Does Eco-Certification Have Environmental Benefits? Organic Coffee in Colombia

Marcela Ibañez
Courant Research Centre for
Poverty, Equity and Growth

Allen Blackman
Resources for the Future
Environment for Development Center for C.A.

ENTWINED Policy Seminar
Emerging Trends in Sustainable Trade
Stockholm, Sweden October 22, 2011

Outline

- Introduction
- Counterfactuals
- Literature
- Background
- Empirical strategy
- Data
- Results
- Conclusion

Eco-certification

- Definition. Three activities:
  - Setting environmental process standards
  - Checking adherence with those standards
  - Certifying producers that adhere
- Increasingly popular
  - Globally: over 600 eco-certification initiatives
  - Agricultural commodities:
    - Bananas: 15%
    - Wild caught fish 12%
    - Forest products: 10%
    - Coffee: 7%

Rationale for environmental benefits of certification

Consumers differentiate among goods based on env. and social attributes

→ Price premiums for certified goods

→ Financial incentives for producers to meet certification standards

→ Producers improve their environmental and/or social performance

Importance in developing countries

- Production of agricultural commodities can have serious adverse environmental effects
  - Agrochemical pollution
  - Deforestation
  - Soil erosion
- Conventional regulation often ineffective
  - Weak institutions
  - Lack of political will
  - Numerous small polluters
- Advocates: eco-certification sidesteps these constraints
  - A private sector system of incentives, monitoring and enforcement

Challenges to realizing benefits

- Certification standards and enforcement must be stringent enough to exclude poorly performing producers
- Price premiums must be high enough to offset certification costs and create financial incentives for certification
- Selection effects must not dominate: producers already meeting standards are not the only ones being certified.

Example: Organic coffee certification

- Key criteria: no agrochemicals
- In developing countries, often numerous small-scale traditional growers: “de facto” organic
- Primarily certifying these growers would not change producer behavior and would have limited environmental benefits

Does eco-certification actually improve environmental performance?

- An empirical question
- Evaluations needed

How do we measure the environmental impact of eco-certification?

- Impact = Difference between certified producers' environmental performance
  - with certification (observed)
  - without certification (not observed)
- Counterfactual: an estimate of certified producers' environmental performance would have been had they not been certified

Problematic counterfactual: Non-certified producers' performance

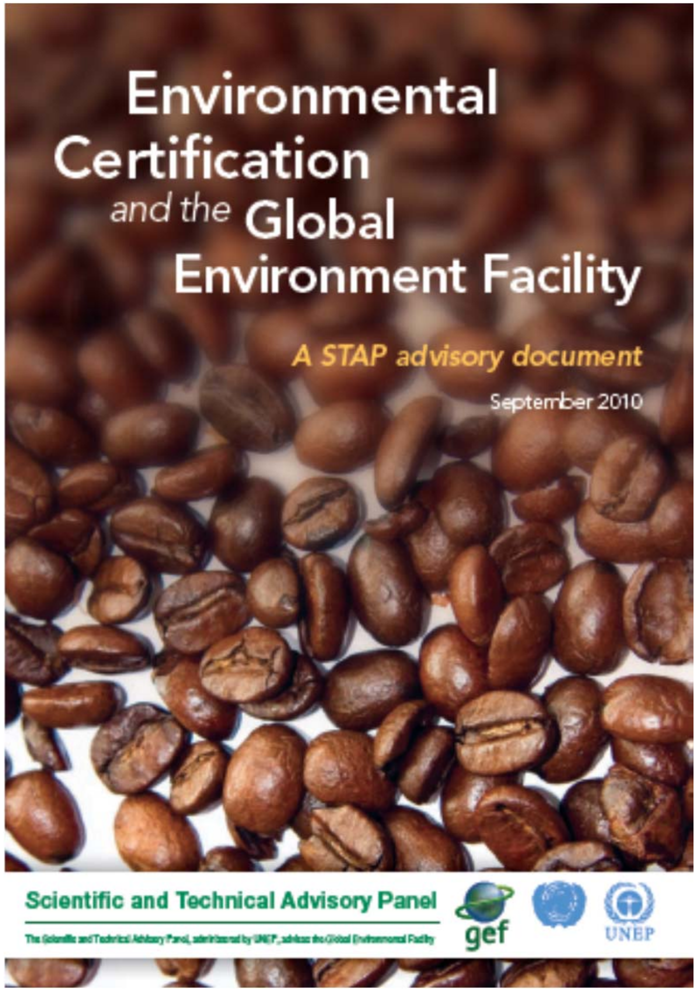
- Ignores the self-selection into certification of already-clean producers, which results in better average environmental performance of certified producers
- Thereby erroneously gives certification credit for spurring this better average environmental performance
- Generates misleading, overly optimistic conclusions about eco-certification impacts

