16	4	23
	Fair employment					
	Number of farmers respecting legal wages and work hours	7	16	11	17	28
	Number of farmers providing training to workers	9	18	16	8	28
	Number of farmers employing child labour	3	1	3	4	0
	Occupational Health					
	Number of households with safe water	15	19	16	24	30
	Number of households with sanitary facilities	10	18	16	25	29
	Number of households with first aid kit	4	18	13	11	29
	Number of households using protective equipment	9	17	12	16	29
	Number of households displaying danger signs	1	18	11	4	29
Economic Impact	**Productivity**					
	Number of *cargas* (125kg) of dry coffee sold per hectare	5	7.3	3.4	10.9	16
	Price					
	Average price paid for one *carga* (125kg) [COP thousands]	366	375	383	364	385
	Average premium paid for one *carga* (125kg) [COP thousands]	-	8**	80**	-	25
	Price information					
	Number of farmers accessing to price information					
	Only at the sale moment	7	6	10	12	3
	All-year long	13	14	10	18	27
	Role of coffee in household's economy					
	Number of household for whom coffee production is the only activity	3	9	5	17	19
	Access to credit					
	Number of farmers having access to credit	6	15	9	17	25
	Land intensification (in the last 3 years)					
	Number of farmers who renovated the coffee plantation by stumping	7	5	3	8	14
	Number of farmers who renovated the coffee plantation by new planting	13	14	6	13	25
	Land expansion (in the last 5 years)					
	Number of farmers that have expanded the coffee plantation	15	8	11	11	8

5.1 Environmental impact

The main environmental problems connected with coffee production are identifiable in deforestation and water pollution (Arce et al., 2009; Blackman and Naranjo, 2012). The most direct consequence of deforestation is a loss in biodiversity, both in terms of plant and animal species. A second consequence is the degradation of soil, due to higher levels of soil erosion. In the study area, although most of the native forest had been cleared out in previous decades, all the coffee is produced under shade, limiting the negative effects on soil erosion. The magnitude of biodiversity consequences though, are strictly dependant on the shade characteristics, since the canopy over the coffee plants can vary greatly depending on

individual farmer practices. Indeed agricultural practices are another determinant component of potential negative effect on the environment; suffice to consider activities as fertilization and pest management. Lastly, coffee producing activities and in general rural activities can shape environmental conditions in terms of the conduct of farmers on their farms regarding wildlife, waste management and reforestation efforts. All of the mentioned issues although depending from different causes have important reflection on the environment's health and thus are important to be monitored. In this part it will be analysed, variable by variable, how and to what extent certification programmes provide measurable environmental impact in the farms they are present in.

Before starting with the presentation of the results, it is important to remember that the present thesis is from a social science perspective, not biology or other specific environmental science, hence a balance was found between specificity and broadness of indicators, keeping in mind the limited time and resources. This is the reason why some variables are, either in themselves or because of the measurement methods used, better to be interpreted as proxy variables, reflecting the aim of trying to include measurable variable for the most important indicator of environmental condition.

5.1.1 Biodiversity

The indicator Biodiversity is the main ecological indicator present in this environmental impact assessment, compared to the other that are more focused on different management and agricultural practices. It is deemed important since it is presumable that while certifications can alter practices via their requirement and standards, they have a less direct impact on ecological indicators (Blackman and Naranjo, 2010).

To measure the impact of certifications on biodiversity the variables *Number of tree species* and *Number of bird species* were selected. The data was collected not via direct observation but relied on farmers' knowledge on the topic. For the number of tree species present in the coffee plot, all the surveyed farmers were able to respond with maximum accuracy, since trees provide vital shade for the coffee and are treated as an integral part of coffee production. The collection of data regarding the number of birds presented more difficulties, with only a part of the respondents able to give an accurate list of the bird species found in their coffee plantations. When farmers presented a partial or lack of knowledge on the topic, to avoid bias, data was not registered. Only a small share of the surveyed farmers maintains an accurate register of bird activities on their farm, with records regarding the season or the time of the day in which certain species can be found.

Several studies have been conducted on the relation between coffee produced under shade and biodiversity. Most of these studies highlight how shade coffee plantations function as a valuable refuge for biodiversity in agricultural landscape (Pineda et al., 2005; Philpott et al., 2007; Martinez-Sanchez, 2008; Cenicafé, 2008). The animals on which biodiversity studies of this kind focus on are mainly birds, followed by ants, frogs and arachnids. In general it is reported that extra layers added by shade trees composing a more complex composition of shade correspond to higher number of birds found in the coffee plot (Moguel

and Toledo, 1999; Martinez-Sanchez, 2008). These results corroborate the fact that structural complexity and diversity of forest habitats is closely related to diversity of other terrestrial species (Burton, 2003). Hence, within a certain degree, results on biodiversity in terms of tree and bird species, the most easily observable taxa, can be a valid as a general proxy of the overall impact of certifications on biodiversity.

FLO

Farmers certified with Fairtrade present significant low levels of biodiversity in terms of tree species, with only 5 tree species per farm compared to the 8 of the control group. Furthermore none of the surveyed farms presented more than 9 tree species, while 35% of farms in the control group present more than 10 tree species per farm. This reduced number of tree species is mainly due to the lack of requirement that the certification gives in terms of the shade system to use. Hence the majority of Fairtrade farmers shifted towards technified shade systems (5.1.7) that use few tree species, mostly *Inga edulis* (referred commonly as *guamo*). This specie is particularly suited for the production of coffee in the Santander region, requiring low levels of maintenance, attracting almost no pests attacking coffee and providing a stable source of firewood for house consumption. Ten per cent of the FLO farmers only employ this specie for their shade system. The negative biodiversity effect experienced in terms of trees species is not recorded for bird species, for which there are no significant differences between control and study group.

Organic

Organic certification has no significant impact on biodiversity. The variety recorded in organic farms in terms of number of tree and bird species are statistically similar to the one registered in the control group, presumably because of similar shade systems. It is important to signal that of the entire sample selected in Ocamonte, the highest number of tree species (21) and bird species (20) were found in two organic farms.

RFA

Rainforest Alliance has protection and preservation of the environment as one of the core principles. That is reflected in the certification requirements that farmers have to respect in terms of shade. In general, SAN standards for coffee production regulate tree species richness as well as tree height and per cent canopy cover. The local interpretation guidelines for Colombian coffee require a minimum number of 12 tree species in the coffee plantation. To avoid the detriment of productivity or household economic wellbeing, in Colombia is possible to account into the 12 tree species also fruit trees as citrus, avocado and banana (SAN, 2012). In Socorro, Rainforest certification is having a significantly strong impact on biodiversity. Compared with the control group, certified farms presents three times more tree species (15) and twice the number of bird species (18). Nonetheless, five farmers presented a number of tree species slightly lower than the one required by the certification, but still higher than the best one registered in the control group. The certified farm best performing in this indicator presents a staggering number of 33 different tree species and 42 bird species recorded, comprising also big birds as the great white heron, in only 2 hectares

of coffee plantation. The high share of certified farmers (90%) keeping a complete record of bird species also reflects a high level of awareness of the topic.

5.1.2 Wildlife protection

To measure the impact of certification on wildlife protection, the main focus was given to hunting practices. It was measured how many farmers practice hunting on their farm and how many actively discourage hunting of wildlife on their farms through apposite signaling and denouncing of forbidden practices to the competent authorities. Testimonies from several farmers of Ocamonte account how the wildlife richness decreased in the last decades, especially for arboreal and terrestrial mammals. In Socorro the situation regarding wildlife is slightly difference, with recorded presence even nowadays of different mammals as armadillos, opossums, porcupines and different species of squirrels. Threats to wildlife in the area come from two main sources: local farmers and poachers. Although farmers are decreasingly relying on wildlife hunting as a source of food, 16% of the non-certified farmers in the two study area practice hunting on their farms.

FLO

Although the generic Fairtrade standards for small producers' organization do not contain guidelines regarding hunting and wildlife protection, APCO's internal inspection checklist for certified farmers prohibits hunting. The strong approach of the association regarding wildlife produced significant results among certified farmers of Ocamonte. None of the surveyed farmer FLO practices hunting and all of them display on their farms signs forbidding hunting. The FLO certification hence has a significant positive impact on the indicator *Wildlife protection.*

Organic

The situation regarding organic certified farmers is different. A fifth of the surveyed farmers admitted practicing hunting, more than the control group although not significantly. In fact organic certification does not specify any standard regarding the environment not strictly connected with agricultural practices. There is no impact recorded also in regards of safeguard of the wildlife, with no significant difference in the number of farmers taking measures to protect animal from hunting practices between certified and non-certified groups.

RFA

SAN standards in regard to wildlife protection are extended with four related criteria going from monitoring of wildlife to protection of nesting place and including the categorical prohibition of hunting on certified farms. Certified farmers in Socorro follow these stringent rules, with a significant improve compared to non-certified both in terms of hunting, no one practicing it, and protection of wildlife, with 29 of the 30 farmers taking measures in regard.

5.1.3 Water conservation

As stated previously, water pollution is one of the main negative environmental outcomes of coffee production. Water contamination can happen in two different ways. Watercourses, particularly abundant in the research area, crossing or bordering coffee plots can receive intake of toxic agrochemical inputs, high levels of nitrate and phosphorus and in general particulate matter decreasing the water quality. A second and more harmful source of water pollution is the post-harvest wet processing of coffee. A research conducted by Cenicafé (1993) informs that the byproducts generated during the wet processing to obtain 125 kilos of dry parchment coffee produce the same water pollution equivalent to that produced by 1,000 people in one day through sanitation services.

Thus, to measure certifications' impact on water conservation it was asked to farmers whether they protect water bodies through live barriers and how they treated residual water from coffee berries processing. Three major methods are employed by smallholder farmers to reduce the water contamination during the coffee processing, but their effectiveness increase parallel to their investment cost. The basic method is the use of a septic tank to store residual waters, because through anaerobic processes developing in the tank wastes are decomposed or mineralized. The small scale sewage treatment system can be improved when septic tanks are coupled with a grease trap. Via the grease trap in fact is possible to collect most of the grease and solid waste substances present in water before going into the septic tank. A coffee processing system achieves the highest level of water conservation when it includes a demucilaging machine, a piece of machinery capable of remove the mucilage layer without the need of fermenting it into water. This machine reduces water use up to only 1 liter per kilo of dry parchment coffee, compared to the 20 required by the fermentation process. The main problem presented by the demucilaging machine is its high price, varying between 3 and 5 COP million.

All three certification standards contain rules on the management of residual waters. The main difference though is that only Rainforest standards have specific criteria for the coffee production, directed to limit the consequences of the wet process. Both FLO and organic present more general rules regarding the discharge of waste water, primarily intended as the one produced by domestic activities. Nonetheless, through APCO and FNC, farmers certified with the two programmes are motivated and supported both technically and financially to install suited methods for the discharge of residual waters.

FLO

The Fairtrade certification has a significantly positive impact on water conservation practices. Almost all the surveyed certified farmers are protecting water courses in their farms through live barriers. The concept of buffering zones created via live barriers is widely applied in FLO standards. Certified farms present live barriers also to separate the coffee plots, or other fields, from the house to avoid constant exposure of the living zones to agrochemicals.

In terms of residual waters management FLO certification also perform significantly better than the control group. 90% of the certified farmers present septic tanks on their farms compared to 50% of the non-certified ones. Only two farmers are releasing waste water from coffee processing directly in their fields, although they are both in the process of installing septic tanks in their farms before this year's harvest. Furthermore, 12 farmers have also grease traps and 5 possess the demucilaging machine. The presence of additional tools to manage waste water is somehow correlated to the coffee production capacity, with the farms producing the most coffee having the complete system (septic tank, grease trap and demucilaging machine).

Organic

The situation on organic farms is almost identical as the one found on FLO farms. Organic certification has overall significant positive impact on water conservation, both in terms of live barriers employed to protect natural water courses and of waste water treatment system.

RFA

Farmers in this group present really positive results in terms of water conservation, both in general and compared to the control group. All the surveyed farmers having water courses on their farms present live barriers made with diverse native plants, creating an effective barrier while enriching and stimulating biodiversity. All farmers use septic tank, sometimes more than one, and most of them employ also grease traps (27). More than half of the sample (60%) employs demucilaging machines for the processing of harvested coffee berries.

5.1.4 Soil conservation

To estimate the impact of certifications in terms of soil conservation the focus was centered on fertilization practices. An analysis of soil erosion was behind the scope of this assessment and would have required complicated sample selection methods, taking into account coffee plot slope and soil erosion propensity among others. One level of analysis focused on the type of fertilization applied: synthetic, organic or a mix of the two. The application of organic matter as fertilizer, even as a share of the total input, has several advantages: decreasing chemical fertilization requirements, soil quality improvement and increased soil pH. Furthermore organic fertilization cause positive effect in economic terms, with a registered increase in production quality and a reduction of the cost of production (Cenicafé, 2001). Apart from the type of fertilization used, it is also of major importance to provide soils with the right amount of nutrients to avoid imbalances in the soil and unnecessary expenses in terms of input. In this sense the best agricultural practice consist in a soil analysis performed on different soil samples from the same coffee plot. The FNC in Santander performs complete soil analysis in laboratories located in Bucaramanga for a subsidies price of 20,000 COP. Farmers in the research area are able to receive analysis results in less than a week after delivering the soil sample. The analysis results are always accompanied with technical advices on the amount and type of fertilization preferable to restore soil quality. Two researches conducted by Cenicafé

(1994 and 2003) show how applying the soil analysis' recommendation reduce the use of fertilizers up to 5 times compared to the usual farmers' habits, without significant difference in the productivity levels.

FLO

Fairtrade farmers usually rely on soil analysis to direct the type and amount of fertilizers to use on their coffee plots (70%). There is a significant difference in the adoption of this agricultural practice between certified and non-certified farmers. FLO certification has no significant impact in terms of type of fertilization used, since the number of farmers applying respectively organic, synthetic or both type of fertilizers are almost identical among study and control group. FLO standards prohibit only the use of specific chemicals, highly toxic, and in general agrochemicals are accepted as long as they are labelled, stored, and used as directed by the certification requirements. This is why most of the certified farmers use synthetic fertilizers (90%) either alone or mixed with organic matter.

Organic

Standards regulating the use of agricultural inputs are the core of organic certification. Farmers certified under this label cannot employ any kind of agrochemicals input, the minimum penalty being the exclusion from the programme for at least three years. The situation encountered in Ocamonte was peculiar. In fact from the survey it was recorded that two farmers included in the sample do not follow the strict requirement in terms of fertilization. Furthermore through the informal interviews and conversation individually had with organic farmers, more than in one occasion it was pointed out how some certified farmers use chemical input to boost their production, hiding the practice from the auditors.

Apart from this, organic certification has a clear and significant positive impact regarding soil conservation, with most of the sampled farmers coupling soil analysis with organic fertilization.

RFA

While in the control group from Ocamonte fertilization is principally achieved via a mix of synthetic and organic matter, in Socorro the use of only agrochemical fertilizers is a common practice performed by 80% of the control group. Rainforest standards encourage farmers to give priority to organic fertilization through the reuse of organic waste generated on the farm, without forbidding the use of synthetic fertilizers. This is the reason why the certification programme accomplish producing a significant overall shift of fertilization in certified farmers, with less than half of the sample (13) relying solely on chemical fertilizers. Among this group, many farmers still employ organic matter as source of nutrient, but the availability of organic waste produced on the farm are almost insignificant compared to the soil nutrient demand, hence it would not be correct to say that they use both organic and non-organic fertilizers.

Apart from the significant shift towards more sustainable fertilizers, RFA has also a positive impact on soil conservation through the number of farmers relying on soil analysis, 2.5 times higher than in the control group.

5.1.5 Integrated pest management

Three major pests are responsible for the most important damages caused to coffee production in Santander: the borer beetle, an insect, the leaf rust, a fungus, and weeds. Each of these pests has different impact on the coffee.

The borer beetle is a small insect attacking directly the coffee berry, building galleries inside the fruit to deposit its eggs. It is regarded as the most harmful pest related to coffee production (Jaramillo et al., 2006) and it causes two types of damage: the premature fall of young berries and qualitative and quantitative losses in coffee (Le Pelley, 1968). There are no recorded coffee varieties presenting immunity or resistance against this pest. The most used practices to prevent and control the insurgence of the borer beetles are cultural and biological. Cultural control, the practice of modifying the growing environment to reduce the prevalence of unwanted pests, is attained by collecting ripe and over-ripe fruits from the trees and floor during and after the harvest season[5]. Via this method, adult insects are removed from coffee plots, avoiding the chance of reproduction and infestation of new berries. The advantages of the ReRe method are the low cost connected to it and the high effectiveness in controlling the insurgence of the insect in the following harvest. Local FNC offices have been encouraging all coffee producers to adopt the practice of ReRe and among the 120 farmers surveyed for the research, all of them were applying this cultural control. In cases of attack of the beetle during the maturation of the coffee berries, the most effective and sustainable strategy to reduce the damages is biological control. In fact, there is a natural fungus called *Beauveria Bassiana* that naturally predates the borer beetle almost eradicating the insect population from infested coffee plants. It is harmless to human and can be easily applied on the most affected plants. In the study area, bags of Beauveria Bassiana are sold for low prices in FNC offices.

