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Analysis

# Profits and poverty: Certification's troubled link for Nicaragua's organic and fairtrade coffee producers

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ABSTRACT

Governments, donors and NGOs have promoted environmental and social certification schemes for coffee producers as certified market channels are assumed to offer higher prices and better incomes. Additionally, it is presumed that these certifications contribute to poverty reduction of smallholders. Yet, gross margins, profits and poverty levels of certified smallholder coffee producers have not yet been quantitatively analyzed applying random sampling techniques. Our quantitative household survey of 327 randomly selected members of conventional, organic and organic-fairtrade certified cooperatives in Nicaragua is complemented by over a hundred qualitative in-depth interviews. The results show that although farm-gate prices of certified coffees are higher than of conventional coffees, the profitability of certified coffee production and its subsequent effect on poverty levels is not clear-cut. Per capita net coffee incomes are insufficient to cover basic needs of all coffee producing households. Certified producers are more often found below the absolute poverty line than conventional producers. Over a period of ten years, our analysis shows that organic and organic-fairtrade farmers have become poorer relative to conventional producers. We conclude that coffee yield levels, profitability and efficiency need to be increased, because prices for certified coffee cannot compensate for low productivity, land or labor constraints.



## 1. Introduction

Coffee is an important export product for Nicaragua as it contributes 24% to total export earnings. The production is dominated by smallholders and involves around 20–40% of the rural labor force (Lewin et al., 2004). The last worldwide coffee crisis from 1998/99–2002/03 affected producers' income strongly and in many regions coffee prices were falling below the production costs (Fitter and Kaplinsky, 2001; Raynolds et al., 2004). Smallholders have been among the hardest hit by this price decline. Between 1998 and 2001, poverty rates of Nicaraguan smallholder coffee farmers increased by 2% while the poverty rate among rural households dropped by 6% due to economic growth in the rest of Nicaragua (Lewin et al., 2004). Paradoxically, at the same time, the coffee market in importing countries flourished. Driven by growing social, environmental and health consciousness (Basu et al., 2003), certified coffees have become popular among roasters and consumers in industrialized countries (Daviron and Ponte, 2005; Rice, 2001). Currently, the organic and the fairtrade certification are two of the oldest and most well-known coffee certifications in the market albeit many more exist.

Since the coffee crisis, national governments, NGOs and international donors have promoted the marketing of coffee through group-based, certified market channels as a viable business model for poor smallholders (Kilian et al., 2006; Linton, 2008; Willer and Yussefi, 2007). The changes in consumer demand and policy thinking have led to a growing body of literature investigating the effects of environmental and social certification standards on environmental indicators like tree, mammal, bird, and butterfly species (Gobbi, 2000; Gordon et al., 2007; Philpott et al., 2007) as well as on socio-economic indicators. Before discussing the various studies that focus on socio-economic indicators of organic and fairtrade coffee certification schemes, the following briefly describes these two standards. Due to regulation, cooperatively organized farmers are the only producers of fairtrade coffee. Also organic certified coffee is often produced by cooperatives or associations since certification is too costly for individual smallholders (Rice, 2001). The exact standards for organic coffee depend on the importing country and certification label. All standards focus on enhancing the health of soils, plants, animals, and humans and prohibit the use of synthetic agro-chemical inputs (IFOAM, 2006).

Different labels exist also in the fair trade movement. The most common standard is the 'fairtrade' label which follows several key principles including creating opportunities for economically disadvantaged producers; payment of a fair price; pre-financing; transparency and accountability; capacity building; respect for the environment, and gender equity (Wills, 2006). In reference to coffee, the term 'fair price' is the guaranteed minimum price including a social premium which

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covers production and living costs[1] (Slob and Osterhaus, 2006). Guided by similar principles, fairtrade also aims at increasing the share of organic production under their label. The double certification organic-fairtrade becomes very popular among coffee buyers and consumers. Both, fairtrade and organic certifications claim to contribute to poverty reduction and food security in developing countries (IFOAM, 2006; Wills, 2006).

Several studies conducted during the coffee crisis supported the promotion of certification schemes and showed that organic and fairtrade coffee markets tend to offer higher prices than the conventional market (Bacon, 2005; Daviron and Ponte, 2005; Lewin et al., 2004; Utting-Chamorro, 2005). During the crisis, fairtrade farmers in Mexico, Guatemala and El Salvador had received prices two to three times higher than conventional farmers (Raynolds et al., 2004). Wollni and Zeller (2007) show that in Costa Rica participation in marketing cooperatives and in specialty coffee market channels (which include the certified market channels) leads to higher producer prices. Other researchers observe that the higher prices from certification lead for example to better nutrition, increased education, improved household sanitation systems, water supplies or cooking stoves (Becchetti and Costantino, 2008; Raynolds et al., 2004; Utting-Chamorro, 2005). Fairtrade and organic coffee certifications also increase social organization and contribute to capacity building of farmers and their organizations (Bray et al., 2002; Raynolds et al., 2004; Taylor et al., 2005). Bacon (2005) finds that while certified and conventional farmers both reported a decline in their quality of life during the coffee crisis, higher prices for certified coffee had some positive effects, for example a lower fear of losing the land. Organic and fairtrade certifications have also moderate positive effects on education, health and infrastructure investments (Arnould et al., 2009; Bacon et al., 2008).

Yet, research results on prices and thus income are not always that clear-cut positive. Analyzing data from several countries in Central America, Kilian et al. (2006) show small to large price differentials for organic and fairtrade coffee for the 2002/03 harvest. In some occasions, fairtrade farm-gate prices were much lower than conventional prices, for example when existing cooperative debts needed to be paid (Bacon, 2005; Utting-Chamorro, 2005). According to Arnould et al. (2009) and Valkila (2009), the positive farm-gate price differences of organic and fairtrade coffee continue after the crisis in Guatemala, Nicaragua, and Peru while Philpott et al. (2007) do not locate premiums in Mexico.

Most studies emphasize the higher prices paid in certified market channels and deduce that higher prices lead to higher farm income which then reduces poverty. As net coffee income is not only determined by the price but also by yield levels and production costs, in our opinion this conclusion is premature. Certified coffees have distinct production and marketing systems with different associated costs than the conventional system. In addition, the rising quality standards for organic and fairtrade coffee (Murray and Raynolds, 2006; Raynolds, 2009) increase production costs as more labor is needed. We agree with Kilian et al. (2006) that there is not much information about production costs of organic certification schemes. Kilian et al. (2006) and Van der Vossen (2005) find that organic farmers have higher production costs than conventional farmers which are not compensated adequately by premiums of organic or fairtrade prices. Other studies mention lower production costs (Nigh, 1997; Valkila, 2009). Mutersbaugh (2002) indicates that in Mexico organic coffee production is only successful when farmers have high yields and that premiums, at best, just cover production costs (Mutersbaugh, 2005). In contrary, Bray et al. (2002) show for Mexico that higher prices for organic coffee offset higher production costs and that farmers benefit from participation. The cited studies are based on the analysis of non-random samples of coffee farmers which may contribute to the contradictory results.