Constructing a reasonable counterfactual

- Experimental (*ex ante*) approach
  - Randomly select producers to certify from among qualified and interested group, non-certified group = control
- Quasi-experimental (*ex post*) approach
  - Matching (among most common)
    - certified producers paired with
    - very similar non-certified producers (= counterfactual)
  - After matching
    - any difference in environmental performance between the certified and matched uncertified groups can be attributed to certification (versus pre-existing characteristics)

Literature 1/2

A. Blackman and J. Rivera. 2010. Environmental Certification and the Global Environment Facility. Science Technical Advisory Panel Advisory Document. September.



A. Blackman and J. Rivera. In Press. Producer-level Benefits of Sustainability Certification. *Conservation Biology.*

aptara	CBI	cobi_1774	Dispatch: October 3, 2011	CE: AFL
	Journal	MSP No.	No. of pages: 10	PE: Amanda

Review

Producer-Level Benefits of Sustainability Certification

ALLEN BLACKMAN*† AND JORGE RIVERA†‡
*Resources for the Future, Washington, D.C. 202-328-5073, U.S.A., blackman@rff.org
†Environment for Development Center for Central America, Turrialba, Costa Rica
‡George Washington University, Washington, D.C. 202-994-0163, U.S.A.

Abstract: *Initiatives certifying that producers of goods and services adhere to defined environmental and social-welfare production standards are increasingly popular. According to proponents, these initiatives create financial incentives for producers to improve their environmental, social, and economic performance. We reviewed the evidence on whether these initiatives have such benefits. We identified peer-reviewed, ex post, producer-level studies in economic sectors in which certification is particularly prevalent (bananas, coffee, fish products, forest products, and tourism operations), classified these studies on the basis of whether their design and methods likely generated credible results, summarized findings from the studies with credible results, and considered how these findings might guide future research. We found 46 relevant studies, most of which focused on coffee and forest products and examined fair-trade and Forest Stewardship Council certification. The methods used in 11 studies likely generated credible results. Of these 11 studies, 9 examined the economic effects and 2 the environmental effects of certification. The results of 4 of the 11 studies, all of which examined economic effects, showed that certification has producer-level benefits. Hence, the evidence to support the hypothesis that certification benefits the environment or producers is limited. More credible data could be generated by incorporating rigorous, independent evaluation into the design and implementation of projects promoting certification.*

Keywords: ecocertification, ecolabel, human-dominated landscape

Beneficios de la Certificación de la Sustentabilidad a Nivel de Productores

Resumen: *Las iniciativas de certificación de productores de bienes y servicios que se apegan a estándares ambientales y de producción de bienestar social son cada vez más populares. De acuerdo con los proponentes, estas iniciativas crean incentivos financieros para que los productores mejoren su desempeño ambiental, social y económico. Revisamos la evidencia para ver si esas iniciativas tienen tales beneficios. Identificamos estudios revisados por pares, ex post y a nivel de productores en sectores económicos en los que la certificación es particularmente prevalente (plátano, café, productos pesqueros, productos forestales y operaciones turísticas), los clasificamos considerando si su diseño y métodos generaron resultados creíbles, sintetizamos los hallazgos de los estudios con resultados creíbles y consideramos como estos hallazgos pueden dirigir investigaciones en el futuro. Encontramos 46 estudios relevantes, muchos de ellos enfocados en café y productos comerciales y con certificación de comercio justo y Forest Stewardship. Los métodos utilizados en 11 estudios generaron resultados creíbles. De estos 11 estudios, 9 examinaron los efectos económicos y 2 los efectos ambientales de la certificación. Los resultados de 4 de los 11 estudios, todos examinando efectos económicos, mostraron que la certificacion tiene beneficios a nivel de productores. Por lo tanto, la evidencia para soportar la hipotesis de que la certificacion beneficia al ambiente o a los productores es limitada. Se deben generar mas datos creíbles mediante la incorporación de evaluaciones independientes más rigorosas en el diseño e implementación de proyectos que promueven la certificación.*

Palabras Clave: ecocertificación, eco-etiquetas, paisaje dominado por humanos

Paper submitted August 26, 2010; revised manuscript accepted October 7, 2010.

Conservation Biology, Volume **, No. *, 1–10

DOI: 10.1111/j.1523-1739.2011.01774.x

Our findings: Very little evidence!