The leaf rust is a fungus attacking the leaves of coffee plants so violently that if not properly controlled can completely and irreversibly defoliate the whole tree. Solutions against the rust are cultural, genetic or chemical. A substantial part in the management of coffee rust is performing the set of recommended practices for the proper development of the coffee plant. Coffee plants density, pruning and shade management are factors that not only affect the development and production of coffee but can also affect the level of rust infection, greatly reducing it. The most effective way of rust management is planting rust resistant varieties (Colombia, Castillo and Tabi), that if matched with a proper cultural management of the pest, can completely free coffee plots from the presence of leaf rust. Lastly, another method to fight the rust is the application of the fungicide called chlorpyrifos. Although this fungicide is effective in controlling the infection, its disadvantages are the high cost and the moderate to high level of toxicity for both humans and the environment (NPIC, 2009).

[5] In Colombia this practice is referred to as ReRe (*repasar y recoger*).

Weeds represent a threat to coffee production since they are competing for nutrient and space with the coffee plants. To eradicate weeds from coffee plots farmers in the area employs manual methods - hoe, scythe, and machete - or using synthetic herbicides as glyphosate.

FLO

Regarding pest management, FLO certification has a significant positive impact only on the application of biological control for the borer beetle, with more than twice certified farmers (13) employing this strategy compared to the control group (7). Apart from having positive environmental consequences, it is clear how the widespread use of this practice helps certified farmer achieving better production both qualitatively and quantitatively, even if affected by the insect. As non-certified farmers, FLO farmers only sometimes employ synthetic products to protect their coffee plantations from leaf rust (6) and weeds (4). There are no significant differences in terms of cultural or genetic practices to reduce the incidence of coffee rust among the study and control group.

Organic

The situation presented by organic farmers is diametrically opposed. The use of biological control for the borer beetle is not significantly different, while organic farmers do not use any kind of synthetic product to eradicate rust or weeds. It is important to point out how organic farmers are the least prone to adopt rust resistant coffee varieties, only 6 farmers from the sample, and in general to take measures to fight the fungus (9).

RFA

Rainforest certification has no significant impact in reducing harmful herbicide use. The certification achieves increasing the use of effective and environmentally friendly methods to eradicate borer beetle and leaf rust: more than two thirds of the certified farmers employ biological control and had adopted the rust-resistant varieties of coffee

5.1.6 Waste management

The municipalities of Ocamonte and Socorro operate a system of waste collection and recycling in their rural areas. One day a week the non-organic waste is collected by small vans passing through the rural communities. Nonetheless the practice of burning or burying household and agricultural waste, most of the time close to houses or fields, is still widespread with harmful consequences for human and environmental health. The negative externalities of these practices are heighten when the waste are related to agrochemicals, mainly bags and containers, that can release highly toxic substances in the air or into the soil. Another common problem in coffee farms is represented by trash accumulating directly in the coffee fields, either as bags of input or waste produced by farmers or workers, as plastic bottles or food packaging.

FLO

Among FLO certified farmers environmentally friendly practices in waste management are widespread. 70% of the surveyed households recycle and collect trash from the field, in line with the control group attitudes.

FLO has a strong positive impact in reducing harmful practices, with only 2 certified farmers burying or burning their trash.

Organic

Organic standards does not regulate in any way negative and harmful practices related to waste management. For this reason, there are no significant differences among the certified and control farmers in terms of waste management, with 30% of organic farmers regularly burning or burying their trash.

RFA

On RFA certified farms there is a uniform use of only environmentally friendly practices for waste management. All the surveyed farmers actively recycle household waste and collect trash from the fields. In this group there is no record of burning or burying trash, although the interviewed farmers said that before the certification, it was a common practice on their farms. Overall, RFA have a strong and statistically significant positive impact on the indicator *Waste management*.

5.1.7 Reforestation

This indicator aims at evaluating the impact of certification programmes in terms of reforestation efforts. It was measured whether farmers are engaging in planting trees outside of their coffee plots, whether farms present a non-productive area with forest and the type of shade system employed.

For the analysis, three main types of shades were considered: rustic, traditional polyculture and technified. Fig 5.1 shows the differences in terms of height, density and trees varieties that can be usually found in coffee farms.

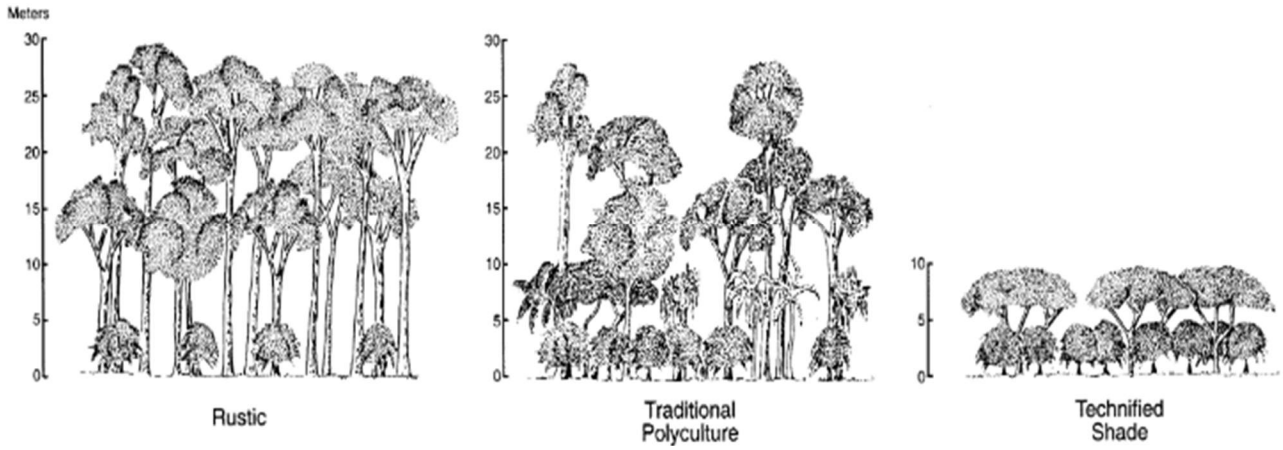


Fig. 5.1 Coffee shade systems according to shade gradient and compoition. Modified from Gobbi, 2000.

In rustic shade systems, coffee trees are planted in areas of existing forest preserving the original canopy more or less intact. This method hardly affects the composition and structure of the original forest, with minimal measures taken by farmers to prune and manage the shade above the coffee. The tree diversity depends on local characteristics and in the study area, rather than native forest, rustic shade is found in marginal areas of farms with sparse local vegetation. The rustic system is considered to be the less intensive one in terms of capital investment and managing practices, usually translating in low yields

(Moguel and Toledo, 1999; Gobbi, 2000). In traditional polyculture systems local forest is preserved alongside the introduction of beneficial plants for coffee production and other economically value tree species (e.g. citrus). This system hence presents a great diversity of tree species, both native and not, integrated in a managed way to provide the right amount of shade and organic matter for the coffee plants. Both rustic and traditional polyculture systems can be considered part of a reforestation effort, because although used for productive goals, they create an environment closely similar to the one present in natural forests. Technified shade systems are common to find in area where the original forest has been completely cleared out. In this system only few tree species are selected to provide shade for coffee and they are planted in the plot in a regular and technified way. The trees are mostly leguminous and are constantly pruned to provide the amount of shade capable of higher the yields. Under this system, coffee plantations have a highly organized appearance and the density of the shade trees is low with considerable gaps between them.

FLO

Fairtrade standards for smallholder producers' organizations refer to reforestation efforts only marginally, with a generic reference to it only twice. Not being a requirement or a specific goal for FLO, certified farmers have little if not negative effect on reforestation efforts in Ocamonte. In fact there is no significant difference with the control group in terms of number of farmers planting tree outside of the coffee plot and number of farms presenting an area of non-productive forest. Even though 14 farmers are planting trees in their farms, the main goal of this activity is selling timber to the sugar mills present in the Ocamonte area or using it for household activities. There is also a significant difference in the shade system used by FLO farmers, with 60% of them using technified shade compared to 65% of rustic shades of the control group.

Organic

Organic certification does not produce any significant impact regarding reforestation efforts. Organic farmers present the same characteristics of the control group in all three variables selected for the indicator. The high number of farmers using rustic shade systems (11) reflects the fact that most of the certified farmers have been practicing, even before entering in the programme, a low capital-intense form of coffee production.

RFA

As reported in the Biodiversity indicator, RFA farmers have a particularly diverse shade system. All of the surveyed farmers present traditional polyculture system, with a significant difference form the control group, mainly adopting technified shade systems (67%). Furthermore, in compliance with SAN recommendations, certified farmers are engaging in actively planting trees (20), creating or preserving areas of natural non-productive forest in 76% of the farms, compared to 26% found in the control group.

5.2 Social impact

To evaluate the social impact of certification programmes four indicators were selected. The first two are meant to measure if certifications enhance farmers' managerial and organizational skills (*Record keeping*) and if following being certified, farmers are better linked with the rest of their communities (*Producers organization*).

The other indicators are meant to assess the impact of certifications on the working conditions in the coffee farms of the study area. Working conditions regard the farmers and their families as well as seasonal or daily workers employed during the harvest. In the area there is an oversupply of labour composed by internal migrant, and smallholder farmers in search of income sources to couple with their coffee production. Thus producers in some cases tend to pay wages as low as possible without providing proper working or health conditions to their workers. Due to only sporadic controls made by authorities, practices as child labour or wages under the legal minimum are not uncommon. Suffice to say that among non-certified farmers in Ocamonte and Socorro, 52% do not guarantee the minimum legal wage or respect limitations on working hours and 14% employ minors in their farms.

The three certifications differ in term of standards and requirement for these indicators. All of them require record keeping of in farm activities related to coffee production. Only FLO specifically requires to farmers to join a producers' organization. While organic certification does not include labor standards, FLO and RFA set standards regarding both working conditions and occupational health.

5.2.1 Record keeping

The practice of record keeping in farm activities bring along several benefits for farmers who employ it. Keeping track of all the costs and revenues connected to productive activities is the first step towards a profitable production. Furthermore, good record keeping is a fundamental tool for decision making, such as projecting sales and purchases, determining breakeven points, and making other financial analyses. Coffee producers exposed to the high volatility of the international market should always know above which price they will be able to profit, and behave consequently in case of low prices. Furthermore, having a complete administrative record of assets and activities is a fundamental requisite to have access to credits via financial institutions. In general, record keeping is the first important step towards enhancing farmers' business management skills. Apart from lack of an entrepreneurial culture and mind-set, illiteracy or low education level pose a serious obstacle in terms of record keeping. In rural settings the practice of record keeping is seldom practiced, as confirmed by data from the research are. More than 75% of non-certified farmers do not keep any record of their activities, making them completely unaware of basic economic considerations such as if in the last season they were able to make a profit out of their coffee plantations.

Results

Organic certification has a significant positive impact in record keeping practices. All farmers keep a basic record involving costs and revenues of their activities and a summary of the assets they own. More than half of them (13) have complete and update record containing detailed maps of the farm, list of hired workers, amount of organic fertilizers produced on farm and sales receipt of at least the last three years.

Fairtrade certification has an even more positive impact compared to organic, with 90% of certified farms keeping complete account of farm activities. All farmers are provided by a special notebook containing different printed form to fill with all kind of information related to the farm. This product was prepared by APCO with the support of the local FNC office and FLO inspectors to facilitate farmers in their activities.

All the thirty Rainforest farmers surveyed presented a complete record of farm's activities, including also environmental aspects as a list of all the wildlife present on the farm, the number of tree species in the coffee plot and a detailed map of the different environment of the farm.

5.2.2 Producers network

Social network is an important asset for smallholder farmers all over the developing world. Producers' organizations in rural areas are important tools for farmers to achieve different goals. They can lower transaction costs, improve market access, and decrease costs for smallholder farmers by offsetting diseconomies of scale (Hill et al., 2008). Furthermore they can be an important occasion to share agricultural knowledge, seek support - either technical or financial-, attend to training courses and in general participate more actively to the life of the community. . In the area of the study, apart from the FNC, the biggest producers' organization in Colombia, and the already mentioned APCO (the organization of the FLO farmers) there are several other producers' organization with different aims as collective purchases of agricultural input, the protection and conservation of natural resources of the community, and contribute to the development of the local economy.

Results

In Ocamonte certifications have significant positive impact in improving farmers' participation to organizations. If only 20% of the control group belong to an organization, 100% of FLO farmers and 80% of organic farmers are part of an organization. This result is strictly related with the presence in the area of a solid and large organization, APCO. Apart from FLO farmers, the organization includes also organic and non-certified farmers to foster economic and social development in the community, as recommended by FLO guidelines. In Socorro the share of non-certified farmers belonging to an association is 13% while more than three-fourths of RFA farmers participate in a producers' organization.

5.2.3 Fair employment

Three variables were taken into consideration for this indicator. Farmers were asked about work conditions during harvest time in the farm regarding working hours and wage. The law in Colombia regulates both

aspects through the *Codigo laboral* (Labour Code), promulgated in 1990, and Act 3068/2013. Art. 161 of the Labour Code states that the maximum legal working hours per day are 8, and per week 48. Furthermore, it is forbidden to perform more than 2 extra hours of work per day and 12 per week. The Labour Code regulate also the modality of payment for minimum salary stating that not more than 30% of the total amount can be paid through in kind transfer, corresponding to food, housing or clothing provided by the employer to the employee or his family. Act 3068/2013 provide disposition for the minimum wage for the year 2013: the minimum salary corresponds to 20,533 COP per day. Following the directives of the Labour Code, 6,160 COP of wage can be paid in kind, but the remaining 14,373 COP must be paid in cash. In the study area providing lunch to the workers is a universal custom, so the measurement of the variable was based on the minimum wage of 14,000 COP. Secondly, the farmers were asked whether they were giving some kind of training to their family members and hired workers. Training usually focuses on first aid, use of safety equipment and general environmentally friendly agricultural practices. The last variable measured the use of minor labour in the farm. Work performed by household's minors were not considered minor labour only in case it did not exceed the two hours per day involving safe and light work and the minor was regularly attending school. It is really important for farmers' sons to participate in some work on the farm to learn the job following the steps of their parents.

FLO

Fairtrade certification has a significant positive impact for what concerns working conditions (wage and hours) and training provision to workers. Though, contrary to the stringent requirement, there are some farmers (4) paying less than the minimum wage and not respecting legal working hours. This happens because workers are paid not per hour but per kilos of coffee berries collected during the day. With one farmer confirming to employ minor labour on its fields, FLO certification does not have a significant impact on prohibiting minor labour.

Organic

The only statistically significant impact that organic certification has on practices of fair employment is the provision of training to workers, with 16 farmers doing it. There are three certified farmers using child labour, as much as the control group. Almost half of the group (45%) does not comply with working conditions stated by law. The biggest problem concern working hours, with organic farmers employing workers for more than 10 hours per day, sometime even 12.

RFA

Rainforest certification has a significant positive impact on all the three variables of the indicator Fair employment. No certified farmer employs minors and a high share (90%) respects the minimum wage and maximum working hours, and train seasonal workers. Furthermore, SAN standards referring to training for workers are stringent enough to create another positive effect. In fact since certified farmers have to

provide training on several different topics, they are more incentivized to contract the same workers through all the harvest due to the time they invested in training.

5.2.4 Occupational health

The provision of safe water and sanitation service are important to achieve basic occupational health. In rural areas of Colombia the coverage of water supply and sanitation services is particularly low if compared to the general economic level of the country, with only 72% having access to safe water and 63% to adequate sanitation (SSPD, 2007). Safe water is defined as water that can be consumed without risk for human health. Because of the diverse number of injuries that can occur working on coffee plantation, the presence of first aid kit and sign signaling dangers were considered as variable for indicators. Lastly, the presence and proper storage of safety equipment to perform hazardous work were surveyed.

FLO and Organic

As seen on the right, among non-certified farmers in Ocamonte only 50% has sanitation service and 75% safe water. Among farmers of the control group, other safety measures are seldom taken: only 5% shows danger signs, 20% has and can operate first aid kit and less than half (45%) regularly use safety equipment. Organic certification has a significant positive effect only regarding display of danger signs and presence of first aid kit. FLO certification achieve good occupational health practices in almost all the certified farms, producing statistically significant positive impact in *Sanitation services*, *Safety equipment*, *Danger signs*, and *First aid kit*.