Qualitative research on the past ten years of coffee certification schemes as well as research combining qualitative with quantitative data, yet without random sampling and statistic analysis, is now abundant—for example Bacon et al. (2008); González and Nigh (2005); Kilian et al. (2006); Murray and Raynolds (2006); Mutersbaugh (2002, 2005); Raynolds et al. (2004); Utting-Chamorro (2005); and Valkila (2009). We found very few quantitative studies evaluating organic or fairtrade certification schemes (Arnould et al., 2009; Bacon, 2005; Becchetti and Costantino, 2008; Bolwig et al., 2009) based on a random sample with a treatment and control group. Similar findings are stated by Becchetti and Costantino (2008) for evaluations of the fairtrade certification in general. Arnould et al. (2009) only focus on the benefits of fairtrade certification in regard to coffee revenue, education, and health in three countries in Latin America. Bacon (2005) proves farm-gate price differences for organic and fairtrade coffee producers during the coffee crisis. Bolwig et al. (2009) find positive effects for participation in a certified contract scheme and modest effects for the application of organic farm techniques. Becchetti and Costantino (2008) focus on effects of fairtrade vegetable and fruits in Kenya on crop diversity, market price, price satisfaction, living conditions, food consumption, dietary quality, and child mortality.

Poverty in small-scale farming systems is strongly linked to crop and animal production, therefore it is important to additionally analyze production costs and prices of non-certified farm products as well as total household income. Summarizing, no study so far has systematically investigated production costs, profitability, household income and poverty of organic and fairtrade certified coffee producing households based on a quantitative analysis with randomly selected producers. However, for national governments and international donor agencies to make effective policies for poverty reduction, quantitative data about profitability, poverty development and poverty reduction potentials of certification schemes are of great importance.

This paper contributes to filling this gap with a random sample quantitative study comparing two certification schemes – the organic certification and the double certification organic-fairtrade – against a control group of conventional coffee producers in Nicaragua. Our study shall provide quantitative evidence to policy makers and donors who are currently supporting or planning to support certification schemes as a tool to reduce poverty. We analyze the three following research questions:

1. Which types of smallholders participate in conventional, organic and organic-fairtrade certified coffee production schemes?
2. In comparison to conventional producers, what are the income effects of participation in certified[2] coffee production?
3. How did poverty of conventional and certified small-scale producers evolve in the past ten years and are there any differences in their current poverty level?

Our hypotheses are:

**Hypothesis 1.** The organic coffee production system is more laborious than the conventional system but labor requirements are covered by available family labor. As organic coffee production requires less expenditures for purchased inputs we thus expect lower variable production costs than in the conventional coffee production.

**Hypothesis 2.** a. Prices at farm-gate are higher in certified than in conventional market channels. b. These higher prices are sufficient to cover additional costs of participation and lead to net increases in per hectare and per capita coffee income as compared to conventional producers.

[1] In 2007, the fairtrade minimum price for conventional washed Arabica coffee in Central America was 2.67 US$/kg coffee 'Free on Board' (FOB), the organic differential 0.33 US$/kg, and the social premium 0.11 US$/kg. From July 2008 onwards, the fairtrade minimum price, organic differential, and premium were raised.

[2] For simplification, we use the term 'certified' when speaking about both organic and organic-fairtrade certified coffee.

**Hypothesis 3.** Ten years ago conventional and certified farmers had equal poverty levels. Since then, relative poverty levels of households participating in organic and organic-fairtrade developed more positively than of the conventional producers.

Additionally, for hypotheses (2) and (3) we expect organic-fairtrade producers to fare even better than the organic producers given fairtrade certification's stronger focus on poverty reduction and rural development.

The next section describes the data collection process and methods used for measuring coffee profitability, income and poverty. This is followed by the results and discussion before conclusions regarding the profitability and poverty effects of certification schemes are drawn.

## 2. Methodology

In this section, we first describe the survey area and data collection process. Then we explain the methods used for measuring profitability as well as absolute and relative poverty.

### 2.1. Data Collection

The survey was conducted in the northern Nicaragua departments Madriz and Nueva Segovia on coffee farms situated between 900 m and 1300 m a.s.l. The coffee of all farmers was classified as strictly high grown; the species is *Coffea arabica*. The sample design ensured that the research region was homogeneous with respect to living conditions, socio-economic level, as well as coffee growing characteristics driving performance of coffee farmers. Quantitative household data were collected in 2007, complemented by qualitative data from 48 key-person interviews with cooperative staff, exporters, roasters and researchers, 33 semi-structured producer interviews and 21 focus group discussions (with an average group size of nine participants) undertaken in 2007 and 2008.

As no complete list of existing cooperatives was available, we constructed a cooperative list for the research region. We classified cooperatives according to their certification and market channel in conventional, organic and organic-fairtrade certified cooperatives. Cooperatives had to be certified for a minimum of five years. From this list, we randomly selected half of the cooperatives in each market channel, which resulted in seven cooperatives with one having conventional as well as organic producers. Depending on the cooperative, either a random sampling or a two-stage random sampling was applied to select participating members. 327 cooperative members were surveyed with a structured questionnaire. Coffee producing members were classified into three groups according to their production: conventional, organic and organic-fairtrade. In those cases where a household had several coffee producers, all were interviewed and the data aggregated at the household level. A conventional cooperative dropped out at the end of the data collection period, which lowered the sample size of conventional farmers.

### 2.2. Measuring Profitability

The profitability of smallholder coffee production is measured by gross margins, profits and break-even analyses. The achieved coffee prices are discounted according to the time difference between main month of coffee delivery and final settlement of the bill. This approach is chosen as certified producers receive the final payment long after harvest has finished, at earliest around four to five months, but usually around eight to nine months, after first harvest delivery. The price for certified coffee already includes the direct certification costs the cooperative had to bear. It also includes the direct costs of the internal control system, which is a requirement for organic group certification.

At harvest time, both conventional and certified farmers need additional cash to cover the high costs of harvesting. Therefore, they sell part of their harvest in the spot market at conventional coffee prices. Five different spot market channels are used: intermediaries coming to the farm, intermediaries in villages, exporters, other cooperatives or the coffee is sold to the own cooperative at spot market prices. Thus, the total coffee revenue is based on various prices. It is given by

$$R_i = x_i p_i^{disc} + \sum_{j=1}^{5} y_{ij} p_{ij}^{spot} \tag{1}$$

where $R_i$ = the total revenue from coffee production; $i$ = the household index ($i = 1,\ldots,N$); $x_i$ = the coffee quantity sold to cooperative; $p_i^{disc}$ = the discounted coffee price (where applicable); $y_{ij}$ = the coffee quantity sold to spot market channels with $j = 1,\ldots,5$; and $p_{ij}^{spot}$ = the spot market coffee price for the respective market channel. Eq. (1) is then used to derive the average price $P_i^{aver}$ a farmer received across all channels, given the equation:

$$P_i^{aver} = \frac{R_i}{x_i + \sum_{j=1}^{5} y_{ij}} \tag{2}$$

Gross margins are useful to compare the profitability of different crops or production systems. The equation for gross margin per hectare coffee is given by

$$GM_i = \frac{1}{a_i}\left(R_i - \left(c_i^{inp} + c_i^{harv} + c_i^{hlb}\right)\right) \tag{3}$$

where $GM_i$ = the gross margin of one hectare coffee; $R_i$ = the revenue from coffee production (Eq. (1)); $c_i^{inp}$ = the variable input costs (chemical and organic fertilizer as well as pest, disease, weed control; nursery and transport costs); $c_i^{harv}$ = the variable harvest costs including hired labor for coffee picking (as payment is per quantity not per hour); $c_i^{hlb}$ = the hired labor costs; $a_i$ = the coffee area in hectare; and $i$ = the household index ($i = 1,\ldots,N$). The accounting profit per hectare $A_i$ is the difference between the gross margin (Eq. (3)) and the fixed costs. The main fixed cost in small-scale coffee production is the depreciation cost of the depulper[3] per hectare $c_i^{dep}$. The accounting profit $A_i$ is thus given by:

$$A_i = GM_i - c_i^{dep} \tag{4}$$

This is the return to family labor and management used in coffee production and constitutes the cash income per hectare of coffee available to the household. The cash income for the whole coffee area is later compared to the income threshold of the poverty line (see Section 2.3).