- Published peer reviewed studies of nonmanufacturing eco-certification
  - 213
- *Ex post* studies of actual eco-certification programs
  - 46
- Constructed a reasonable counterfactual
  - 11
- Examined environmental impacts
  - 2
    - Rivera and de Leon (2004): tourism certification in US
    - Rivera et al. (2006): tourism certification in US
- Found evidence of environmental benefits
  - 0

Coffee in Colombia

- Scale
  - 900,000 hectares
  - 8 million 60 kg bags per year (8% global exports)
  - $US 1.7 billion in export revenues
  - Majority of farms < 5 hectares
- Environmental impacts
  - 2/3 coffee is “technified” monocrop with minimal shade and intensive application of agrochemicals
  - Soil erosion; surface and groundwater pollution; occupational exposure

Criteria for organic certification

- Use compost instead of chemical fertilizers
- Use natural pest and weed control instead of pesticides herbicides
- Adopt soil conservation practices
- Minimal use of fossil fuels
- Minimal pollution during harvesting

Organic coffee in Colombia

- First certifications in 1980s
- Today
  - 95,000 60 kg bags per year
  - 16% of global exports of organic coffee

Cauca, Colombia

Study area

- Cauca Department
  - 16% of coffee farms, 8% acreage
  - Leading center of organic production
- 5 municipalities (Inza, Cajibo, Tambo, Timbio, La Sierra)
  - 331 certified organic growers harvesting 587 has.
  - 162 growers in transition to certification harvesting 211 has.
  - Virtually all certification after 1997
- Local certifying agencies
  - Bio-Latina
  - IMO-Controls
  - Organic Crop Improvement Association

Empirical strategy: matching

- Compare environmental performance of
  - Organic certified growers
  - Matched non-certified growers = counterfactual
- Propensity scores used to identify best matches
  - Probability of certification as predicted by a probit regression
  - An index of grower characteristics weighted by their importance in predicting certification

Data

- Original 2007 survey
  - 379 randomly selected growers
  - Administered on-site by trained enumerators
  - Grower and farm characteristics for 2007 and 1997
- Attrition (n = 147)
  - Not producing in 1997 (n = 94)
  - Multiple certifications (n = 35)
  - Other reasons (n = 9)
- Regression sample (n = 232)
  - Certified growers (n = 56)
  - Non-certified growers (n = 176)

Outcome variables & sample means

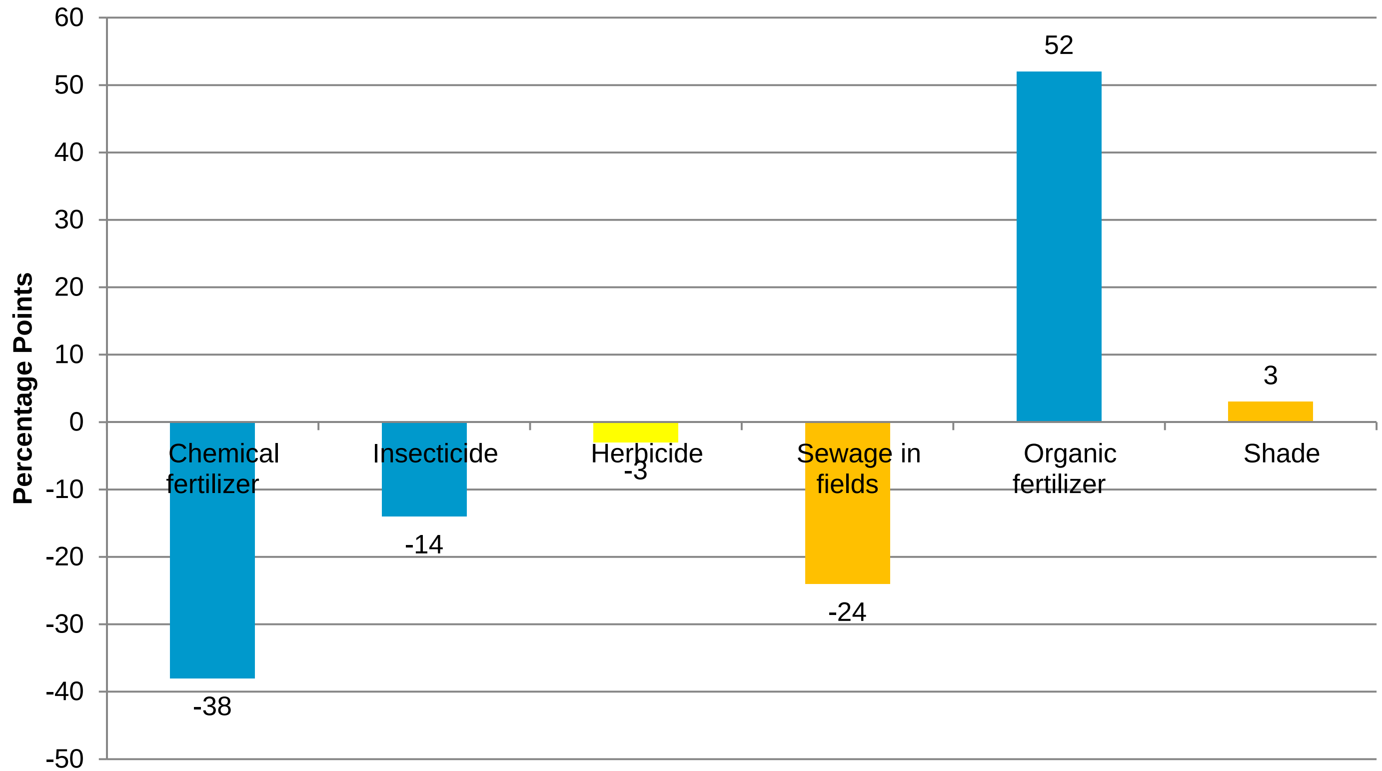
- "Negative" practices
  - Chemical fertilizers 38%
  - Chemical insecticides 13%
  - Chemical herbicides 12%
  - Dispose sewage in fields 29%
- "Positive" practices
  - Organic fertilizer 51%
  - Shade trees 95%