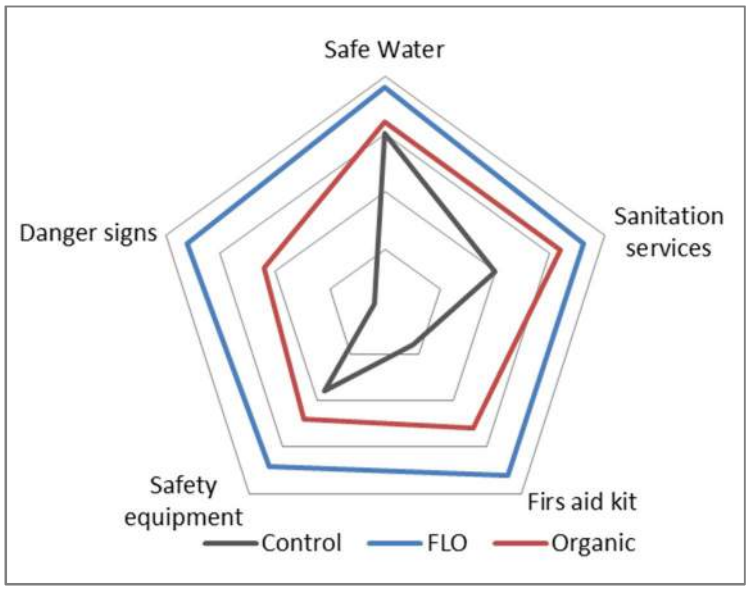


Fig. 5.2: Occupational health in Ocamonte

RFA

In Socorro there is a higher provision of safe water and sanitation services compared to Ocamonte with high percentages even among non-certified farmers (80% and 83% respectively). Rainforest certified farmers score particularly well on this indicator with at least more than 95% of the surveyed sample presenting all the five components.

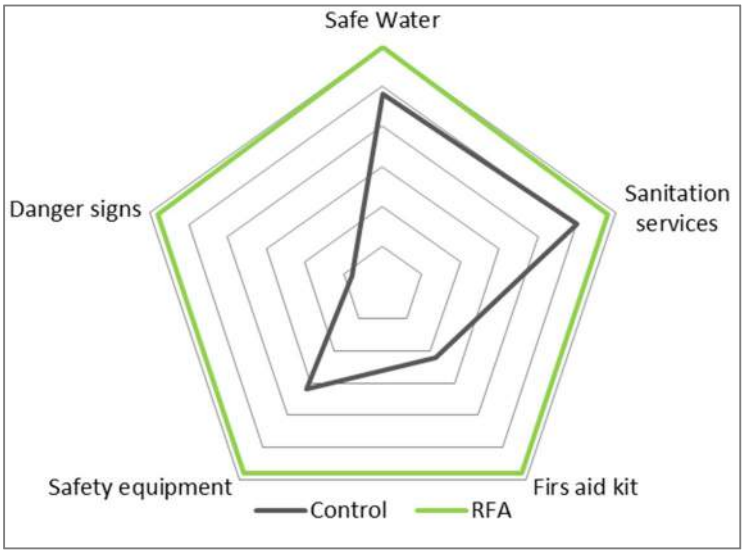


Fig. 5.3: Occupational health in Socorro

5.3 Economic impact

5.3.1 Productivity

Due to the timing of the research, it was not possible to measure farmers' productivity by directing sampling the harvest. The amount of dry parchment coffee sold for the season 2013 was used as a proxy for productivity, to have reliable data since all farmers know with precision this amount. Usually the conversion ratio between harvested coffee berries and dried parchment coffee is 5:1, although it is probable that among the sample selected the ratio may vary widely. Hence, measurements of productivity account for the outcome of both agricultural practices and coffee processing operations. The unit of measurement selected for this indicator is number of 125kgs bags (*cargas*) of parchment coffee sold per productive hectare. As previously explained, the results show the average productivity among same group, and a t-test was conducted to test difference between groups.

Ocamonte

The average productivity of non-certified farmers in the Ocamonte municipality is 5.2 bags/ha, lower than the national average of 7 bags/ha in the same year (FNC, 2014).

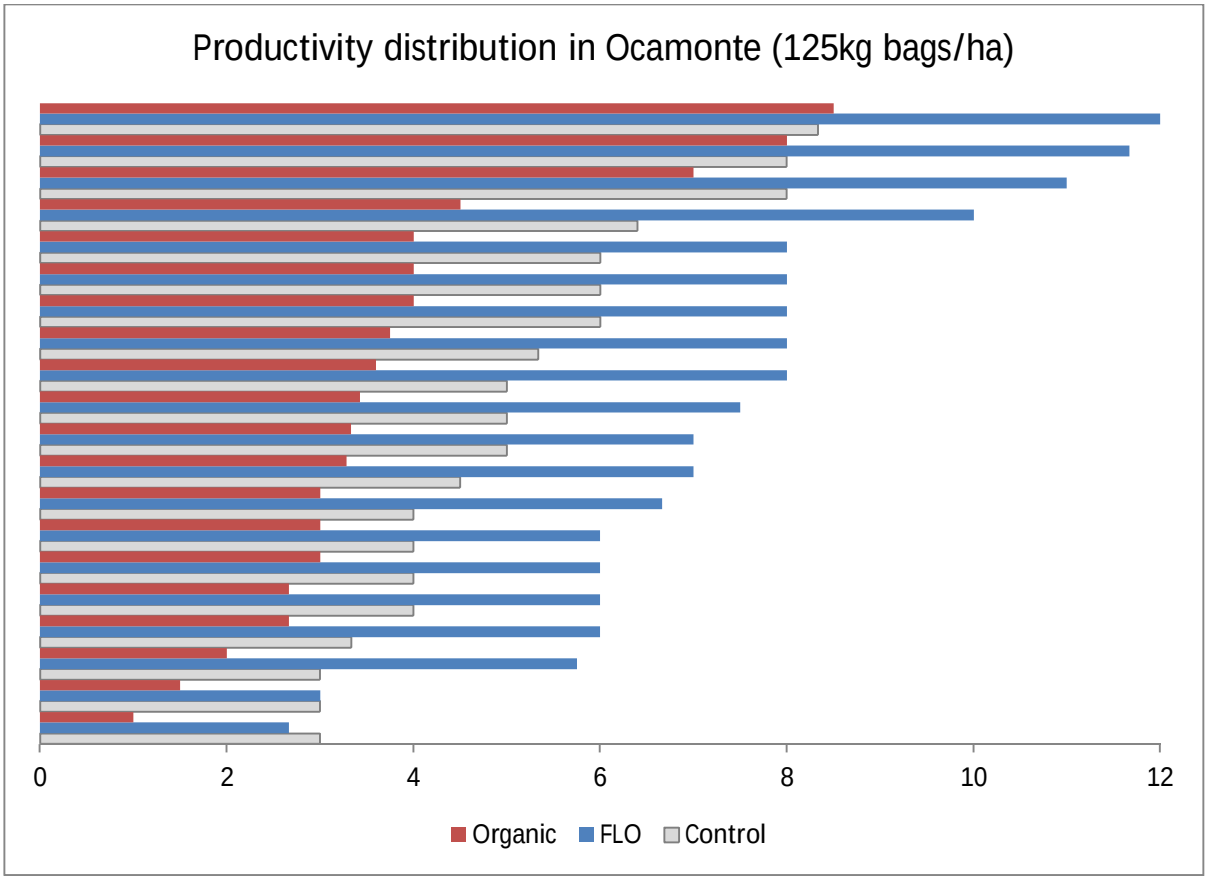


Fig. 5.4 Distribution of productivity levels achieved by farmers in Ocamonte

Organic certification has a significant negative impact on productivity, with farmers recording an average productivity of 3.4 bags/ha. Individual productivity levels are also significantly low, with 80% of organic farmers achieving producing 4 or less bags of parchment coffee per hectare. Economic wellbeing of organic

farmers is then particularly dependent by coffee prices and the premium price, due to the low production. FLO farmers achieve productivity levels significantly higher than the control group. The average among Fairtrade certified farmers is 7.3 bags/ha. Good productivity is also reflected in the fact that 60% of FLO farmers are at least productive as the national average.

Socorro

In the area of Socorro, coffee farmers achieve high level of productivity. The control group of non-certified farmers registered for 2013 an average productivity of 10.9 bags/ha, significantly over the national average. Rainforest certification has a significantly positive impact on productivity, regardless the already high levels registered in the area. RFA famers recorded an average productivity of 16 bags per hectare. It is also interesting to highlight how a third of the certified producers reach the productivity level that FNC set as a national long term goal in 2002 (20 bags/ha).

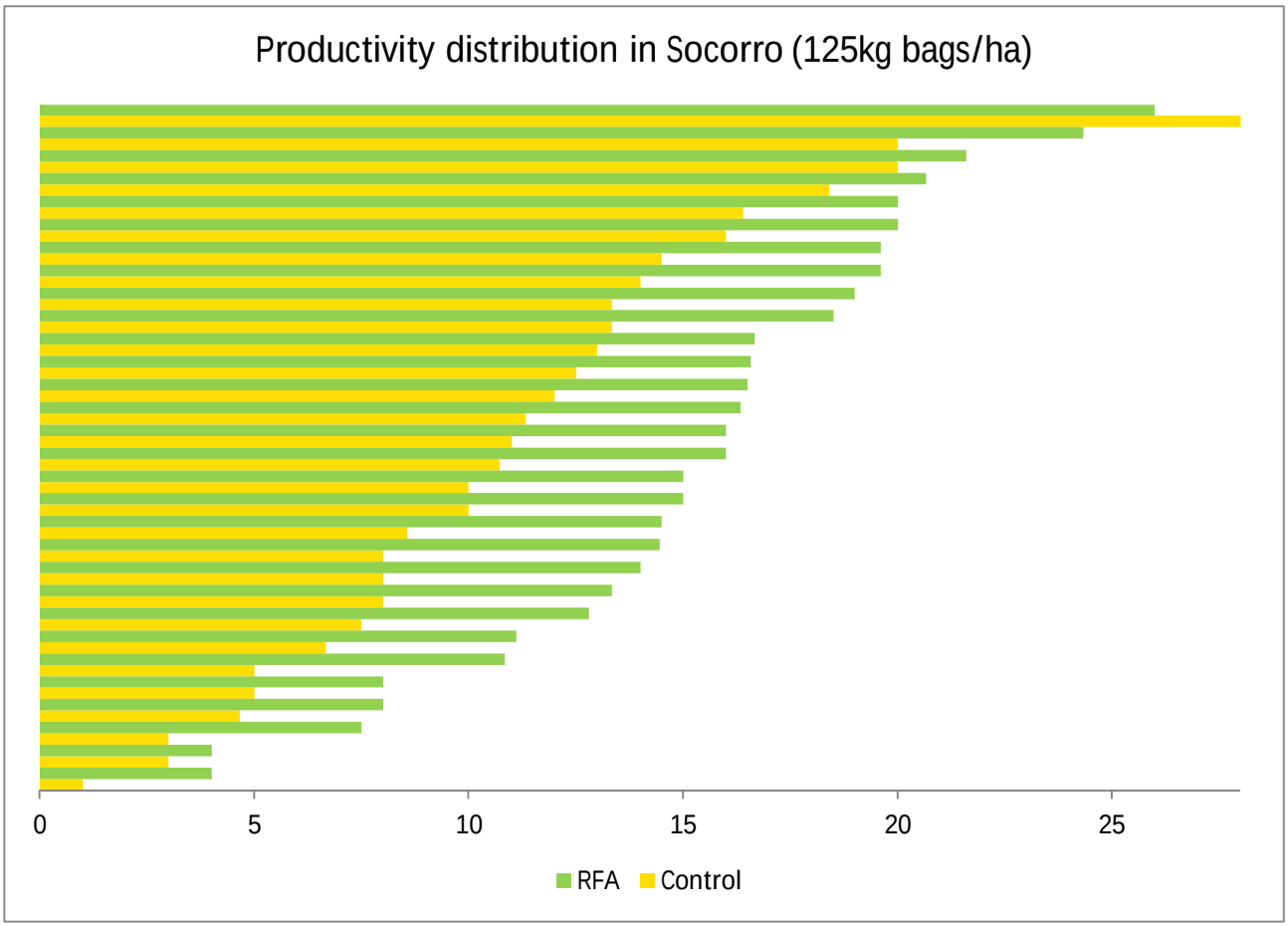


Fig. 5.5 Distribution of productivity levels achieved by farmers in Socorro

5.3.2 Price

Prices during and after the harvest of last productive season (2013/2014) registered a particularly low level (Fig. 1.2) dropping almost threefold compared to the previous two years. If in the season 2011/2012 farmers were on average able to sell one carga for more than a million COP, last year the average price received by the 120 farmers surveyed was 375,000 COP. Certifications have no significant impact on base

prices paid to farmers, especially because trader refers to international prices, with only minimal variations depending on product quality.

Before discussing price premium for the three certifications is important to make a clarification. Fairtrade farmers are entitled to receive the minimum price set as standard by FLO requirements, higher than the base price of last season. Interviewed certified farmers though, when asked about the price they received did not mention FLO minimum guaranteed price. The reason is that APCO collects the difference between price paid to individual farmers and minimum guaranteed price and uses it to promote social and economic development of its members through several projects, as required by the certification.

Each certification has a different price premium paid to adherent farmers. Organic is the programme paying the highest premium to certified farmers. The premium is divided into two tranches; the first is paid directly at the moment of the sale equals 80,000 COP, the second is paid after six months and corresponding to 70,000 COP. In years with low prices organic price premium, usually high, represents a really important income source for farmers. Last year the price premium represented 40% of the base price, increasing the price received by certified farmers to a total of 525,000 on average. High price premiums for organic certification are due to the high demand of organic coffee internationally and are a way to repay farmers that have to follow the strict requirements in terms of agricultural practices. Also FLO premium is divided in two tranches in the study area, with farmers receiving 8,000 COP at the sale moment and other 92,000 COP once the organization sell all the labelled coffee of its members[6]. As previously stated, the total amount of the FLO premium is fixed by Fairtrade International and does not depend on market dynamics. RFA certified farmers instead receive their entire premium directly at the sale moment. For the last season the amount was 25,000 COP, the lowest premium compared to other two certifications. RFA premium is not guaranteed but is influenced by coffee quality and international demand for sustainable shade coffee.

5.3.3 Price information

Access to price information can present a valid tool for decision making in a volatile market as the coffee one. Although farmers are bound to sell the coffee after no more than three weeks from its harvest because of decrease in bean quality and loss of production, being alert on the international market can help receiving higher prices. In Ocamonte there is no significant impact created by certification on price awareness, with little less than half of the surveyed population not caring about price information. Rainforest has a significantly positive effect on the subject, with 90% of certified farmers constantly following international price fluctuations.

5.3.4 Role of coffee in household's economy

To evaluate the importance of coffee for the economic wellbeing in the area, farmers were asked how much of their income came from its production. Data was collected also on other activities farmers

[6] In case the organization does not manage to sell all the coffee as certified, price premium can be sensibly lower.

undertake in case coffee was not the only source of income. Results in terms of farmers' activities diversification strategies are discussed in Ch. 5.4.1.

Socorro and Ocamonte present different situation in terms of this indicator. In Socorro coffee is the only source of income for 60% of the sample (both non and certified farmers), and in general is contributing to at least three fourth of the household income. In this regard Rainforest certification has no significant impact, with control and study group presenting similar situations. High levels of specialization are not found in Ocamonte. Coffee represents the only source of income for 28% of the entire sample, and for more than 43% of surveyed farmers coffee represents half or less of their total income. Indubitably the big difference between Socorro and Ocamonte in terms of coffee specialization can partially be explained by the different average productivity achieved in the two municipalities. Organic certification does not have significant impact on coffee specialization, while Fairtrade significantly improve the number of farmers for whom coffee is the only source of income (45%).

5.3.5 Access to credit

For smallholder farmers access to credit is an important tool to guarantee and improve economic wellbeing. Credit can be the key to invest in important improvements or assets for the farm capable of increase productivity or product quality. Furthermore credit can represent a safety net for farmers during seasons of exceptionally low prices, guaranteeing the possibility to buy the desirable amount of input without hindering the subsequent season's production. Smallholder coffee producers in Colombia mainly use credits to either renovate their coffee plantations with new trees (see 5.3.6) or to expand their activities with new machinery or better processing infrastructures for their farms. Some obstacles to credit access are represented by: the lack of administrative records on the farm, the difficulty with documents and papers for low educated farmers and the old age, since many credit institutions in the country do not provide credit to individual over 70 years of age.

Entering in a certification programme can help farmers receiving credits due to improved record keeping, and sometimes financed investments are required to accomplish with certification's requirements. This is confirmed by results on this indicator, showing how all three certifications have significant impact in access to credit for expansion and upgrading farm infrastructures.