Although not included in the accounting profit of a coffee farm, opportunity costs exist and are important for managerial and policy decisions (Kay et al., 2004) as they indicate the differences in efficiency of resource use in the three production systems. Therefore, we estimate the economic profit through inclusion of the opportunity costs for the production factors (Torre, 2002). The economic profit is calculated as

$$E_i = A_i - c_i^{opd} - c_i^{opvar} - c_i^{opland} - c_i^{opflb} \tag{5}$$

where $E_i$ = the economic profit per hectare coffee; $c_i^{opd}$ = the interest for depulper; $c_i^{opvar}$ = the interest for variable costs; $c_i^{opland}$ = the opportunity costs for land[4] and $c_i^{opflb}$ = the opportunity costs for family labor. The interest rate used for evaluating the opportunity costs is 17%, based on a weighted average between the nominal interest rate for borrowed capital and the interest rate for savings[5].

[3] Depreciation costs are estimated based on qualitative interviews.

[4] As some interviewees had difficulties estimating their land value, we use the mean value across all households.

[5] The average yearly interest rate for borrowed capital is 24%, and for savings 3%. As most of the expenses in coffee production are covered by credit, we weight the rate for borrowed capital at 70% and for savings at 30%.

We apply the estimation methods for opportunity costs of Reisch and Zeddies (1977) and Kay et al. (2004). The opportunity costs for family labor are valued with 60% of the salary that farmers could obtain as casual day laborers. We choose this approach as hardly any off-farm employment exists and casual labor is not available all year round.

Additionally, we measure the break-even yield ($\bar{y}$) and break-even price ($\bar{p}$). The return to family labor per working day ($\bar{a}$) is obtained by dividing the accounting profit (Eq. (4)) with the total amount of family labor person-days. A person-day is assumed to be eight hours which has been found in our study to be equivalent to the average working time on coffee farms in the region. The ratio of on-farm family labor per hectare of coffee ($\bar{r}$) is calculated by dividing the number of self-employed household members in agriculture with the total coffee area. The statistical measurement of profitability is based on Eqs. (1)–(5), $\bar{y}, \bar{p}, \bar{a}$ and $\bar{r}$. Profitability is measured for all sampled households and weighed according to the proportion of sample size to the total cooperative size in each producer group.

### 2.3. Measuring Absolute and Relative Poverty

We apply the income method to measure absolute poverty. In order to measure relative poverty, we construct a poverty index. This section describes both methods.

#### 2.3.1. Measuring Absolute Poverty

Absolute poverty measurements have traditionally relied on either measuring total income or total consumption expenditures of a household. As we are interested in coffee income and its contribution to the total income, we chose to collect income data of a household. Apart from the coffee data, additional income variables like off-farm income, remittances, pensions, crops sold and consumed, sold animals or animal products, and sales of firewood are used. Our approach has certain limitations. The value of sold animals is likely to be over-estimated as production costs were not collected. The production costs of food crops are in part estimated based on secondary data from Aburto Sanchez (2008). The value of home consumption of animals and their products, an in-kind source of income, is omitted. However, this omission is likely to cause only a small error as there is – apart from chicken eggs – a very low amount of home-consumption of animal products observed. The equation used for total per capita income is

$$I_i^{pc} = \frac{1}{f_i}\sum_{j=1}^{7} z_{ij} + \sum_{k=1}^{7}(r_{ik} - c_{ik}) \quad (6)$$

where $I_i^{pc}$ = the total per capita income; $i$ = the household index ($i = 1, \ldots, N$); $f_i$ = the family size; $j$ = the non-crop income type; $z_{ij}$ = the income of household $i$ generated by income type $j$; $k$ = the crop type; $r_{ik}$ = the return of crop $k$; and $c_{ik}$ = the production costs for crop $k$.

According to the total per capita income (Eq. (6)), it is possible to classify a coffee producing household above or below national and international poverty lines. We apply four absolute poverty lines. The national poverty line and the extreme poverty line for 2007 are based on the poverty lines from 2005 published in the 'Nicaragua Poverty Assessment' of the World Bank (2008). We adjust them with the Consumer Price Index (CPI) for 2007. The extreme poverty line is a food poverty line while the general poverty line includes expenditures such as housing, clothing and schooling. For 2007, the national poverty line is 442.6 US$ and the extreme poverty line 246.8 US$. We include the '$1-a-day' and '$2-a-day' poverty lines because these are the common poverty lines for international country comparisons (Van de Ruit and May, 2003). After being adjusted with the Purchasing Power Parity (PPP) for Nicaragua in 2007, the '$1-a-day' poverty line is equivalent to 200.6 U$ per year; the '$2-a-day' poverty line to 320.95 US$ per year.

All poverty lines use income/expenditure as the only dimension to describe well-being.

### 2.4. Measuring Relative Poverty

Poverty's multidimensionality means that it cannot be exclusively measured by income or expenditures (Anand and Sen, 1997). Therefore, we also measure poverty using an index derived from indicators which cover different dimensions of poverty like quality of housing, food consumption, household assets and demographic data. Several studies have found that these proxy variables are reliable indicators of well-being (Van de Ruit and May, 2003; Zeller et al., 2006). These variables are aggregated, based on defined weights, into a univariate poverty index. The weights for poverty indices can be derived by several methods. One method is 'Principal Component Analysis (PCA)', which several authors have applied to derive so-called wealth or poverty indices with good results (Filmer and Pritchett, 2001; Van de Ruit and May, 2003; Zeller et al., 2003, 2006). We follow the method of measuring relative poverty described by Zeller et al. (2006) which uses PCA to determine the weights for a defined set of variables and to obtain a poverty score of each household. The model estimating the poverty index is calibrated for the control group of conventional coffee producers. Variables which show no impact are excluded. The final model is then applied to the whole sample. In the next step, the conventional control group is divided into terciles yielding three groups with poorest, less poor and least poor households. According to their poverty score, certified coffee households are classified into one of the three poverty groups. The quantitative data was triangulated with qualitative data from the focus group and individual interviews.

In order to identify how poverty developed among the three groups from 1997 to 2007, we used recall questions for these time periods as panel data does not exist. The recall questions were based on quantitatively measurable variables which are easily remembered like housing conditions, and the ownership of transport assets, major household appliances and (electronic) assets, animals and farm tools. While the data obtained by such long-term recall questions is likely to be less precise than the information regarding current asset status, the asset indicators chosen (e.g. TV, radio, and number of rooms) were vividly remembered by all interviewees given their low asset levels.

To measure the changes of relative poverty over time, we include only those households that already existed in 1997, which decreases the sample size. To compare the relative poverty status over time, poverty indices are calculated for 1997, 2002 and 2007, allowing for flexible weights and flexible variables as the indicators for best describing relative poverty are likely to change over such a time period. This approach may be affected by a selection bias as those households which had left coffee production or the cooperatives since 1997 could not be included. It is difficult to control for this missing data and it could influence the result in either direction.