5.3.6 Land intensification

Renovation of coffee plantations is an important agricultural practice bearing economic consequences. A coffee plant is transplanted to the field six months after the germination and can already produce berries the first year. Plant productivity constantly increases up to reaching highest productive capacity around the sixth and seventh year. Afterwards, the production decline up to the eleventh year, when the plant keep a steady level of low production – approximately a fourth of its maximum production level. Hence constantly renovating the plots planted with old trees is a key factor to keep high levels of productivity. Renovation

can be done either via stumping or via planting new coffee plants. Renovating by stumping is less expensive and produces as byproduct a substantial amount of firewood, considering that a plot of one hectare usually hosts 5,000 coffee trees. In this way, the same plant can produce for more than 15 years without having to replace with a new one. Another practice used to renovate consist in planting new trees. This method, although more expensive and labour intensive allow farmers to plant different varieties more resistant to pests and more productive compared to the old one. FNC Extension technicians encourage farmers to renovate after the ninth or the tenth year to maintain high level of productivity.

In Ocamonte, FLO does not have a significant impact on land intensification, with equal number of producers renovating by stumping and replacement compared to the control group. Organic certification though seems to have a negative impact on land intensification with only 35% of certified farmers renovating their plantation in the last 3 years, compared to the 85% of the control group. In Socorro, Rainforest has a significant positive effect on this indicator, with almost all the farmers (26) engaging in renovation processes compared to little more than half of the control group (18).

Considering the importance of renovating the coffee plantation in regards to productivity levels, it is not surprising that RFA farmers have higher level of productivity and that organic farmers record the lower level of productivity.

5.3.7 Land expansion

The last indicator measuring the economic impact of certifications is the expansion of land dedicated to coffee in the last five years. In all the surveyed groups, farmers have engaged in coffee land expansion in the last 5 years. One of the main reasons is the occurrence of periods of high prices. In fact high coffee prices have a double effect. From one side, coffee production is more profitable with higher prices, giving the economic incentive to farmers to expand its production at expanses of area of the farm dedicated to other activities (other crops or pasture). Furthermore, one or two season characterized by high prices can provide farmers with the adequate resources to transform non-productive areas of their farms into coffee plantation. An analysis of the source of land used to expand coffee is presented at 5.4.2.

Although compared to the respective control groups less certified farmers have expanded their coffee land, only for FLO certification the difference is significant.

5.4 Farmers strategies

The present paragraph presents the effect that certifications have on farmers' strategies. Three areas were considered to evaluate the changing approaches of coffee producers: diversification of income generating activities, source of land used to expand coffee production and strategies for the future years. Through the analysis of these topics it will be possible to shed further light on the role and impact certifications have on the life of farmers.

5.4.1 Activities diversification

Farmers in the research area frequently engage in multiple activities, apart from coffee production, as a mean to increase their income sources. This diversification is dictated by two main and opposite reasons. From one side there are agricultural activities as the production of crops - in the area mainly maize, sugar cane and fruit trees - or livestock - cattle, pigs, chickens and rabbits - that represent agricultural diversification seen as opportunities to achieve economic returns from different value-added agricultural products. Through this first kind of diversification farmers do not have to depend on the seasonality of costs and revenues dictated by coffee production and can achieve steadier cash flows throughout the year. On the other hand, diversifying income generating activities can also be a response to threats. Fluctuations of coffee prices in fact can cause one or several consecutive seasons of economic losses, forcing farmers to find income sources out of their farms to compensate. The main source of off-farm income consists in day labour in other farms, usually of medium or large size, of the municipality. Here farmers have to work all day long for a salary equal to the legal minimum or lower, that in turn they will have to pay to other workers in order to not lose their harvest. Daily labour is mostly practiced in sugar cane farms, since sugar cane is a crop cultivated all year round with continuous harvest periods. The main negative consequence of daily labour is keeping coffee producers away from their fields, reducing the care and attention dedicated to coffee plantations.

It is important to keep in mind that is not uncommon for the same farmers to perform more than one of the activities previously listed in the same year; hence the sum of percentages per group in Fig. 5.6 and 5.7 can be higher than 100%.

Ocamonte

In Ocamonte an elevated number of coffee producers engage in diversified activities (Fig. 5.6). Non certified farmers present almost equal levels of diversification generated by opportunities and threats, with the latter being slightly more important. Fairtrade has a positive effect, with higher share of farmers diversifying activities in order to increase their opportunities. 35% of the FLO farmers engage in crop

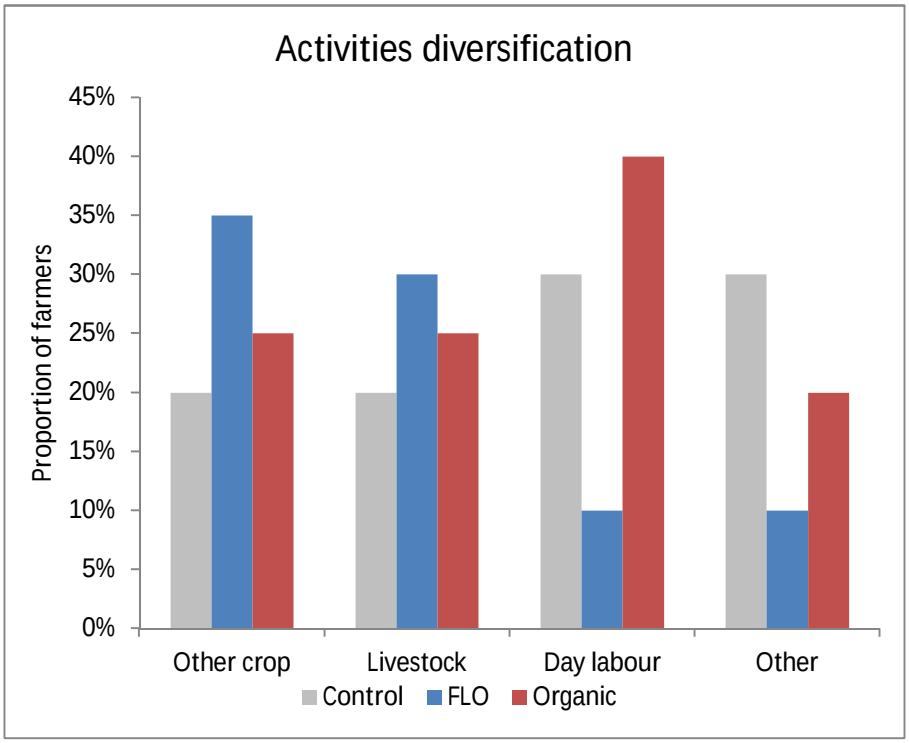


Fig. 5.6: Activities diversification in Ocamonte

production sometimes even in larger areas than coffee. Production of both wide ranging animals and animals requiring limited space as chicken is also a common practice, depending on land availability.

Organic farmers instead present a different situation. Up to 40% of them in fact have to perform day labour to achieve acceptable levels of income to sustain their family. Furthermore 20% of the sample performs other activities such as public transportation driver, bricklayer or sugar mill worker. Keeping into account the averagely low level of productivity achieved by organic farmers it is clear that for most of them diversification is dictated by vulnerabilities.

Socorro

In Socorro coffee production is the main and only activity for most of the rural households. In general livestock is not a common activity, due to the area landscape with only few patches of lands completely cleared of vegetation for pasture. Among non-certified farmers, same proportions of farmers are developing opportunity and threat driven activities. From the results gathered, it is clear how Rainforest certification succeed in reducing certified farmers' financial vulnerability. In fact no RFA farmer engages in low paid activities as day labour in other farms. The interesting aspect is that reduced financial vulnerability is not achieved through a high price premium or an established minimum price, rather by the implementation of environmentally sound agricultural practices able to increase yields.

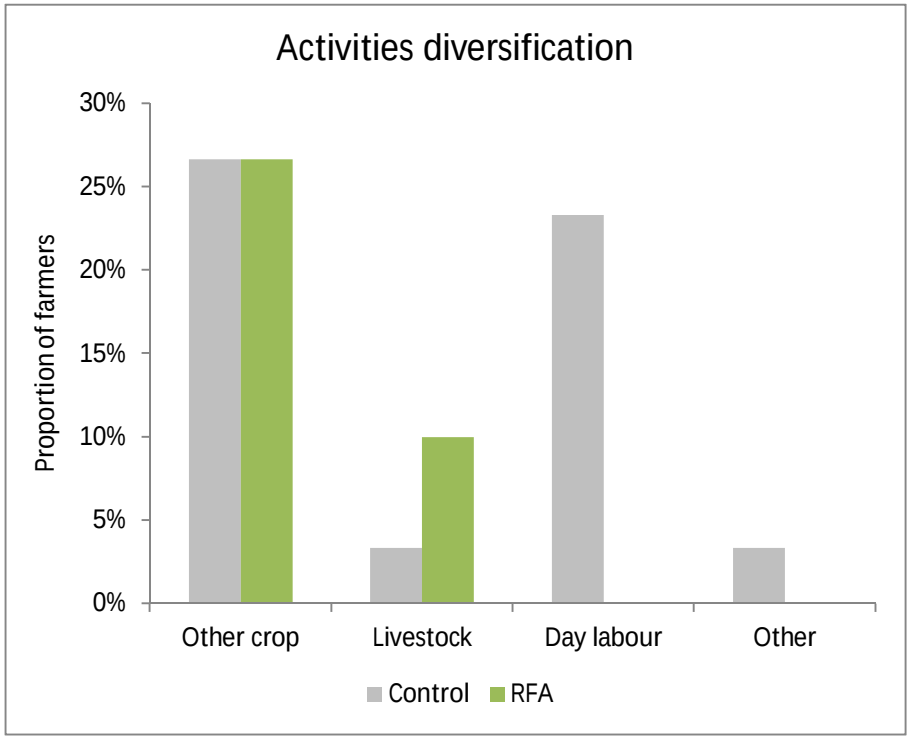


Fig. 5.7: Activities diversification in Socorro

5.4.2 Land expansion

As previously discussed several farmers have expanded the amount of land devoted to coffee in the last five years. Interestingly, throughout the same period no farmer decided to reduce it. Several factors can account in the decision making process of expanding the land, although only two have been predominant and transversally important in the research area. In fact the rise of coffee prices in the biennium 2011-2013 traduced in higher coffee profitability and in an increase availability of financial resources to convert nonproductive areas.

A note, percentages as shown in Fig. 5.8 and 5.9 refers only to farmers that have expanded coffee land; hence the sum of percentages per group equals 100%.

Ocamonte

The results from Ocamonte confirm the previously presented trends. Fig. 5.8 shows how high prices in coffee led the majority of farmers to expand coffee plantation at the expenses of other agricultural activities as production of other crops or livestock (pasture). Effect on financial resources availability was weaker, with a smaller share of farmers converting fallow lands or forest into coffee production. In Ocamonte coffee production confirms to be an important cause of deforestation, with 20% of the farmer expanding coffee at the expenses of natural forest. In general, the source of land used to expand coffee was almost the same for FLO certified and noncertified farmers. Organic farmers instead had a stronger impact on deforestation, with 36% of farmers using natural forest as land source.

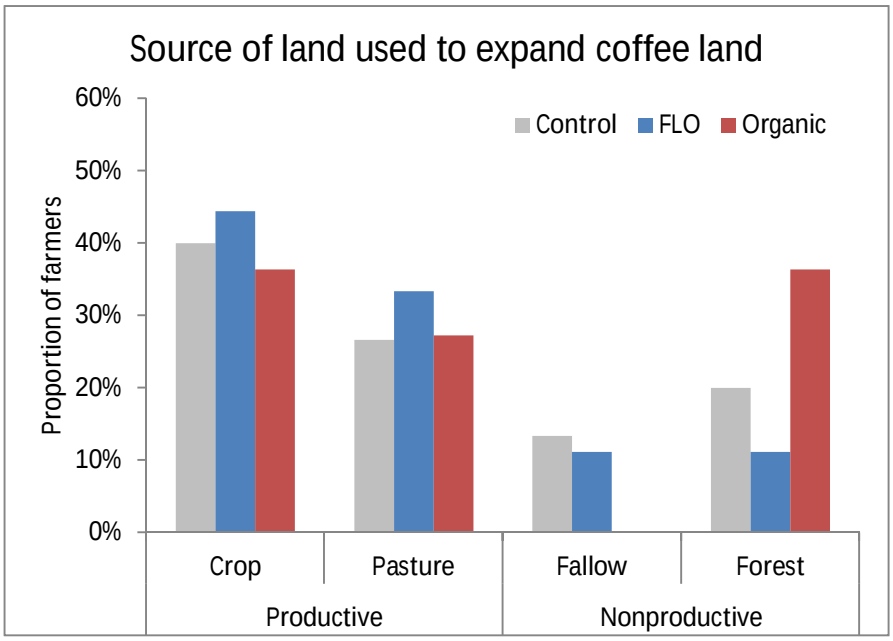


Fig. 5.8: Land cover replaced by certified and noncertified farmers to expand coffee cultivation in Ocamonte

Socorro

In Socorro the situation between control group and Rainforest farmers is sensibly different. In fact, non-certified farmers expanded coffee land more towards nonproductive areas of their farms (64%) while certified farms registered a change in the structure of agricultural production, with 75% of them reallocating productive land towards coffee.

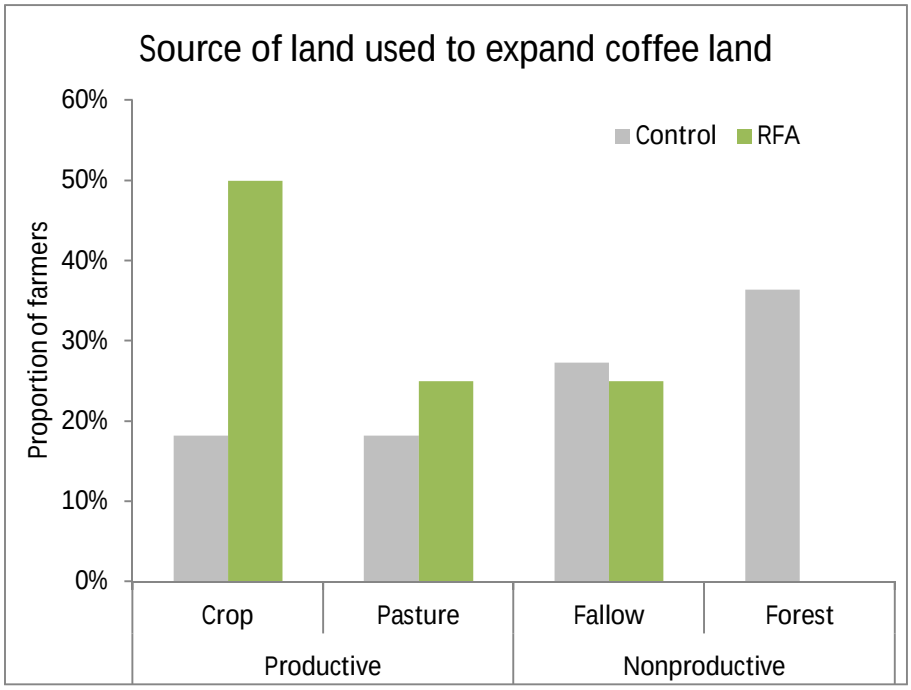


Fig. 5.9: Land cover replaced by certified and noncertified farmers to expand coffee cultivation in Socorro

Also in Socorro 20% of the farmer expanded coffee at the expenses of natural forest, but all of are part of the control group. It is prohibited by SAN standards to expand agricultural activities by clearing natural vegetation, with the important result that Rainforest certification has a positive and significant impact on not only fostering reforestation but also avoiding deforestation.

5.4.3 Strategies for the future

In an attempt to forecast future behavior of coffee producers of the study area, two hypothetical scenarios were presented to coffee producers. In the first one, farmers were asked how they would react to a period of two consecutive years of high coffee prices. In the second one, farmers were asked how they would react to a period of two consecutive years of low coffee prices. Given the high volatility of prices, is equally probable that one of the two scenarios would actually come true in the next years. Through this exercise it was possible to assess whether certification programmes have the power to shape not only current practices but also the way farmers react in the future to external factors.

5.4.3.1 High coffee prices

For this scenario, high coffee prices were defined as two consecutive years of coffee prices above 900,000 COP. This price levels were actually registered only two years ago. Results are shown in the Figure below.

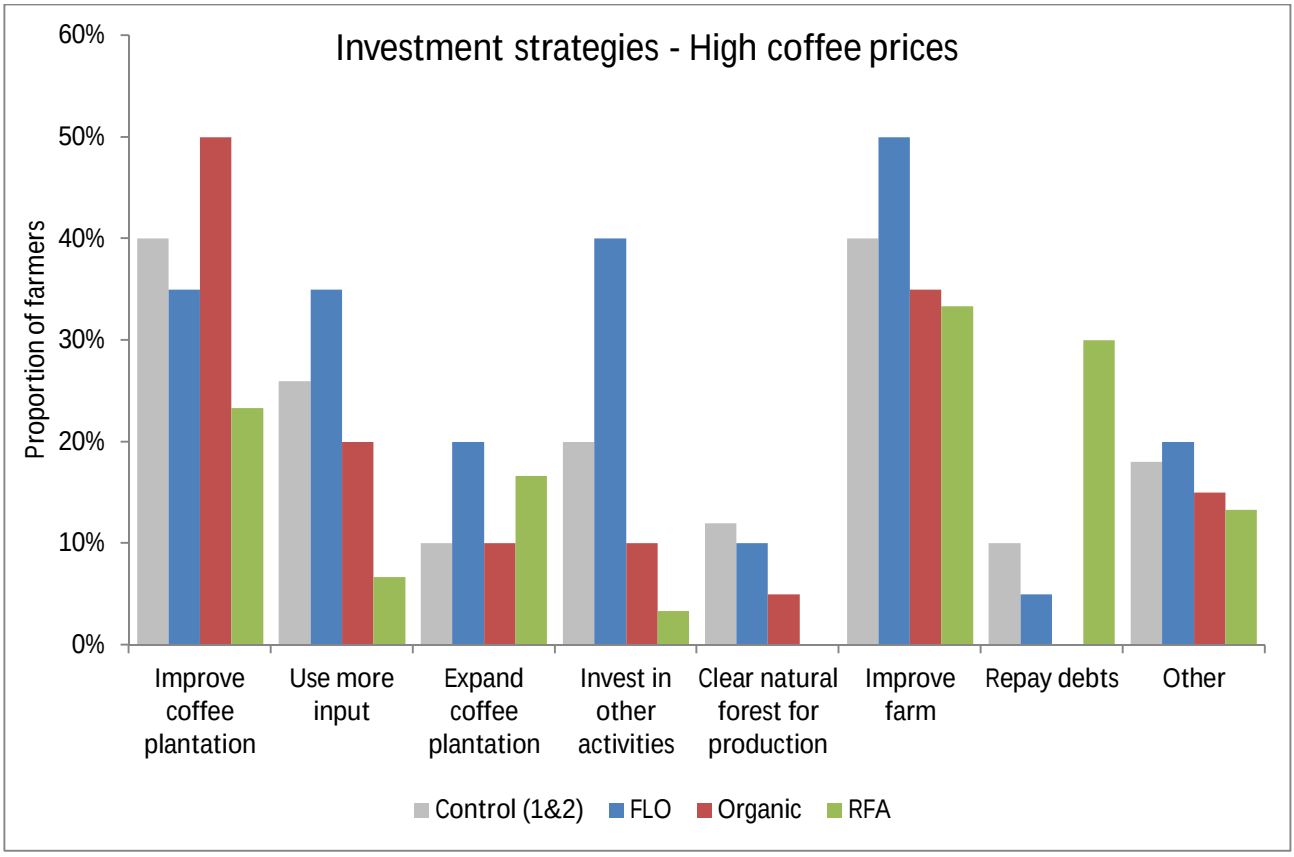


Fig. 5.10: Farmers' strategies in case of two consecutive years of high coffee prices (above 900,000 COP per 125kg bag).

Non certified farmers identify as the most important strategies in case of increased income generated by coffee production the general improvement of their farms and coffee plantations. 40% of the group would invest in improving farm assets, defined as both productive machineries and living areas. Non-certified

farmers feel that investing in farm's equipment and machinery would be the key to sustain higher revenues in a long term perspective, even in case of decreasing prices. On the other hand, many farmers expressed the strong desire of improving the quality of their lives via improving nonproductive infrastructures of their farms, as kitchen or sanitation services. Furthermore 26% of the farmers in the control groups would invest more in input purchases, feeling that using more input will higher the production in the short-medium term.

Organic

Organic farmers' strategies are the most closely similar to the control group. The top three choices of investment are the same of noncertified farmers, although their ranking is slightly different. In fact 50% of the farmers identify as a priority the improvement of their coffee plantation. More specifically the changes would involve extensive renovation of old coffee plants, better and integrated management of the shade system and more attention dedicated to the preparation and application of fertilization. For the rest, there are no significant differences with the control group.

FLO

Strategies patterns of Fairtrade farmers follow the previous ones, with high importance assigned to farm improvements (50%), coffee improvements (35%) and higher desired level of input use (35%). Nonetheless, there is a strong difference in terms of willingness to activity differentiation. In fact 40% of the sample expressed the desire to invest the extra money in productive activities not related to coffee.

RFA

Improving farms assets is a priority also among RFA certified farmers (33%). Compared to other groups, a relatively small share of farmers has the desire to improve the coffee plantation (23%), understandable when considering the elevated productivity of most RFA farmers. Against the prevailing trend, repaying contracted debts is an important concern for Rainforest farmers (30%). To comply with certification standards many farmers had to upgrade their infrastructure through access to credit, making debit repayment one of their highest concerns.

5.4.3.2 Low coffee prices

For this scenario, low coffee prices were defined as two consecutive years of coffee prices below 350,000 COP, almost as low as the one registered last season. Results are shown in the Figure below. Although not included in the original list of possibilities, many farmers replied that the main thing to do in case of low prices is to keep working on the coffee plantation as usual, conscious that they have little or no influence on the international prices. Apart from this "static" approach to low prices, the other strategies can be divided between procyclical (reduction of costs) and countercyclical (proactive approach).

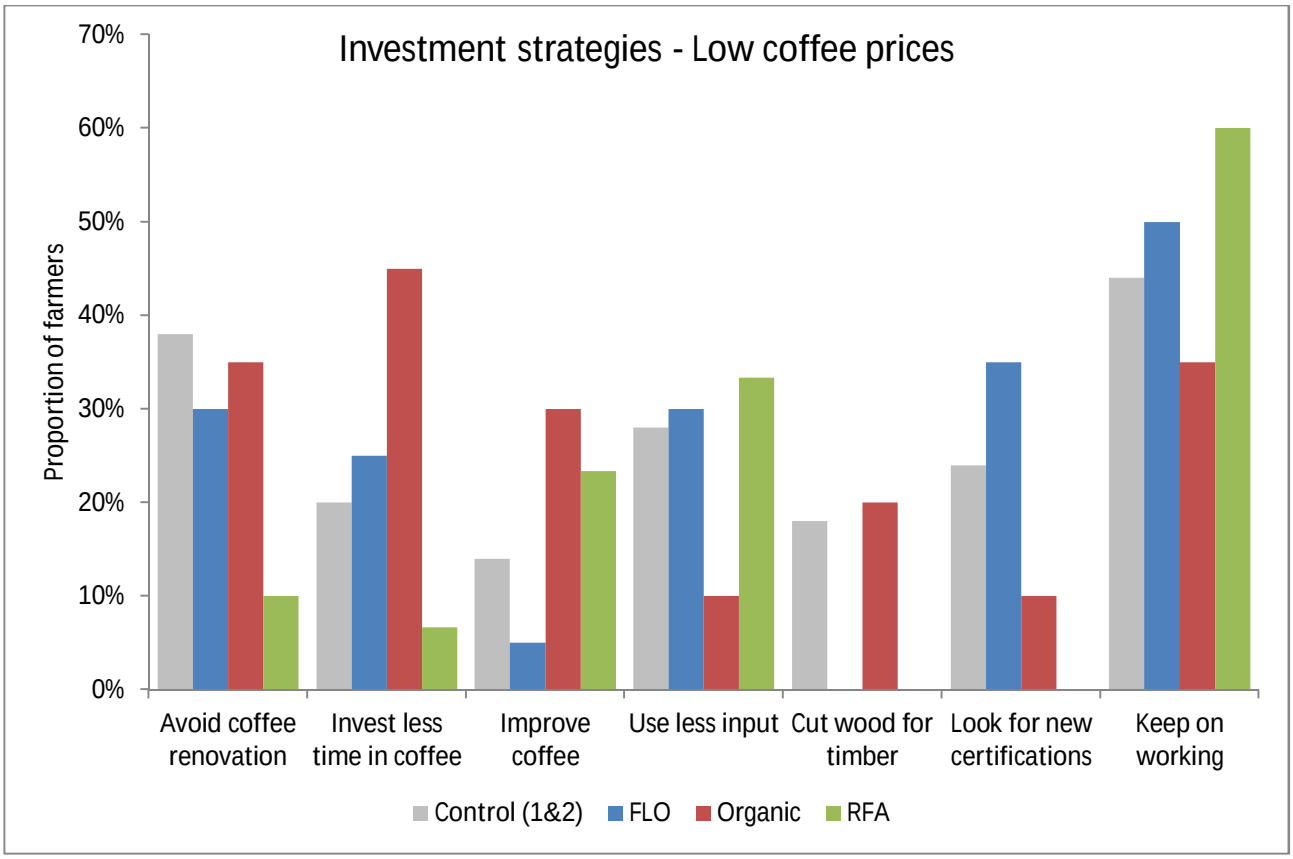


Fig. 5.11: Farmers' strategies in case of two consecutive years of low prices (below 350,000 COP per 125kg bag).

The tendency among organic farmers is rather procyclical or static, with most of the farmers responding to low prices by investing less time in coffee plots (45%), avoiding coffee renovation (35%) and not changing current practices (35%). This behaviour has the potential of further diminish financial security for organic farmers, having to face low price while reducing even more their production. Among this group, 20% of the farmers would cut more wood for timber as an alternative source of income, and only 10% would look for the possibility of getting a further certification (FLO). A fraction of organic farmer (30%) would apply countercyclical strategies, improving the coffee plantations to boost production.

Farmers using considerable amount of input in their productions (noncertified, FLO and RFA) would consider as a viable strategy to reduce the production costs by cutting the total amount of expensive agrochemicals. A high share of FLO (50%) and RFA (60%) farmers would continue working on the coffee plot without changing their practices. This behaviour reflects the economic stability achieved through high coffee yields of these farmers, able to withstand a couple of negative years without major drawbacks in their economic wellbeing. A considerable proportion of FLO farmers (35%) would try to apply for new certifications, either organic or other private sustainable standards (Nespresso). RFA farmers have the least procyclical approach to low prices, almost not considering the possibility of avoiding coffee renovation (10%) and taking less care of coffee plantations (7%).

5.5 Farmers drives

This paragraph analyses the drives and motivations of farmers towards certification programmes. First, the analysis will focus on certified farmers, looking into reasons that brought them to participate in their programmes and reasons for which they are still part of them. Secondly, the focus will be on the reasons explaining why farmers in the region are not being certified.

5.5.1 Reason for joining certification programmes

As shown in Fig. 5.12, at least half of farmers joined the three certifications because of the promise of a price premium. Economic motivation hence is the main determinant and transversal reason for farmers to enter into a certification programme.

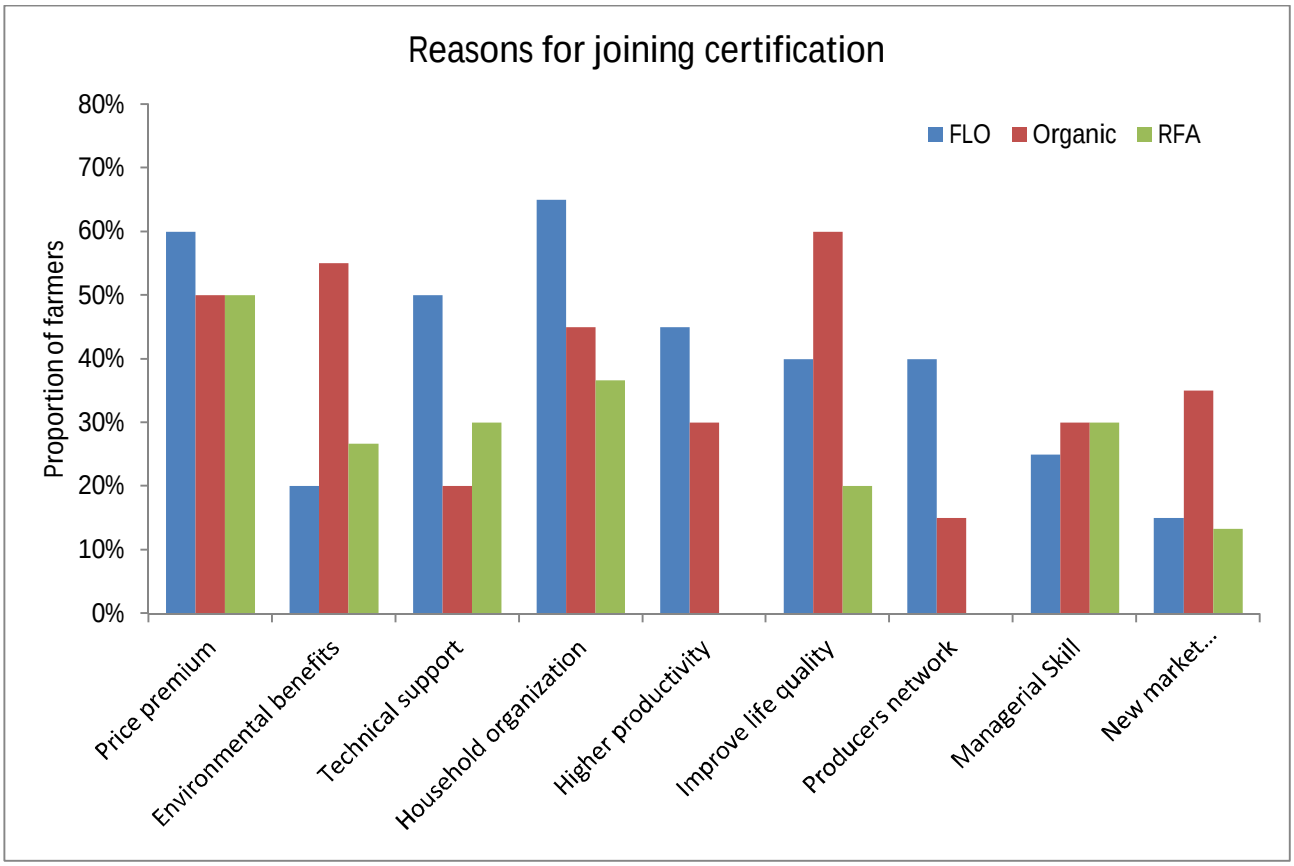


Fig. 5.12: Certified farmers' main reasons for joining certification programmes

FLO

Apart from the promise of a price premium, farmers approached Fairtrade with the expectation of improve their household organization (65%) via improved record keeping, properly storage of tools and agrochemicals and general improvement to kitchen, sanitation services and living areas. Attention is also focused on way to improve their productive practices through improved technical support (50%) and expected higher productivity levels (45%). Little attention was given to non-economic reasons as potential environmental benefits (20%).

Organic

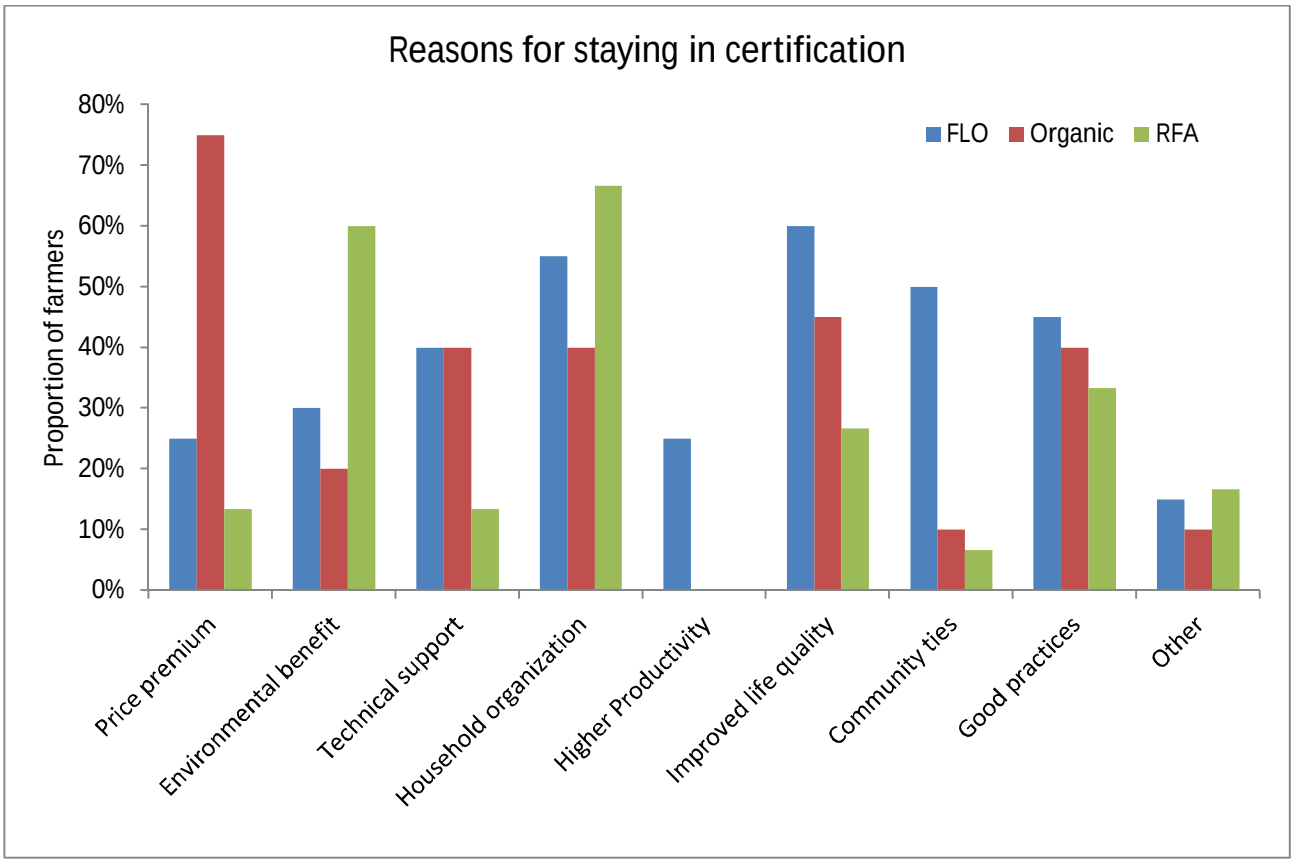
Farmers joined organic certification with the expectation of improving their quality of life (60%) and environmental condition (55%) by implementing the requested avoidance of synthetic and toxic agrochemicals. Compared to other certifications, an elevated number of farmers (30%) joined this programme in order to get access to new markets and increase their revenues.