## 3. Results and Discussion

The household characteristics of conventional, organic and organic-fairtrade certified producers do not show strong differences (Table 1). In general, small-scale coffee producing households are mainly headed by men in their forties, the majority of whom are able to read and write, but have not finished primary school. They take care of more than five household members, of which up to 50% are children. Organic-fairtrade farmers have the highest child dependency ratio. More than 20% of the household adults are illiterate and around 40% did not finish their primary school. Around 30% participated in secondary education, often the young adults, but only few finished high school or have tertiary education. Close to 50% of the household adults are self-employed in agriculture. Food crops are grown beside coffee and are usually consumed at home; surpluses are sold at local markets. Mainly male adults work in agriculture while women are more involved in domestic work. Apart from helping out in coffee production – especially at harvest time – some women also own tiny convenience shops. Off-farm work is more common among certified producers but is not a major income

**Table 1**
Profile of conventional and certified smallholder coffee producing households, mean values for 2007.

| | Conventional [n = 68] | Organic [n = 108] | Organic-fairtrade [n = 105] |
|---|---|---|---|
| Share of female-headed household (%)‡ | 8.4 ± 28.0 | 17.6 ± 38.3 | 13.4 ± 34.2 |
| Age of household head† | 46.3 ± 13.0 | 43.5 ± 12.4 | 43.5 ± 11.3 |
| Household head can read and write (%)‡ | 80.2 ± 40.2 | 76.1 ± 42.8 | 72.4 ± 44.9 |
| Number of household members† | 5.4 ± 1.8 | 5.7 ± 2.3 | 5.7 ± 2.1 |
| Child dependency ratio† | 0.8 ± 0.6 | $0.7 \pm 0.6^{a}$ | $0.9 \pm 0.7^{a}$ |
| Share of illiterate adults (%)*‡ | 20.0 ± 25.8 | 20.9 ± 31.2 | 29.2 ± 34.9 |
| Share of adults with <6 years education (%)*† | 38.8 ± 30.1 | 46.8 ± 30.8 | 42.6 ± 33.0 |
| Share of adults with ≥6 and <12 years education (%)*† | 31.6 ± 22.0 | 33.2 ± 21.0 | 26.5 ± 19.0 |
| Share of adults with ≥12 years education (%)*‡ | $11.0 \pm 14.0^{e}$ | $4.7 \pm 12.5^{e}$ | 9.4 ± 16.4 |
| Share of adults self-employed in agriculture (%)‡ | 47.0 ± 17.9 | 48.7 ± 19.7 | 42.6 ± 22.6 |
| Share of adults with off-farm work (%)‡ | $3.3 \pm 11.8^{c}$ | 6.9 ± 15.5 | $9.7 \pm 20.3^{c}$ |
| Number of self-employed in agriculture‡ | 1.5 ± 0.8 | $1.8 \pm 1.2^{a}$ | $1.3 \pm 0.8^{a}$ |
| Total land area (ha)‡ | $8.7 \pm 10.2^{a}$ | $5.4 \pm 7.5^{a}$ | 6.0 ± 6.6 |
| Per capita value of animal assets (US$)‡ | 186.7 ± 754.0 | 103.9 ± 346.6 | 56.6 ± 133.1 |
| Per capita value of transport assets (US$)‡ | 99.1 ± 266.8 | 69.9 ± 322.2 | 158.6 ± 828.4 |
| Per capita value of major household assets (US$)‡ | $41.3 \pm 83.4^{c}$ | $18.8 \pm 38.7^{c}$ | 30.1 ± 57.7 |
| Per capita value of yearly off-farm income (US$)‡ | $54.5 \pm 145.9^{c}$ | $43.9 \pm 142.9^{a}$ | $126.9 \pm 543.5^{ca}$ |
| Per capita value of home consumption (US$)‡ | 68.1 ± 79.7 | 58.4 ± 52.4 | 48.9 ± 53.1 |
| Total per capita income (US$)‡ | $498.5 \pm 432.7^{e}$ | $406.7 \pm 390.3^{e}$ | 499.6 ± 957.6 |
| Share coffee income to total per capita income (%)‡ | 59.9 ± 28.6 | $63.1 \pm 26.3^{e}$ | $53.7 \pm 48.1^{e}$ |

Note: Superscript letters indicate a significant difference between two groups marked by the same letter. [a] or [b] indicates a significant difference at $p<0.01$, [c] or [d] indicates a significant difference at $p<0.05$, and [e] indicates significance at $p<0.1$. * The educational shares do not sum up to 100% as some adults went to primary school but have not learned to read or write. † Normally distributed variables. ANOVA was used to test for statistical differences, followed by pairwise comparisons based on the Bonferroni post hoc test. ‡ Non-normally distributed variables. Kruskal-Wallis tests were used to test for statistical differences, followed by pairwise comparisons based on the Mann–Whitney post hoc test adjusted by the Bonferroni correction factor (Field 2005).

**Table 2**
Gross margins and profit calculations per hectare of conventional and certified coffee production, 2007.

| | Conventional [n = 68] | Organic [n = 108] | Organic-fairtrade [n = 104] |
|---|---|---|---|
| Coffee area (ha)‡ | $3.2 \pm 2.3^{ab}$ | $2.2 \pm 2.0^{a}$ | $2.4 \pm 2.6^{b}$ |
| Yield of green coffee (kg/ha)‡ | $365.9 \pm 192.4^{e}$ | $434.4 \pm 253.8^{ea}$ | $353.9 \pm 176.7^{a}$ |
| Average farm-gate coffee price $P_i^{aver}$ (US$/kg)‡ | $2.1 \pm 0.2^{ab}$ | $2.3 \pm 0.2^{a}$ | $2.3 \pm 0.3^{b}$ |
| Revenue from coffee (US$/ha)‡ | $762.7 \pm 395.3^{a}$ | $987.7 \pm 587.9^{ac}$ | $825.1 \pm 421.4^{c}$ |
| Chemical disease, pest, weed treatment‡ | 5.1 ± 13.0 | 0.0 ± 0.0 | 0.0 ± 0.0 |
| Organic disease and pest treatment‡ | $1.5 \pm 6.0^{ab}$ | $4.1 \pm 6.9^{a}$ | $8.0 \pm 22.2^{b}$ |
| Chemical fertilizer‡ | 32.3 ± 73.0 | 0.0 ± 0.0 | 0.0 ± 0.0 |
| Organic fertilizer‡ | $0.1 \pm 0.7^{a}$ | $1.5 \pm 9.4^{b}$ | $7.5 \pm 40.7^{ab}$ |
| Nursery and transport‡ | 8.6 ± 11.5 | 10.9 ± 18.0 | 8.6 ± 9.9 |
| *Total input costs (US$/ha)‡* | *47.6 ± 85.0* | *16.5 ± 22.6* | *24.1 ± 63.5* |
| Harvest costs (incl. hired harvest workers)‡ | 129.7 ± 85.1 | 136.9 ± 97.7 | 141.8 ± 91.2 |
| Hired labor (without labor employed in harvest) ‡ | 81.5 ± 86.7 | $91.8 \pm 152.8^{c}$ | $141.7 \pm 159.9^{c}$ |
| *Total variable production costs (US$/ha)‡* | *258.7 ± 159.4* | *245.2 ± 201.8* | *307.6 ± 242.5* |
| Gross margin from coffee (US$/ha)‡ | $504.0 \pm 349.2^{a}$ | $742.5 \pm 514.2^{ab}$ | $517.5 \pm 328.2^{b}$ |
| Depreciation of depulper (US$/ha)‡ | $14.1 \pm 10.1^{ab}$ | $26.3 \pm 27.0^{a}$ | $20.8 \pm 14.5^{b}$ |
| Accounting profit (US$/ha)‡ | $489.9 \pm 346.0^{a}$ | $716.1 \pm 502.0^{ab}$ | $496.7 \pm 330.4^{b}$ |
| Interest of depulper‡ | $22.1 \pm 16.0^{ab}$ | $41.4 \pm 42.5^{a}$ | $32.7 \pm 22.8^{b}$ |
| Interest for variable production costs for 6 months‡ | 11.0 ± 6.8 | 10.4 ± 8.6 | 13.1 ± 10.3 |
| Land charge*‡ | 58.0 ± 0.0 | 58.0 ± 0.0 | 58.0 ± 0.0 |
| Opportunity costs of family labor‡ | $207.6 \pm 130.0^{c}$ | $278.2 \pm 183.4^{c}$ | 246.1 ± 166.1 |
| Economic profit (US$/ha)‡ | $191.2 \pm 292.6^{c}$ | $328.2 \pm 394.5^{ca}$ | $146.8 \pm 298.1^{a}$ |

Note: Superscript letters indicate a significant difference between two groups marked by the same letter. [a] or [b] indicates a significant difference at $p<0.01$, [c] or [d] indicates a significant difference at $p<0.05$, and [e] indicates significance at $p<0.1$. ‡ Non-normally distributed variables. The same significance tests as noted in Table 1 were applied. * Local interest rate for savings of 3% used as most producers obtained land for free from land distribution and renting of coffee areas is uncommon.

source. Conventional and organic certified producers gain around 60% of their available income from coffee production, and organic-fairtrade certified producers slightly less. As total per capita income is not higher than 500 US$ per year, the asset values are pretty low. Conventional farmers own more land and invest more in animals while organic-fairtrade farmers invest in transport assets. The standard deviation of some variables is very high as each group includes some very poor and some better-off farmers. This is the main reason for apparently different mean values being not statistically different.

In the research region, smallholder coffee producers generally pursue low input production systems. Their coffee plantations are of mixed age with 20 year old trees next to rejuvenated or young coffee trees. The average green coffee yield in Nicaragua is 761.45 kg/ha (IICA, 2004). Conventional and organic-fairtrade certified coffee yields are more than 50% below national average, and yields from organic coffee on average are 43% lower (Table 2). The qualitative interviews indicated that the main reasons for these differences are poorly managed plantations, insufficient fertilization and low planting densities. The higher yield levels of organic farmers in comparison to the other producers are unexpected. The differences cannot be contributed to the organic production system as such because the fairtrade certified producers have the same production system. Possible reasons can be differences in the applied quantities of organic fertilizers, better coffee management practices of organic farmers as well as a higher density of coffee trees per hectare. They relate to the ratio of land size and number of self-employed adults. Organic producers have the smallest mean coffee area but have the highest ratio of on-farm family labor per coffee hectare (see Table 3). They can manage their coffee plantations without having to invest much in hired labor and thus in labor supervision costs. This management could be explained by diseconomies of scale frequently found in family farms (Eastwood et al., 2010). Another explanation would be that smaller plots tend to receive more attention than larger coffee plots which can be described by the inverse relationship between farm size and land productivity (and thus the labor/land ratio) (Carter, 1984; Eastwood et al., 2010).

The certified cooperatives sell over 85% of their coffee in certified market channels. The average farm-gate coffee price differed significantly between conventional and organic as well as between conventional and organic-fairtrade farmers (Table 2). In comparison to conventional coffee prices, organic producers received 8% and organic-fairtrade producers 11% higher prices. The absolute difference is around 0.2 US$/kg[6] coffee which confirms our hypothesis (2a) of

[6] The exchange rate for Nicaraguan Córdoba against US$ was 1 US$ = 18.96 C$ as of 31 August 2007.

**Table 3**
Break-even analysis, labor requirements and net coffee incomes of conventional and certified coffee production, 2007.

| | Conventional [n = 68] | Organic [n = 108] | Organic-fairtrade [n = 104] |
|---|---|---|---|
| Break-even yield at average farm-gate price (kg/ha)‡ | 124.6 ± 76.5 | 107.6 ± 88.2 | 133.5 ± 102.5 |
| Break-even price at given hectare yield level (US$)‡ | 0.8 ± 0.5$^{e}$ | 0.7 ± 0.7$^{ea}$ | 0.9 ± 0.6$^{a}$ |
| Return per family labor person-day (US$/day)‡ | 6.2 ± 6.4 | 5.4 ± 3.3 | 5.1 ± 3.4 |
| No. of person-days used per ha*‡ | 104.3 ± 52.2$^{ac}$ | 156.1 ± 84.3 $^{ad}$ | 136.9 ± 65.3$^{cd}$ |
| No. of hired person-days used per ha ‡ | 17.9 ± 22.3$^{c}$ | 23.0 ± 34.7$^{e}$ | 35.2 ± 40.1$^{ce}$ |
| No. of family person-days used per ha‡ | 86.4 ± 49.7$^{a}$ | 133.1 ± 78.7$^{ab}$ | 101.7 ± 51.0$^{b}$ |
| Ratio of on-farm family labor per ha coffee ‡ | 0.7 ± 0.7$^{a}$ | 1.7 ± 2.4$^{ab}$ | 0.9 ± 0.8$^{b}$ |
| Net income for whole coffee area (US$)‡ | 1416.9 ± 1373.7 | 1202.3 ± 1127.2 | 1361.2 ± 2227.4 |
| Per capita net coffee income (whole area) (US$)‡ | 289.3 ± 302.3 | 240.2 ± 248.7 | 279.1 ± 462.2 |

Note: Superscript letters indicate a significant difference between two groups marked by the same letter. $^{a}$ or $^{b}$ indicates a significant difference at $p<0.01$, $^{c}$ or $^{d}$ indicates a significant difference at $p<0.05$, and $^{e}$ indicates significance at $p<0.1$. ‡ Non-normally distributed variables. The same significance tests as noted in Table 1 were applied. * Labor for weeding and harvest not included when paid as lump sum.

higher farm-gate prices paid in certified than in conventional market channels.

Due to the different yield levels, the revenue is significantly higher for the organic farmers while organic-fairtrade certified producers have only slightly higher revenues than their conventional colleagues. The certified coffee farmers know this problem as one organic-fairtrade certified producer explained *"[The price] is really good but more in our case it is not the price it is the yield we have per manzana,*[7] *we don't have a good yield"* (organic-fairtrade producer in a focus group interview, 7 April 2008). We assumed that organic coffee production involves lower expenditures for purchased inputs (Hypothesis 1). This cannot be confirmed because total input costs do not differ significantly between the groups, although the mean input expenditures for organic and organic-fairtrade producers were lower than for conventional producers (Table 2). Many of the organic production processes are more laborious as shown by the significant differences in total person-days per hectare in comparison to conventional production. The higher labor intensity was also frequently mentioned by farmers in the qualitative interviews. One organic-fairtrade producer explained that *"on the one hand, the organic [coffee] is [cheaper] because one spends less but as it was said there is more work, one has to work more because one has to make these compost heaps"* (focus group interview, 16 April 2008). Organic farmers cover the additional labor requirements mainly by family labor, although they also hire more labor than conventional farmers. Organic-fairtrade certified farmers tend to use less family labor and hire more labor which can be explained by the shortage of family labor, their higher child dependency and location effects with higher opportunity costs (Table 1). The sum of total variable production costs shows no significant differences between the three producer groups. This was not anticipated. The additional labor requirements of organic production were assumed to be fully covered by available family labor which is only partly true. Certified coffee producing families, especially organic-fairtrade certified ones, face labor constraints and thus need to hire additional labor. Therefore, Hypothesis 1 needs to be rejected as neither input costs nor production costs are significantly lower for certified producers and labor costs are likely to rise. The comments of organic coffee producers confirm this: *"The [production] costs are much higher because you have to give better maintenance to the farm"* and *"if I think about that [the production costs] it is not profitable"* (two organic producers in a focus group interview, 24 April 2008).