RFA

The promise of a price premium has been the main reason to join Rainforest certification for half of the farmers. Other important factors were the improved household organization (37%), technical support (30%) and managerial skill (30%). No attention at all was given to potential improvement of productivity or to increasing the connection with other producers.

5.5.2 Reasons for staying in certification programmes

The situation presented in the previous paragraph changes significantly when analysing the reasons convincing farmers to stay in the certification programmes. The only variable that has high level of agreement for all the three certifications is household's organization (40% or higher).



Fig, 5.13: Certified farmers' main reasons for staying into certification programmes

FLO

Fairtrade farmers' drives towards certification changed after joining the programme. If before starting 60% of them has price premium as an important drive, after joining the share of farmers giving importance to additional price paid to their certified coffee drops to only 25%. Probably caused by only partial fulfillment

of expectations, higher productivity levels decrease in importance from 45% to 25%. From the results it is evident how FLO farmers are highly satisfied for an increase in their life quality (60%), improved household organization (55%) and stronger community ties (50%).

Organic

Compared to others, organic farmers are by far the most satisfied about certification's price premium, with three fourth of the group identifying it as an important reason to stay in the programme. Other important reasons were identified in improved life quality, employment of good agricultural practices, better household organization and increased technical support. Finally, it is interesting to notice how organic certification seems to not completely satisfy farmers' expectations in terms of environmental benefits, with only 20% of farmers identifying this variable as a reason to stay certified compared to 55% pointing at it before entering.

RFA

The three main reasons identified by farmers to stay in RFA certification are, apart from household organization, environmental benefits and use of good practices. Economic related reasons seems to have particularly low importance as only 13% of the farmers stay certified for price premium and no one stays for higher productivity levels. This does not mean that farmer do not acknowledge the economic impact created by the certification, rather that they experienced a shift in drives from economical to environmental.

5.5.3 Non certified farmers

This paragraph shows data referring to one of the sub questions guiding the research, about the obstacles and barriers preventing smallholder farmers from both Ocamonte and Socorro to join certifications.

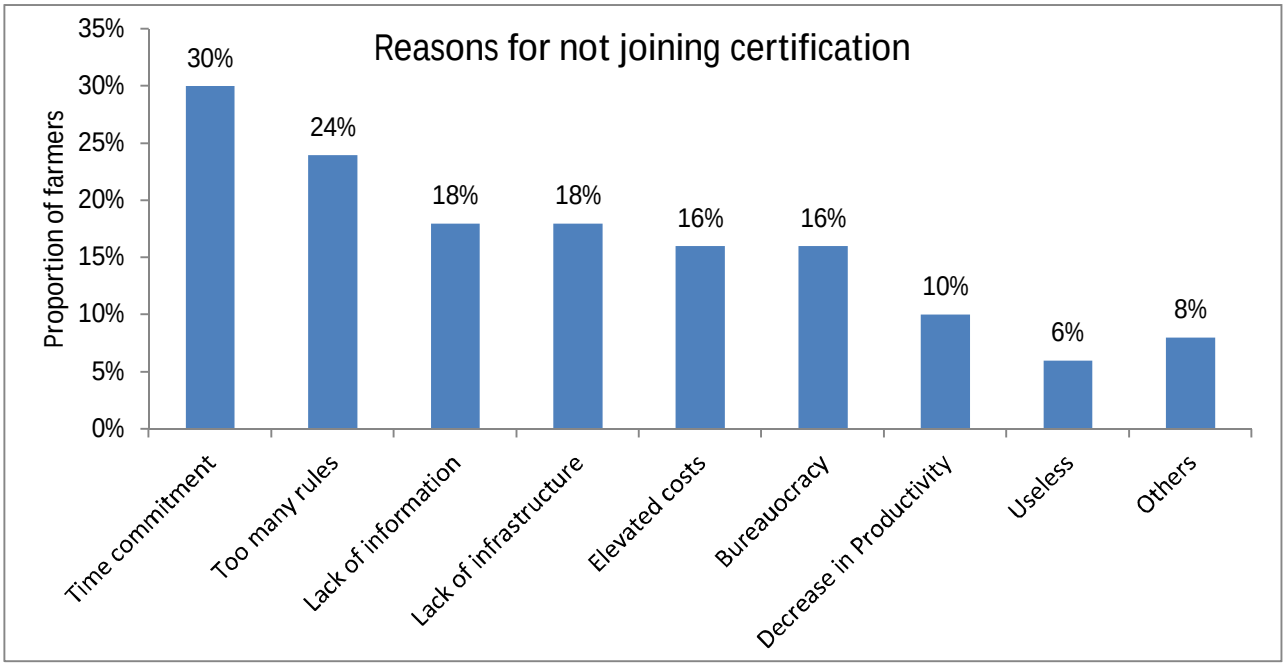


Fig. 5.14: Non certified farmers' reasons for not joining certification programmes.

Four main classes of factors have been identified as barriers to join certifications.

Farmers' personal preferences and situations constitute the biggest obstacle for the dissemination of certifications in the area. In fact 30% of farmers consider that being certified bring along too much time commitment in terms of training to attend, auditing and verification visits, and organization meetings. Such farmers feel that dedicating their scarce time to these events rather than to their agricultural activities would only deteriorate their economic wellbeing. Furthermore, almost a fourth of the farmers complain about the countless rules and guidelines to follow once adhering to certifications. Farmers see some of these rules, especially the one regarding the organization of the household and farm, as a direct loss of personal freedom and do not feel they will be satisfied constantly living under the scrutiny of third persons.

Another class of barriers is represented by structural factors as the high costs related to certification or the lack of basic infrastructure (16% and 18% respectively). Although certification costs are paid by FNC, this barrier represents the indirect costs that farmers would have to face to be able to enter in the certifications (e.g. three years before getting organic certification).

General lack of knowledge regarding the programmes (18%) and their effectiveness is also an important factor. 6% of farmers think that certifications are completely useless and others (10%) think that these programmes are detrimental, by hindering productivity. Although for organic certification it seems to be the case, other certifications actually have positive effects on productivity.

The last barrier identified is the difficulties encountered by farmers to fill documents and record keeping due to lack of proper education level (16%).

5.6 Farmers vision

Farmers' vision was tested in reference to the preservation of natural forest and to the three pillar of sustainability, to assess whether certifications have some kind of impact on these topics.

5.6.1 Natural forest preservation

As reported in section 5.1.7 some farmers are preserving an area with non-productive forest on their farm. Apart from the different number of farmers preserving such area, it is interesting to study the reasons behind this choice and check if being certified or not has an influence on farmers' vision. Five reasons explaining the preservation of forest on farm were identified. One of them is the compliance to a national law (Decree 1449/1977) requiring the preservation of a forest cover to protect springs in rural areas.

Non certified farmers' main reasons to keep a forest area are economic. Two thirds in fact use it as a source of wood for timber while 50% adduce not having the resources in terms of money or time to put it into production. Only 13% keeps the forest area because of personal preference, while it is an important reason for a large proportion of all the certified farmers. Organic and FLO farmers mostly follow the answers provided by non-certified farmers, using natural forest for timber or keeping it for lack of resources or because national laws. A significant change in vision is though found in RFA farmers, with the majority of

them (87%) keeping the forest because beneficial for the environment. Apart from personal preference, RFA farmers keep forest for no other reasons, not the need of timber nor lack of economic resources to transform it into a productive area.

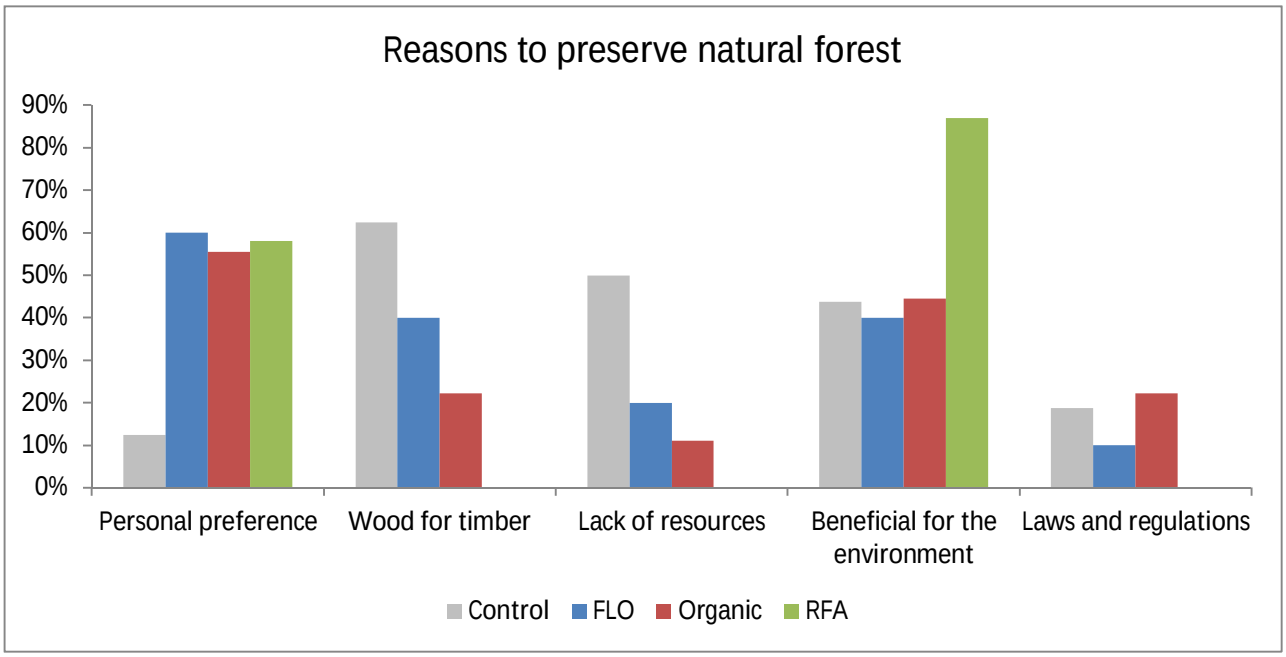


Fig. 5.15: Farmers' reasons to preserve an area of natural forest in their farm.

5.6.2 The three dimensions of sustainability

Surveyed farmers were asked which among different dimension of their activity as coffee producers they deemed as the most important. Each dimension was explained through examples and key words to ease the farmers' answer. Environmental, social and economic were the choices respondents could select, with the possibility to choose more than one dimension. The control group is formed by non-certified farmers from the two study areas.

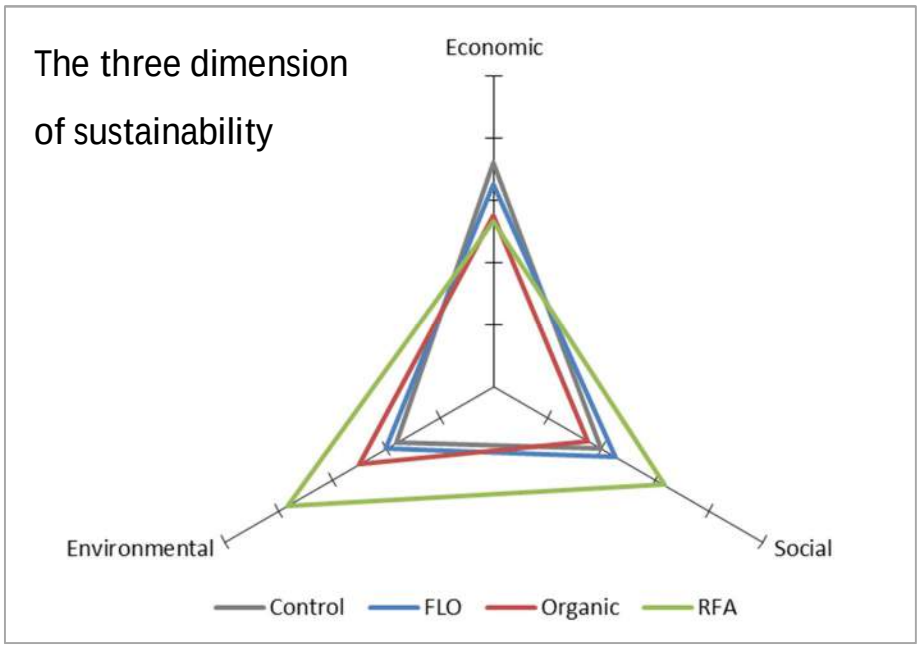


Fig. 5.16: Coffee producers' vision on the three dimensions of sustainability.

From the results shown in Fig. 5.16 it is possible to conclude that Rainforest farmers have the most different vision compared to other groups. First of all, RFA farmers are the only ones selecting the environmental dimension as first choice (77%). Furthermore farmers in the group on average selected two dimensions as important (1.9) compared to one and a half chose by farmers from other groups. This is a sign that RFA farmers have embrace a more sustainable vision, with equal importance given to more dimensions. Notably, also the social dimension is considered more than among other groups, with 63% of farmers selecting it as important.

Apart from RFA, the three other groups present similar, although not identical, visions as perfectly represented by the shapes in Fig. 5.16. Compared to the control group, both Fairtrade and organic farmers' vision registered are slightly more sustainable, decreasing the importance given to the economic dimension and increasing the attention for the others. The shift in organic farmers' vision consists in higher importance compared to the control group given to the environment (50%) and less given to economic (55%) and social (35%) dimensions. Fairtrade farmers' vision instead only slightly shifted from economic towards both social and environment, although not greatly.

Due to the lack of longitudinal data on farmers' vision, tracking certified producers' point of views before joining the programmes, it is not possible to draw conclusions about the causality of visions differences. In fact, from one hand farmers with certain visions are more likely to join certain certification programmes with similar ideals, and from the other certification programmes can change farmers' visions through training programmes and new productive concepts introduced by standards and requirements.

6. Discussion and Conclusion

6.1 The impact of sustainable certifications

Before starting resuming the specific impact each certification has on smallholder farmers it will be discussed the generic effect produced by certification programmes.

Regardless different requirements, standards, strategies, and visions, certifications programme have common benefits. In fact certified farmers increase notably their skills and abilities helping them coordinating their assets to improve the sustainability of their production. Through certifications, farmers attain better access to technologies, information, producers' networks, and untapped resources in a better and more organized way than noncertified farmers. By strengthening their agroecosystems they are able to access to new markets guaranteeing higher and more stable prices. It is important to highlight though that price premiums are only one of the direct benefit for certified farmers. Due to the auditing process they are also encouraged to improve record keeping and documentation, in turns helping them developing their business, identifying strength and weaknesses, and facilitating the processes to access to credit. Joining certification also enable access to training. Auditors help determining the areas in which farmers require specific training that in turn is provided by implementation programmes and the technical staff of FNC. Through skill development farmers gain better product quality and improved agricultural practices improving their socioeconomic and environmental conditions. Standards and requirements positively reinforce this process by incentivising farmers to change their usual practices or by guaranteeing that growers keep employing existing practices already beneficial in terms of environmental or social dimension.

Another important impact registered during the research was a complete change in farmers' mentality and approach towards coffee production. Although using different methods, all three certification bring along to farmers an entrepreneurial mind-set. Certifications successfully change the role of coffee production in many smallholder farmers' life, from a burdening and time consuming activity towards a business opportunity. In this sense, farmers choose between diversification and specialization of coffee production as a business strategy rather than out of necessity, making decisions with a long term vision of their needs and opportunities.