In comparing the gross margins and accounting profit per hectare for the three producer groups, no difference between conventional and organic-fairtrade producers is found although organic producers have a significantly better gross margin and accounting profit than the other two groups. As the same production technique is used, we expected the accounting profits of organic-fairtrade producers to be at least similar if not better than organic producers. The contrasting finding between these two groups can be explained by differences in yield levels, coffee area, and the ratio of on-farm family labor per coffee hectare which determines also differences in costs for hired labor. The large standard deviations regarding gross margins and profits per hectare are commonly observed (Kilian et al., 2006). These deviations indicate that different farm management techniques are applied and that there is potential for further income gains across all producer groups. The break-even yield and break-even price for all groups are much below the obtained yield and price level, therefore production costs are covered even when small changes in prices or yields occur. The return to family labor is higher than the paid average salary of 3.77 US$/day, including in-kind payments obtained by casual day laborers. The investment of family labor in coffee production pays off among all three producer groups.

Positive economic profits per hectare of coffee are derived on average by all producer groups, i.e. their coffee production is efficient. The highest efficiency is obtained by organic producers, the lowest by organic-fairtrade producers. The contrasting efficiency between organic and organic-fairtrade producers cannot be related to the organic production system. The standard deviations point out that there are also inefficient producers. This apparent non-rationality of continuing coffee production could be explained rationally by further considering risk aversion, loss of social status and high costs for switching to other land uses.

Whether a household can generate an income above the poverty line with coffee production depends on the accounting profit for the whole coffee area, and the net income, in relation to the family size. The net income for the whole coffee area is highest for conventional farmers, followed by organic-fairtrade certified farmers and lowest for organic farmers (Table 3). The per capita net coffee income follows the same order. Net coffee income for the whole area and per capita is not significantly different between the three producer groups. The per capita net coffee income in all producer groups is not high enough to enable farm households to meet all basic needs since per capita coffee incomes are below the national and the international '$2-a-day' poverty line. As an organic-fairtrade producer puts it: *"We have many years working organic […] we know that until now we have not, how to say it, better economic resources"* (focus group interview, 7 April 2008). Therefore, we anticipate the rejection of our hypothesis (2b) regarding per capita net coffee income. That certified farmers do not have higher net coffee incomes for the whole coffee area and per capita can be explained by their higher labor requirements due to organic production, and thus costs, which offset saved input costs. This is especially relevant for organic-fairtrade producers compared to conventional farmers. That organic producers fare slightly worse than conventional farmers can be additionally explained by their smaller coffee area.

Due to non-coffee income sources, total household income needs to be additionally considered when identifying the poverty status of a household. On average, only organic producers have a per capita income below the national poverty line (see Table 1). The other two groups have an average per capita income above the different poverty lines. As mean values do not reflect the heterogeneity within producer groups, producers are categorized according to their per capita incomes above or below the various poverty lines (Table 4). Compared to one-third of conventional producers, 45% of the organic and organic-fairtrade certified producers have per capita incomes below the extreme poverty line—which means that they cannot cover their food requirements. An organic producer explains that by the

[7] *1 manzana* = 0.705 ha.

**Table 4**
Percent of conventional and certified coffee producer households below the poverty line in 2007.

| | Conventional (%) | Organic (%) | Organic-fairtrade (%) |
|---|---|---|---|
| National extreme poverty line | 30.9 | 44.4 | 44.8 |
| National poverty line | 60.9 | 71.3 | 68.6 |
| World Bank '$1-a-day'[a] | 23.5 | 38.9 | 36.2 |
| World Bank '$2-a-day'[a] | 39.7 | 56.5 | 56.2 |

[a] indicates significance between the three groups at $p<0.1$ using $\chi^2$ tests.

time the cooperative has sold all the coffee and paid their producers *"now it is sure that the coffee comes at a good price but now everything is expensive. Thus we, the poor, always change for the worse, you understand? Of course, for us poor everything is failing although we try. Sometimes we say […] that it is better to sell the coffee at harvest time, although we will give it away for nothing, but we will buy cheaper beans and maize"* (organic producer in an interview, 18 May 2008). Around two-thirds of all producers are classified as poor according to the national poverty line. More organic and organic-fairtrade certified producer households than conventional producers have incomes below the poverty lines but no significant difference exists between the three groups.

As the absolute poverty levels were only based on the income dimension, we further analyzed the relative poverty levels based on different dimensions of poverty. The variables and their component loadings used for constructing the poverty index of 2007 are shown in Table 5. The variables cover several dimensions of poverty, such as quality of housing, food consumption, household assets and demographic data. Only one food variable could predict relative poverty differences between the groups. This was expected as chronic hunger and severe undernutrition is not so common among coffee farmers although food insecurity still persists. After calibration, the goodness of fit of the PCA model for all data is indicated by a Kaiser–Meyer–Olkin measure of sampling adequacy of 0.741, a highly significant Bartlett's Test of sphericity ($p<0.000$), an eigenvalue of the first component of 4.167 and an explained variance of the model of 26%. The mean poverty index for conventional producers was $0.25571 \pm 1.36924$, for organic producers $-0.10180 \pm 0.82492$ and for organic-fairtrade producers $-0.01082 \pm 0.84238$. Post-hoc tests show that organic farmers are relatively poorer than conventional farmers at $p<0.05$. There is no significant difference between the other producer groups.

The classification of conventional, organic and organic-fairtrade certified households in the three poverty groups, poorest, less poor and least poor, shows that more organic and organic-fairtrade certified households are in the poorest group than conventional households. To compare against the terciles of conventional households in each group, nearly half of the organic (49%) and organic-fairtrade (46%) households are in the poorest group. Differences in the less poor group are minor. Only 18% of organic producers are categorized as least poor, compared to 27% of organic-fairtrade producers and 33% of conventional producers. By and large, the comparison of relative poverty among the three groups confirms the above results with respect to absolute poverty. That coffee certifications as such do not help smallholders to earn incomes above the poverty line is confirmed by the qualitative interviews with key-persons. As a NGO-expert working in the smallholder coffee sector states: *"We need to see what [coffee producers and their cooperatives] can do in addition to coffee, because you have producers which will not even escape the situation of poverty in which they are now even if the coffee prices reach 200 US$ el quintal.*[8] *If they do not have a diversification strategy and see how they can create other alternatives to generate income opportunities, so much to fairtrade […], the people will not escape their situation – producers with three manzanas which each produces four to five quintales [of coffee] and with seven children – not even if they earn 250 US$ [per quintal] or more. In addition you have the problem that they don't have access to education, you have to pay for that […]. All this sums up and in the end you do not have the possibility to escape the poverty level in which you are"* (key-person interview, 13 May 2008).

**Table 5**
Variables and component loadings of the relative poverty index, 2007.

| | Component loading[a] |
|---|---|
| *Family structure* | |
| Percent of literate household adults | 0.299 |
| Share of adults with complete secondary school | 0.362 |
| Share of adults self-employed in agriculture | −0.356 |
| Share of adults self-employed in off-farm enterprise | 0.479 |
| *Food consumption* | |
| Times cheese served in last 7 days | 0.485 |
| *Housing* | |
| Floor material now | 0.365 |
| Cooking material now | 0.516 |
| Light source now | 0.525 |
| No of rooms per person | 0.402 |
| *Assets* | |
| Value of vehicles | 0.418 |
| Value of TVs | 0.782 |
| Value of DVD/VHS | 0.579 |
| Value of radios | 0.631 |
| Value of mobile phones | 0.615 |
| Value of gas/electric oven | 0.644 |
| Value of storage room | 0.452 |

[a] Component loading ranges from −1 to +1.

The question remains how poverty levels have developed in the past ten years. General living standards in Nicaragua have improved in the last ten years, as demonstrated by the increase in Human Development Index values from 0.597 in 1995 to 0.699 in 2007 (UNDP, 2009). Our data also show that all producer groups have developed positively and improved their housing conditions as well as asset composition from 1997 to 2007. To identify the trend in relative poverty among the three producer groups, poverty indices were calculated for the years 1997, 2002 and 2007.

We hypothesized that ten years ago conventional and certified farmers had equal poverty levels; the civil war only ended in 1990 and the country was still recovering from the vast destructions and losses (Ruben and Zerman, 2005). In 1997, there were less certified than conventional producers in the poorest group, more in the less poor and similar numbers in the least poor group (Table 6). The absence of statistical differences suggests that groups were rather homogeneous. Since 1997, the situation of organic farmers deteriorated and they became relatively poorer than the other groups in 2002 and 2007. The relative poverty levels of organic-fairtrade producers in 2002 reveal that, when conventional prices dropped below production costs during the coffee crisis, they were relatively less poor than the other two producer groups—an effect which may be contributed to the price stabilization through the guaranteed minimum price of fairtrade, described in other studies (Bacon, 2005; Raynolds et al., 2004). However, this positive trend reversed, and in 2007, organic-fairtrade certified farmers are predominately found in the poorest poverty group. They are relatively poorer than conventional farmers but not at statistically significant levels (Table 6). The hypothesis (3) that relative poverty levels of households participating in organic and organic-fairtrade certification schemes developed more positively than the conventional producers has to be rejected. While not being free of potential selection bias, we see the result as a challenge to conventional assumptions and as an interesting starting point for further research on long-term poverty effects of certification.

[8] *1 quintal* = 46 kg. *The mentioned coffee price converts to* 4.35 US$/kg.

**Table 6**
Comparison of relative poverty levels in 1997, 2002 and 2007; percent of conventional and certified households in three poverty groups.

| | Household grouping | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1997 | | | 2002 | | | 2007 | | |
| | Poorest | Less poor | Least poor | Poorest | Less poor | Least poor | Poorest | Less poor | Least poor |
| Conventional [n = 61] | 32.8 | 34.4 | 32.8 | 34.4 | 32.8 | 32.8 | 34.4 | 32.8 | 32.8 |
| Organic [n = 84] | 26.2 | 41.7 | 32.1 | 41.7 | 34.5 | 23.8 | 51.2 | 32.1 | 16.7 |
| Organic-fairtrade [n = 92] | 25.0 | 42.4 | 32.6 | 33.7 | 28.3 | 38.0 | 42.4 | 29.3 | 28.3 |

Note: To test for significant difference between the three groups $\chi^2$ tests were used.

Given the severe impact of the coffee crisis in Nicaragua, it is surprising that the relative well-being of organic-fairtrade producers during the crisis results in no lasting benefit for organic-fairtrade producers as currently they are relatively poorer than conventional producers. Conventional producers, who even had a slightly higher relative poverty level in 1997, suffered more in the coffee crisis and yet are slightly less relative and absolutely poor than the organic and organic-fairtrade producers. More research is needed to understand why organic-fairtrade producers managed the coffee crisis better but do not develop equally well as conventional producers during times of good coffee prices.

## 4. Conclusion

In this paper, we first analyzed if farm-gate coffee prices are higher in certified chains and lead to increasing net coffee income compared to conventional production. Second, we identified whether certified coffee producers are more or less poor than conventional producers with similar socio-economic characteristics and whether poverty levels have changed over time.

Organic-fairtrade coffee is found to achieve the highest farm-gate prices, followed by organic coffee in comparison to conventional prices. Organic production processes require fewer purchased inputs but are more laborious. Due to constrained availability of family labor, additional labor has to be hired which offsets saved input costs. The higher prices of certified coffees compensate for production costs but fail to increase per hectare gross margins and profits in the case of organic-fairtrade farmers compared to conventional produces. Organic producers have higher yields and thus experience an increase in per hectare gross margins and profits. Due to smaller coffee areas and large family size, the increase in gross margins does not result in improved per capita net coffee incomes for organic certified producers. Also organic-fairtrade certified producers do not have higher per capita net coffee incomes than conventional producers.

We conclude that the profitability of the organic certified production system is not clear cut; there is a trend that organic but not organic-fairtrade certified producers have higher gross margins and profits than conventional farmers in northern Nicaragua. Our study shows that higher farm-gate prices do not lead necessarily to higher per capita net coffee income, as yield levels, production costs, family and land size, as well as labor availability play important roles. Further research comparing several coffee producing countries could more specifically identify factors and conditions which determine economic success of certification schemes.

In comparison with previous literature that mainly approached poverty through qualitative studies, we measure poverty based on quantitative data. Among certified producers, a higher share of households is grouped below the poverty line than among conventional producers. This may indicate that the organic and organic-fairtrade coffee certifications as such do not help northern Nicaraguan coffee farmers to earn a coffee income above the poverty line or to make them better off than their conventional fellow men. Moreover, we find that over a period of ten years, organic certified producers became relatively poorer. Organic-fairtrade certified producers first improved their relative poverty status and were relatively better off than conventional producers during the coffee crisis. After the crisis, the relative poverty levels of organic-fairtrade producers deteriorated compared to conventional producers. Yet, we cannot rule out the possibility that the results are influenced by selection bias. This paper does not provide for a causal econometric impact analysis and such studies are strongly suggested for further research to test the claims that certified coffee production contributes to poverty reduction. Quantitative socio-economic evaluations of certification schemes should ideally be done in different institutional settings with producer groups of various countries and should include panel data. With such a design, the institutional, policy and market settings could also be compared in order to identify the conditions in which certifications are likely to work or not. Although our sample design does not allow for generalizations beyond the study area of northern Nicaragua the results are likely to be representative for coffee growers in higher altitudes in Nicaragua as production conditions are similar in these areas.

We recommend that the policy focus of government and donors should move from certification schemes to investments in the farm and business management skills of producers as well as the establishment of public extension and production support systems. There is a need for an efficient public extension system equipped with adequate financing as cooperatives do not have sufficient funds of their own to deliver these services; so far cooperatives depend only on short-term external funding. Furthermore, we propose public support for cooperatives, for example state credit at market conditions, to remove cooperatives' liquidity constraints at harvest time or to enable them to improve their credit services to farmers. Individual land titling of former collective land belonging to the cooperatives should be eased and implemented more quickly. Cooperatives should be supported through policies and funds during this process as they face a high administrative burden. Organic certified cooperatives could also think about creating their own central organic fertilizer production to be sold to their members as they often face constraints in producing sufficient fertilizer for their fields. We conclude that coffee yields, profitability and efficiency need to be increased, as prices for certified coffee cannot compensate for low productivity, land or labor constraints.

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## References


Aburto Sanchez, E., 2008. From subsistence to market oriented livestock smallholder development in Nicaragua and Honduras. Vol. 94 of Farming and Rural Systems Economics. Margraf, Weikersheim.

Anand, S., Sen, A., 1997. Concepts of human development and poverty: a multidimensional perspective. Human Development Papers. United Nations Development Programme (UNDP), New York.

Arnould, E.J., Plastina, A., Ball, D., 2009. Does fair trade deliver on its core value proposition? Effects on income, educational attainment, and health in three countries. Journal of Public Policy & Marketing 28 (2), 186–201.

Bacon, C., 2005. Confronting the coffee crisis: can fair trade, organic and specialty coffees reduce small-scale farmer vulnerability in northern Nicaragua? World Development 33 (3), 497–511.

Bacon, C., Ernesto Mendez, V., Gomez, M.E.F., Stuart, D., Flores, S.R.D., 2008. Are sustainable coffee certifications enough to secure farmer livelihoods? The Millenium Development Goals and Nicaragua's fair trade cooperatives. Globalizations 5 (2), 259–274.