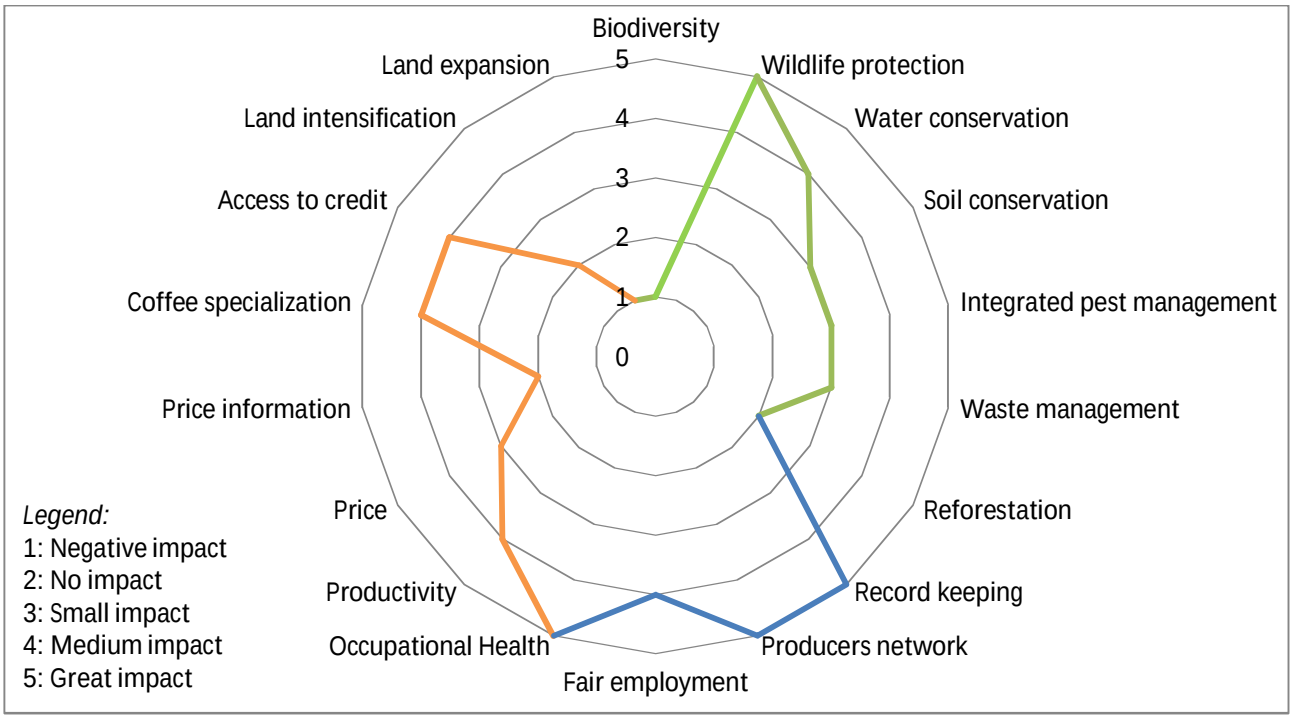
Another impact of certifications is to involve smallholder farmers in international and complex value chains, making them part of a bigger network of stakeholders compared to the local one. This process helps farmers challenging their traditional vision of their activities, providing them with a more dynamic and complex business environment. By entering into higher value global chains smallholders have more incentives to continuously upgrade their activities to match consumer preferences in ways that can be beneficial to their households and local environment. This condition coupled with farmers' investments in terms of time and money to join and remain into certification programmes create a stronger bond between

producers and their coffee production, not merely representing an activity passively carried on. It is not a surprise that only in certified farms young members of the household were actively involved and interested in the family business. On the other hand, several noncertified farmers were seriously considering the possibility to sell their farm and move to town as they were growing old and no one in the family wanted to continue their activity.

Lastly, certifications manage to reduce farmers' agricultural risks by decreasing their vulnerability to the highly volatile coffee market. This result is achieved either via high price premiums and minimum price or by implementation of improved agricultural practices resulting in higher yields. It is though true that this process can be sustained only through a continue demand for certified coffee by companies and eco-consumers.

6.1.1 Fairtrade impact

The focus of Fairtrade certification is to improve the socio, economic and working conditions of certified producers while fostering environmental conservation. Standards for social development include strengthening of democratic and participatory farmers' organizations, better and healthier working conditions, and prohibition of child labour. Environmental rules focus on minimised and safe use of agrochemicals, proper and safe management of waste, maintenance of soil fertility and water resources. On the economic side FLO guarantee minimum price and price premium coupled with better access to credit. Keeping this in mind, it is interesting to see whether and how the recorded impacts (Fig. 6.1) are in line with Fairtrade's strategies and requirements, and with previously conducted studies cited in literature.



Fig, 6.1: Impact summary of Fairtrade certification on the three dimensions of sustainability.

In Ocamonte, Fairtrade resulted to have a general positive environmental impact, although modest and not homogeneous among the seven indicators. FLO has a small positive impact in soil fertility conservation, pest management and waste management, while on water conservation and wildlife protection the impact is greater. On ecological indicators as biodiversity and reforestation efforts the results are not positive, with a negative impact on animal and plant biodiversity and no impact on reforestation. In the case of FLO the presence, or absence, of specific requirements is directly connected with environmental impact. All indicators directly connected with FLO (soil and water conservation, pest and waste management) or APCO (wildlife protection) requirements score positively, while in areas not covered by them certified farmers present no difference with noncertified ones. Literature on environmental impact of Fairtrade is particularly scarce. Nelson and Pound (2009) reviewed 33 case studies assessing the impact of FLO certifications, finding that although most of these studies made significant comment on environmental aspects of Fairtrade, none of the papers carried a methodical environmental assessment. This consideration is reported also by Barham and Weber (2012) that stress how no research exists on the environmental outcomes of different certification programmes for coffee. Only one study focuses on coffee plantation biodiversity (Philpott et al., 2007) finding no significant difference in tree and bird diversity between FLO and uncertified farms, confirming the results found in this research.

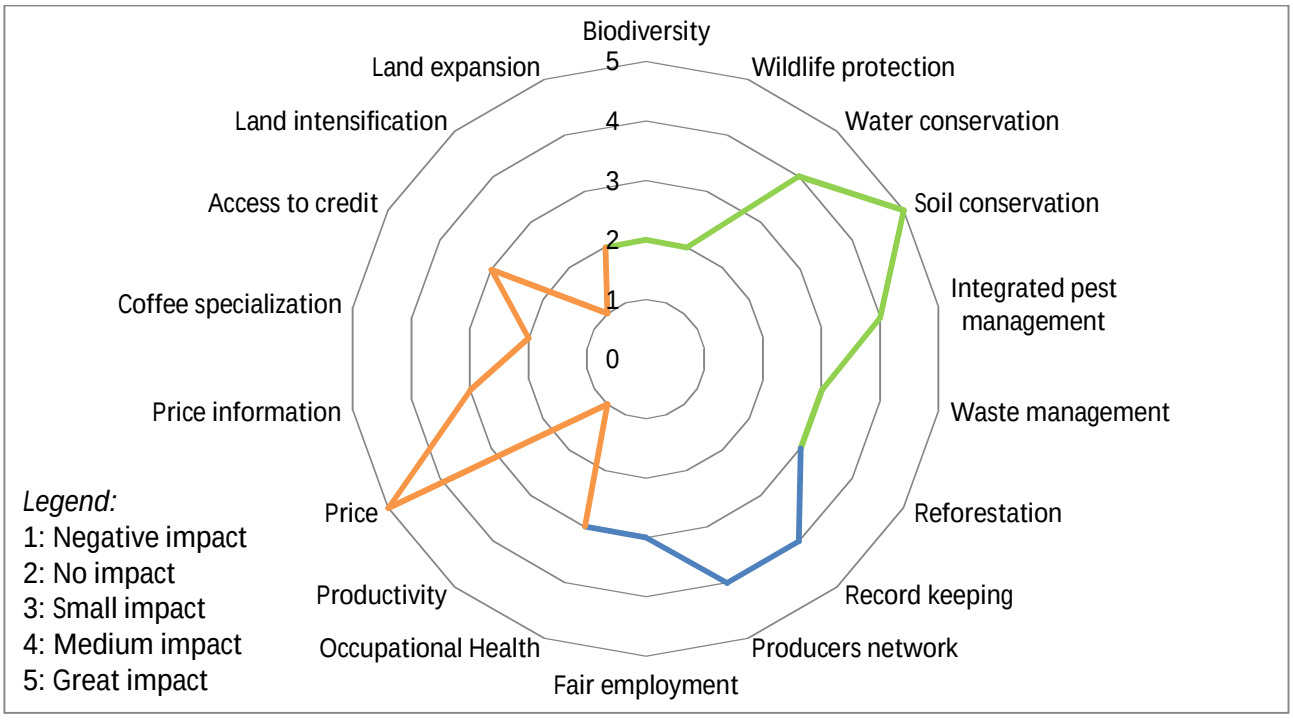
Considering that the Fairtrade movement is primarily a socially-oriented one, it should not be a surprise that FLO has a great positive impact on all four social indicators of this study. Fairtrade regulates through its standards the rules for fair employment and occupational health, and the participation in a producers' organization is mandatory for smallholders to receive the certification. Furthermore APCO states clear rules regarding complete record keeping for its members. Thanks to this multilateral enforcement of socially friendly practices, the impact on this dimension is positive. Fair employment is the only indicator with a medium positive impact, due to one farmer employing minor labour and four producers not respecting legal wages and work hours. This situation is favoured by FLO standards failing to be strict in the case of seasonal labour in coffee production. There is an important lack of cover of seasonal labour conditions also in terms of research, as highlighted by Vagneron and Roquigny (2011). Impacts of Fairtrade on occupational health are instead extensively quoted in literature. Although some studies find no impact on working conditions (Valkila and Nygren, 2008; Dragusanu and Nunn, 2014), the majority found positive effect of the certification on occupational health (Lawson, 2004; Imhof and Lee, 2007; Becchetti and Gianfreda, 2008; Ruben and Fort, 2011; amongst others).

On the economic dimension, FLO has a general small positive impact. On one side Fairtrade coffee producers have higher yields, better access to credit, higher prices paid and higher coffee specialisation; nonetheless the certification has no effect on access of price information and land intensification, and a negative effect on coffee land expansion. Economic impact of Fairtrade in terms of productivity as found in literature is mixed and ambiguous. For example, Murray et al. (2006), Jaffee (2007) and Arnould et al.

(2009) found that FLO certification has a positive impact on production levels of coffee, while Fort and Ruben (2008) found that FLO farmers in Peru have lower incomes and productivity. Furthermore a study conducted on smallholder farmers in Kenya reports that Fairtrade has no influence on productivity in one study area and has negative effect on productivity in another (CIDIN, 2014). Higher levels of coffee specialization are also registered in Ruben et al. (2008) and this strategy is connected with a period of relatively good and stable prices. The ability of the producers' organization, APCO, to sell its members coffee as certified is fundamental in terms of price premium and minimum price guaranteed. Producers receive a fixed price premium of 8,000 COP, only 2% of the base price of 2013, and the remaining part of FLO premium, 92,000 COP, depends on how much coffee can be labelled and sold at the Fairtrade price. This uncertainty has been reported in other studies highlighting how the Fairtrade system many times fails to deliver the promised fair remuneration for smallholder producers (Taylor, 2005; Valkila and Nygren, 2008; Mendez et al., 2010; Weber, 2011a).

6.1.2 Organic

Organic certification focuses on the preservation of ecosystems through employment of only natural agricultural input. Hence organic standards mostly focus on soil, pest and nutrient management coupled with robust record keeping allowing traceability of the organic product. From a sustainability perspective organic certification places his focus on the environment through the ban of any kind of synthetic agrochemicals. Fig. 6.2 below shows the impact results of organic certification on the three dimensions of sustainability.



Fig, 6.2: Impact summary of organic certification on the three dimensions of sustainability.

From an environmental perspective organic certification manage to have a strong positive impact on the indicators that are more aligned with the core of organic movement: soil conservation, integrated pest management and water conservation. These results are in line with a study carried by Blackman and Naranjo (2010) that found organic certification of coffee in Costa Rica significantly reducing the employment of environmentally negative practices (synthetic pesticides, fertilizers and herbicides) and increasing the adoption of environmentally friendly practices (organic fertilization). In other environmental indicator instead organic certification has limited (reforestation and waste management) or no (biodiversity and wildlife protection) impact. No impact on ecological indicators as biodiversity are confirmed by two studies in coffee plantations of Mexico and Nicaragua conducted by Philpott et al. (2007) and Martinez-Sánchez (2008), finding no differences in bird diversity among organic and conventional farms. It is then to be presumed that organic certification manages to change agricultural practices more easily than providing changes in ecological indicators.

Organic certification positively impacted the record keeping practices of farmers and the rate they joined coffee producers' organizations. This last result though is enhanced by the presence of a big and important organization as APCO in the same area. The lack of requirements for working conditions is reflected in only small positive impact produced by organic certification on fair employment and occupational health.

The economic impact of organic certification is one of the most discussed topics in literature. Findings of this research point out that the income effect of organic certification is mixed: from one side the certification pays the highest price premium, accounting for almost 39% of the base price in 2013, but on the other side average productivity significantly decrease compared to the control group. Causing a lower productivity is not only the avoidance of use of agrochemicals, but in general a reduced care for the coffee plantation. Organic producers renovate less their coffee plantations and poorly manage their rustic shade by not properly pruning with the consequence of level of shade intensity detrimental to productivity.

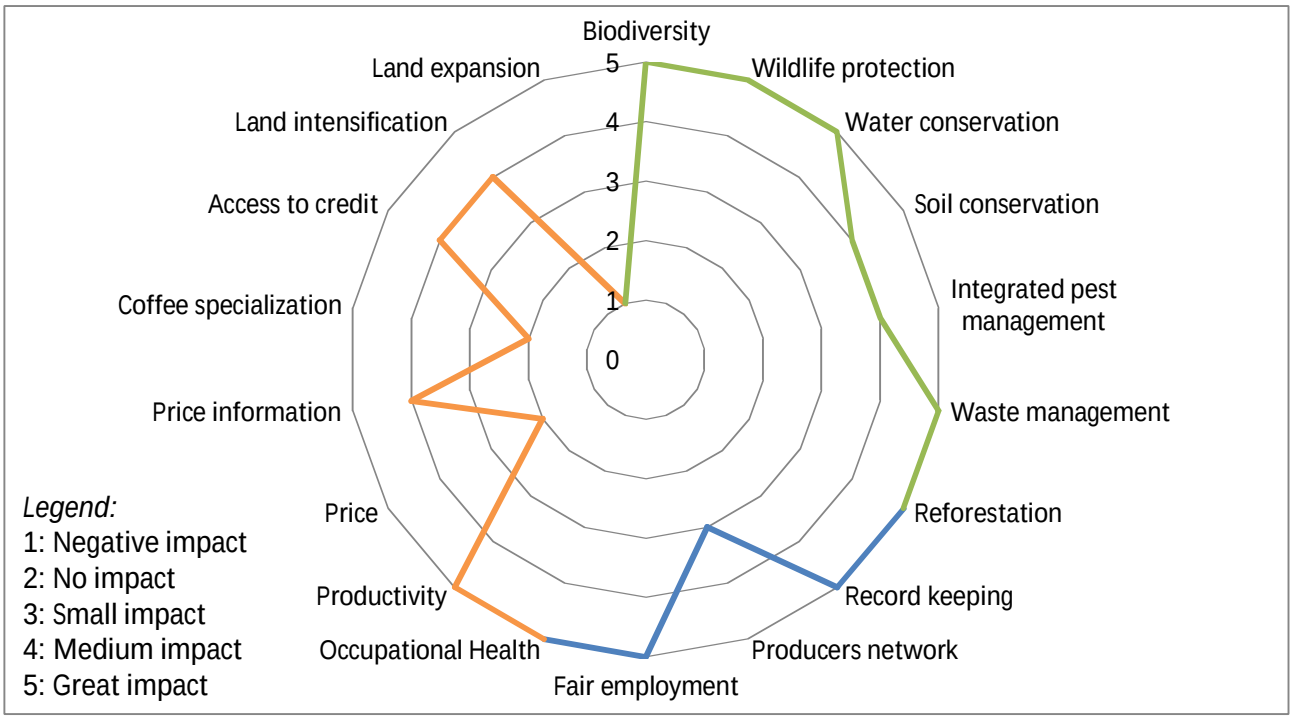
While positive effect of high price premium is a result found in most of the literature, due to a high demand on international markets of organic coffee, findings on productivity are mixed. In fact, decrease in coffee productivity is found in studies as Lyngbaek et al. (2001) and Calo and Wise (2005). On the other hand increase in organic productivity is found especially when conventional farming of control groups are characterised by low-input intensity and general low productivity (UNCTAD, 2007; Bolwig et al., 2009; Valkila, 2009). In Ocamonte, the majority of conventional coffee producers do employ medium to high levels of agrochemicals, resulting in higher average productivity compared to organic. It can be concluded that organic certification is particularly suited for farmers already used to a low intensive management of production since, without altering the productivity, it guarantee stable and high price premiums. Organic certification certainly has a higher impact on farmers in case base price of coffee is particularly low, because with high prices the importance of the price premium on the overall revenues decrease and volume of coffee sold is the most important variable. In the study area income generated by coffee is not

always sufficient to sustain economic wellbeing, with organic producers having to work as day labour in neighbouring farms more than conventional farmers.