Basu, A.K., Chau, N.H., Grote, U., 2003. Eco-labeling and stages of development. Review of Development Economics 7 (2), 228–247.

Becchetti, L., Costantino, M., 2008. The effects of fair trade on affiliated producers: an impact analysis on Kenyan farmers. World Development 36 (5), 823–842.

Bolwig, S., Gibbon, P., Jones, S., 2009. The economics of smallholder organic contract farming in tropical Africa. World Development 37 (6), 1094–1104.

Bray, D.B., Sánchez, J.L.P., Murphy, E.C., 2002. Social dimensions of organic coffee production in Mexico: lessons for eco-labeling initiatives. Society & Natural Resources 15 (5), 429–446.

Carter, M.R., 1984. Identification of the inverse relationship between farm size and productivity: an empirical analysis of peasant agricultural production. Oxford Economic Papers 36 (1), 131–145.

Daviron, B., Ponte, S., 2005. The coffee paradox. Global Markets, Commodity Trade and the Elusive Promise of Development. Zed Books, London and New York.

Eastwood, R., Lipton, M., Newell, A., 2010. Farm size. In: Pingali, P., Evenson, R. (Eds.), Handbook of Agricultural Economics. Vol. 4. Elsevier, Ch. 65, pp. 3323–3397.

Filmer, D., Pritchett, L.H., 2001. Estimating wealth effects without expenditure data—or tears: an application to educational enrollments in states of India. Demography 38 (1), 115–132.

Fitter, R., Kaplinsky, R., 2001. Who gains from product rents as the coffee market becomes more differentiated? A value-chain analysis. IDS Bulletin 32 (3), 69–82.

Gobbi, J.A., 2000. Is biodiversity-friendly coffee financially viable? An analysis of five different coffee production systems in western El Salvador. Ecological Economics 33 (2), 267–281.

González, A.A., Nigh, R., 2005. Smallholder participation and certification of organic farm products in Mexico. Journal of Rural Studies 21 (4), 449–460.

Gordon, C., Manson, R., Sundberg, J., Cruz-Angón, A., 2007. Biodiversity, profitability, and vegetation structure in a Mexican coffee agroecosystem. Agriculture, Ecosystems & Environment 118 (1–4), 256–266.

IFOAM, 2006. Organic agriculture and rural development. Accessed 20 July 2006. URL International Federation of Organic Agriculture Movements (IFOAM). http://www.ifoam.org/organic_facts/politics/pdfs/Rural_Development_Leaflet.pdf.

IICA, 2004. Cadena agroindustrial del café en Nicaragua. Instituto Interamericano de Cooperación para la Agricultura (IICA), Managua.

Kay, R.D., Edwards, W.M., Duffy, P.A., 2004. Farm Management, 5th Edition. McGraw-Hill, New York.

Kilian, B., Jones, C., Pratt, L., Villalobos, A., 2006. Is sustainable agriculture a viable strategy to improve farm income in Central America? A case study on coffee. Journal of Business Research 59 (3), 322–330.

Lewin, B., Giovannucci, D., Varangis, P., 2004. Coffee markets: new paradigms in global supply and demand. Agriculture and Rural Development Discussion Paper No. 3. World Bank, Washington D.C.

Linton, A., 2008. A niche for sustainability? Fair labor and environmentally sound practices in the specialty coffee industry. Globalizations 5 (2), 231–245.

Murray, D.L., Raynolds, L.T., 2006. The future of fair trade coffee: dilemmas facing Latin America's small-scale producers. Development in Practice 16 (2), 179–191.

Mutersbaugh, T., 2002. The number is the beast: a political economy of organic-coffee certification and producer unionism. Environment and Planning A 34, 1165–1184.

Mutersbaugh, T., 2005. Fighting standards with standards: harmonization, rents, and social accountability in certified agrofood networks. Environment and Planning A 37 (11), 2033–2051.

Nigh, R., 1997. Organic agriculture and globalization: a Maya associative corporation in Chiapas, Mexico. Human Organization 56 (4), 427–436.

Philpott, S.M., Bichier, P., Rice, R., Greenberg, R., 2007. Field-testing ecological and economic benefits of coffee certification programs. Conservation Biology 21 (4), 975–985.

Raynolds, L.T., 2009. Mainstreaming fair trade coffee: from partnership to traceability. World Development 37 (6), 1083–1093.

Raynolds, L.T., Murray, D., Taylor, P.L., 2004. Fair trade coffee: building producer capacity via global networks. Journal of International Development 16 (8), 1109–1121.

Reisch, E., Zeddies, J., 1977. Einführung in die landwirtschaftliche Betriebslehre. Bd. 2. Spezieller Teil. Ulmer, Stuttgart.

Rice, R.A., 2001. Noble goals and challenging terrain: organic and fair trade coffee movements in the global marketplace. Journal of Agricultural and Environmental Ethics 14 (1), 39–66.

Ruben, R., Zerman, Z., 2005. Why Nicaraguan peasants stay in agricultural production cooperatives. Revista Europea de Estudios Latinoamericanos y del Caribe 78, 31–47.

Slob, B., Osterhaus, A., 2006. A fair share for coffee producers. Business Unusual. Successes and Challenges of Fair Trade. FLO, IFAT, NEWS, and EFTA, Newcastle-upon-Tyne, pp. 121–139.

Taylor, P.L., Murray, D.L., Raynolds, L.T., 2005. Keeping trade fair: governance challenges in the fair trade coffee initiative. Sustainable Development 13 (3), 199–208.

Torre, A., 2002. The traditional economic approach to measuring economic profit. In: Standfield, K. (Ed.), Intangible Management. Academic Press, San Diego, pp. 247–256.

UNDP, 2009. Human Development Report. United Nations Development Program (UNDP), New York.

Utting-Chamorro, K., 2005. Does fair trade make a difference? The case of small coffee producers in Nicaragua. Development in Practice 15 (3–4), 584–599.

Valkila, J., 2009. Fair trade organic coffee production in Nicaragua—sustainable development or a poverty trap? Ecological Economics 68 (12), 3018–3025.

Van de Ruit, C., May, J., 2003. Triangulating qualitative and quantitative approaches to the measurement of poverty: a case study in Limpopo Province, South Africa. IDS Bulletin 34 (4).

Van der Vossen, H.A.M., 2005. A critical analysis of the agronomic and economic sustainability of organic coffee production. Experimental Agriculture 41 (4), 449–473.

Willer, H., Yussefi, M. (Eds.), 2007. The World of Organic Agriculture. Statistics and Emerging Trends 2007, 9th Edition. Internationale Federation of Organic Agriculture Movements (IFOAM) and Forschungsinstitut für biologischen Landbau (FiBL), Bonn.

Wills, C., 2006. Fair trade: what's it all about? In: Osterhaus, A. (Ed.), Business Unusual. Successes and Challenges of Fair Trade. FLO, IFAT, NEWS, and EFTA, Newcastle-upon-Tyne, pp. 7–27.

Wollni, M., Zeller, M., 2007. Do farmers benefit from participating in specialty markets and cooperatives? The case of coffee marketing in Costa Rica. Agricultural Economics 37 (2–3), 243–248.

World Bank, 2008. Nicaragua poverty assessment. Volume 1: Main Report. No. 39736-NI. World Bank, Washington D.C.

Zeller, M., Wollni, M., Abu Shaban, A., 2003. Evaluating the poverty outreach of development programs: results from case studies in Indonesia and Mexico. Quarterly Journal of International Agriculture 42 (3), 371–383.

Zeller, M., Sharma, M., Henry, C., Lapenu, C., 2006. An operational method for assessing the poverty outreach performance of development policies and projects: results of case studies in Africa, Asia, and Latin America. World Development 34 (3), 446–464.