Organic certification slightly improves access to credit and price information and has no impact on coffee specialization and land expansion.

6.1.3 Rainforest

SAN standards are built upon the three integrated pillar of sustainability, giving importance to environmental, social and economic dimensions at the same time. Principles regarding environment are ecosystem, water and soil conservation, and wildlife protection. From the economic perspective the standards require farmers to redact and continuously update farm management plan and from a social perspective certified farmers have to guarantee dignified treatment and occupational health to workers. Extensive literature on Rainforest Alliance and its impact is lacking compared to the one regarding FLO and organic (Blackman and Rivera, 2010).



Fig, 6.3: Impact summary of Rainforest certification on the three dimensions of sustainability.

Rainforest certification has a great positive impact in all the environmental indicators. As reported by other studies (Mas and Dietsch, 2004; Guzman, 2010), RFA has great positive impact on biodiversity of trees and birds. The great attention given by requirements on shade system and natural vegetation areas on farm is reflected in a positive effect in reforestation efforts and wildlife protection. Only soil conservation and integrated pest management record a medium positive impact, but in general it can be affirmed that RFA is an environmentally sound certification. Results on the environmental impact of the certification are in line with previous studies focusing on agricultural practices implemented by certified coffee farmers (Serna, 2010; Rueda and Lambin, 2013b).

From a social prospective the certification manages to highly improve practices of record keeping in the farm, provide fair employment to the seasonal workers and guarantee complete occupational health. Serna (2010) founds same positive results of the certification investigating training provision to hired labour and appropriate use of protective equipment, but found negative results in terms of certified farmers respecting legal wage and working hours.

On the economic dimension Rainforest produce generally positive impacts. The only exception are the indicators price and coffee specialization, in which no impact are found, and land expansion for which RFA has a negative impact. The level of specialization is high in certified farms but not significantly higher than within the control group, a result contrasting with Zimmerer (2007) that founds certification produces increase specialization. Low price premium for RFA certified farmers has been found in other studies (Barham and Weber, 2012; Rueda and Lambin, 2013b) and it is not a surprise since the certification does not guarantee any fixed price premium. Farmers receive higher prices for RFA certified coffee because the seal is associated with products of higher quality (Ventura, 2007). RFA strategy to secure economic wellbeing of certified farmers focuses on maximizing yields and protecting the long-term soil fertility by improving the all spectrum of farming practices. Results from Socorro prove that this strategy can be a success: productivity levels of certified farmers are on average almost 50% higher than the ones reached by conventional farmers in the area. Similar results confirming the success of the RFA strategy are found in different studies (Serna, 2010; Weber, 2011b; COSA, 2012). High productivity levels are effective in maintaining farmers' economic wellbeing regardless fluctuations in coffee prices, while price premiums can be significant mainly during low prices seasons.

RFA certification improves the productivity not only through the establishment of complete requirements touching upon a vast array of topics. In fact two other tools implemented by the programme are certainly pivotal for its success: training programmes and farm management plans. Through trainings farmers can constantly upgrade their skills and understanding of the processes involved in their activity. Training varies from agricultural practices to general environmental and social related topics. The effect of training can also be seen in the shift of farmers' vision towards a more sustainable one, as highlighted in Ch. 5.6.2. Via the farm management plans, certified farmers have the possibility to set with technicians and auditors a continuous strategy of improvement with a long term view. In this way they can channel their investments towards assets promoting the sustainability of their business.

6.2 The role of FNC

The Federation of Coffee Producers of Colombia plays an important role connected to certifications and their impact.

In Colombia FNC successfully manages to bridge the gap between smallholder farmers and certification programmes. In fact while large farms are easier to reach and presents fewer difficulties to follow

standards (low hanging fruits), smallholders can greatly benefit from external support to enter into certification programmes (KPMG, 2013). On one side, FNC eliminate at the individual level the direct financial burden connected to certification, namely auditing and verification processes. This expense many times can present a serious barrier to access to certification and is a threat to profitability for smallholder farmers (Gullison, 2003; Giovannucci and Ponte, 2005). In Colombia instead the direct costs connected to coffee certification are paid by FNC thus smallholder producers will not be burdened by them once certified. By leveraging on the community ties and similar environmental conditions, FNC created cluster of certified farmers, reducing the costs connected to auditing. Apart from the costs, the Federation thanks to its capillarity is continuously striving to include farmers with potentialities into the *café especiales* programme to make them access to new markets and gain price premiums. FNC managed also to give support to smallholder farmers that would have struggled to make the initial investments to enter certification through channelling governmental and international donors' funds into specific support and credit projects.

From a certain perspective the services provided by FNC could have a detrimental effect in the assessment of certifications impact. In fact, FNC technical services are provided directly to farmers through the Extension Service to both certified and non-certified farmers. Although it is true that certified farmers can receive more attention from technician, it also interesting to consider the effect on non-certified farmers. Some agricultural practices, especially concerning soil conservation, integrated pest management, and renovation of coffee plantation, are the focus of technical support. For example, the practice of ReRe to avoid borer beetle infestation had been so widely spread among all farmers that the entire sample selected, regardless being certified or not, is applying this effective environmentally friendly practice. In a way then, it can be said that results scored by noncertified farmers in several indicators are higher thanks to the active presence of FNC. This in turn can potentially reduce the positive impacts of certification as studied with this research by increasing the outcome of the control group.

6.3 Obstacles to access certification

Regardless the continuous efforts carried on by FNC to facilitate the access of smallholders to certification schemes, several barriers are still in place.

First of all an important barrier is played by the way coffee and other agricultural production developed in one area during previous decades. For example a technologically oriented development of coffee or the production of crops requiring high level of synthetic input can place a considerable amount of stress on the environment. Consequences varying from deforestation, to water contamination and loss of soil fertility can reduce the present feasibility of environmental certification (as Rainforest or Bird Friendly) that set rigorous requirements in terms of shade characteristics.

Intrinsic environmental conditions of an area can also play an important role. Depending on some characteristics as altitude, rain precipitation and exposure to sunlight coffee production can be profitable only employing full-sun method, again preventing accessibility to some certifications. At the same time, soils characterised by poor fertility and composition can represent an obstacle to accessing organic certification, at least in the short to medium period.

Apart from environmental issues, other structural factors (Ch. 5.5.3) can represent serious obstacles for smallholder farmers. As previously mentioned a basic education level is required to be able to access to the information and redact the document necessary to enter into a certification scheme. Record keeping is a basic requirement for all certifications and older illiterate farmers struggle to comply with it, especially when younger members of the household already left the rural areas. Furthermore various credit institutions are reluctant to grant loans to farmers older than 65 years old. Young farmers willing to enter into certifications can also found some barriers as lack of land ownership and of upgraded productive infrastructure.

Another important obstacle to universal access to certification depends on smallholders' proneness to behavioural changes. Every certification has standards and requirements regarding agricultural practices that many times do not coincide with the ones usually carried on by farmers. As Giovannucci (2002) reports, smallholders are usually reluctant to radical technological changes in their agricultural activities, especially when alternatives are available or further investments are required in terms of money or time. Furthermore other factors as lack of time, lack of managerial ability needed to obtain and maintain certification, unwillingness to long term commitment, and aversion to stringent rules regulating private business and household organization can prevent some smallholders to join certifications. At last, an important role is played by lack of information or misinformation about the requirements and benefits of certifications. It also has to be considered that institutions as FNC and the same certifying organization should not promote the universal widespread of certifications among smallholder farmers, since increase in production of certified coffee unmatched by proportional increases of international demand would create a diminishing in price premiums.

Apart from these general considerations, each of the three studied certification has specific obstacles. For example, FLO requires smallholders to join or create an organization of producers to join the programme. Hence Farmers who do not want to join a producer group are excluded from certification. Furthermore if in an area the basic conditions to create an organization are missing (e.g. strong ties among producers, complete information regarding legal procedures to create an organization), all farmers of a community cannot benefit from FLO certification. The main obstacles to join Rainforest are mostly environmental and had been previously discussed. Organic certification is highly unsuited for most of smallholders that use moderate to high amounts of chemical inputs since they would have to significantly change their management practices. Finally, also farmers' beliefs can be important obstacles. Individuals that do not

believe in environmentally sustainable or socially responsible management of their activities will be less willing to voluntarily change their agricultural practices.

6.4 Conclusion

This study aimed at evaluating and assessing the impact of coffee certification programmes on the three pillars of sustainability. Results of this thesis have been produced using sound methodologies built on previous empirical researches, shading light on the debated topic of certification impacts. Furthermore the research had been designed following recommendations for further research presented in different studies (Blackman and Rivera, 2010; Giovannucci and Pots, 2008 and Prado, 2010 among others) to directly fill knowledge gaps on the topic previously identified by other researchers.

The first main research question was: *What are the environmental, social and economic impact of different sustainable certification programmes for smallholder coffee producers in rural areas of Santander, Colombia?*. Results from field research show how certification programmes have significant positive impacts on the socioeconomic life and environmental conditions of smallholder producers (see Fig.6.4).

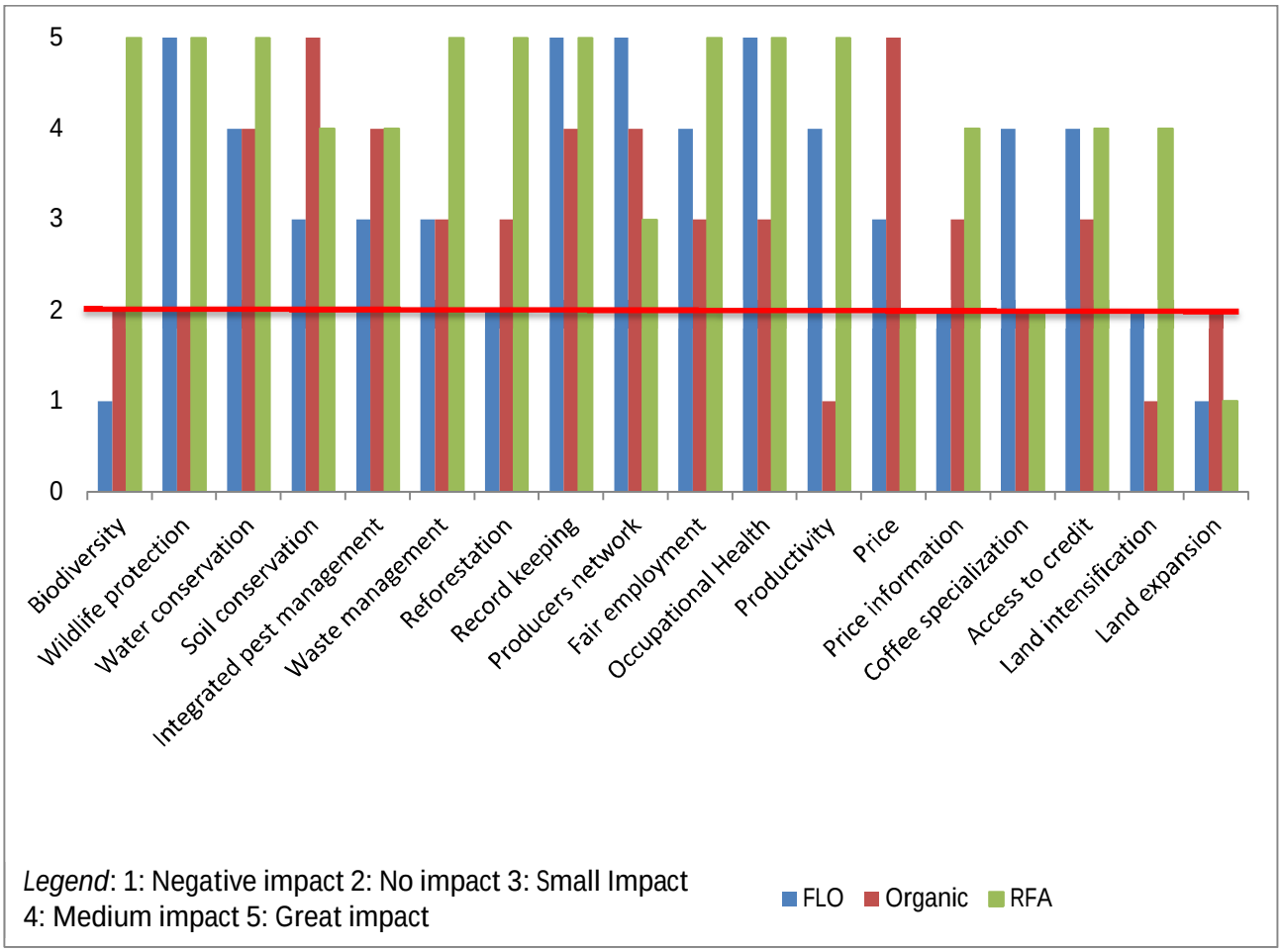


Fig. 6.4: Impact summary of Rainforest certification on the three dimensions of sustainability.

Positive impacts are particularly evident for the areas and topics that each certification has as core strategies. Overall claim about improving specific producers' conditions (working conditions, environment, quality of the product, etc.) made by certifications to consumers are generally met. More critical evaluation

of certification programmes is needed not only to test their actual impacts, but also to improve consumers' awareness and help consumers making conscious decisions about product choices. This process could in turn benefit the producers by an increase in demand of sustainable products, which have also to be supported by public and private partnerships guaranteeing higher degrees of sustainability of the entire value chain.

For smallholder farmers living in precarious conditions and being exposed to the volatility of international market prices the economic dimension of their production is the most important, as confirmed by the analysis of farmers' vision. Successful certification initiatives have to find ways, besides focusing on price premiums, to improve smallholders' economic conditions through implementation of practices and trainings able to foster smallholders' productivity. This study shows that such goal can be achieved in a sustainable way, enhancing economic returns without hampering the environment or the social conditions of workers. The key for this kind of success resides in designing and implementing standards adapted and tailored for specific localities and products. In this term, the example set by Rainforest Alliance is evident. RFA is the only programme having product specific standards that, through a participatory and inclusive process with national stakeholders, are geographically suitable. Bridging the gap between international technical documents, standards and requirements, and the realities smallholders face every day is a fundamental step to increase impact and effectiveness of certification programmes. This research also highlighted the fundamental role played by local environment and historical agricultural development. These factors are highly relevant in easing or enabling the diffusion of specific certification programmes, especially the ones with strict environmental requirements, and play and equally important role in their effectiveness.

The second main research question was: *Which are the strategies and visions of farmers that joined a sustainable certification and to what extent are they aligned with those of the certification organization(s)?*. Through the field research it was possible to assess that although almost the entire sample of certified farmers respects and follows the standards, not all of the certifications manage to provoke deeper changes in the vision of certified smallholders. Official certification standards and requirements are comprehensive and extended documents, but in reality they are seldom directly accessed by certified smallholders. Certification norms are translated into applied agricultural practices by the FNC Extension Service technicians and by external auditors that farmers apply to pass annual inspections. Thus some certified farmers have a vague idea of what the certification and the organization behind it are in terms of core concepts, mission and vision.

This study found that among the three labels, price premiums promised to farmers are the main reason to join certifications. Though, after entering into the programmes, price differentials alone are not responsible for retention into certifications. In fact, other benefits more aligned with each certification mission were identified by farmers of the three groups as important to remain certified. Fairtrade farmers valued as

important the improvements in terms of quality of life and the stronger community ties created after joining the programme, organic ones highly valued the implementation of healthy and safe agricultural practices and Rainforest farmers identified as main reason to stay in the programme the environmental benefits.

As a concluding remark, this thesis add empirical evidence on the debated issue of certifications impact, a topic presenting discordant evidences and results in literature. Apart from the lack of appropriate methodological approach, another reason for divergent findings could be found in one specific aspect of certification programmes discussed in this work. The success of certification programmes around the world depends only partially on the list of standards and requirements proposed, being the main but not only variable. Broad generalizations about actual benefits or disadvantages brought by these programmes are a problematic exercise. Their effectiveness in fact highly depends on local conditions and on the presence of a strong apparatus of technicians or other professionals bringing support and bridging the divide between certifications and smallholder farmers.

Appendix 1

The table below resumes the p-values of t-test on farmers' observable characteristics, used to check the validity of the sample matching. No significant differences are found between characteristics of certified farmers and respective control group at a 0.05 level.

	Ocamonte		**Socorro**
	FLO	**Organic**	**RFA**
	(n=20)	(n=20)	(n=30)
Age of household's head	0,722	0,476	0,739
Number of people in the household	0,639	0,611	0,687
Number of year of education of household's head	0,954	0,530	0,858
Number of hectares of land devoted to coffee	0,418	0,233	0,619
Number of household members working on the farm	0,822	0,839	0,371
Number of hired daily workers on the farm	0,744	0,244	0,932
Years of farming experience of the household's head	0,477	0,121	0,381

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