Testing for impact: Average Treatment Effect on Treated (ATT)

- ATT = difference of means test (for each of 6 production practices) ($\mu_C - \mu_U$)
  - μ_C = mean rate of adoption for certified growers
  - μ_U = mean rate of adoption for matched sample of uncertified growers (counterfactual)

Results 2/2

Average Treatment Effect on Treated



Blue: significant & robust

Yellow: significant but not robust

Orange: insignificant

Summary: organic certification…

- Significantly reduces use of chemical inputs
  - Chemical fertilizers
  - Chemical insecticides
- Increases adoption of environmental friendly practices
  - Organic fertilizer

Why do our results differ from those of previous rigorous studies?

- Organic certification standards are
  - well-defined
  - stringent
  - farm-level
  - enforced by independent third-party inspectors

Conclusion 4/5

Policy implications?

- Much more research is needed before we can generalize about whether and under what conditions eco-certification has environmental benefits!

Conclusion 5/5

Certification can have environmental benefits when they entail standards that are…

- applied to individual producers
- well-defined and stringent
- enforced by independent 3rd party inspectors

Even in contexts where selection effects threaten to undermine certification impacts

Thank you

Extra Slides

Objective: Evaluate environmental impacts of organic coffee certification in South east Colombia

Problematic counterfactuals

- Certified producers' pre-certification performance
  - Assumption: certified producers performance would not have changed absent certification
  - Problem: performance may change for reasons unrelated to certification
- Non-certified producers' performance
  - Assumption: certified and uncertified producers would have the same average performance absent certifications
  - Problem: certain types of producers select into certification

Literature 3/4

Less rigorous published studies of the environmental impact of coffee certification

- None that construct reasonable counterfactual
- Three less rigorous studies—all of organic and Fair Trade coffee certification in Mexico—reach mixed conclusions:
  - Philpott et al. (2007): no effect
  - Jaffee (2008): benefit
  - Martinez-Torres (2008): benefit

Unpublished rigorous study of the environmental impact of coffee certification: Blackman and Naranjo (2010)

- Organic certification in central Costa Rica
- Propensity score matching
- Certification has environmental benefits
  - Significantly reduces use of chemical inputs
    - (chemical fertilizers, insecticides, herbicides)
  - Increases adoption of environmental friendly conservation practices
    - (soil conservation measures, organic fertilizer, shade trees)

Organic coffee certification benefits and costs

- Benefits
  - Price premium which average 10-20% depending on coffee quality
  - Reduces cost of purchased inputs (for growers that use them)
- Costs
  - Increases labor
  - Reduces yields (for growers using agrochemicals)
  - Transactions costs of certification including transition period

Selection regression results: significant regressors

Number of distinct lots	(+)
Coffee variety (Borbon)	(+)
Coffee variety (Colombia)	(+)
Coffee grade (Calidad)	(+)
Muncipality (Cajibo)	(+)
Municipality (Timbo)	(+)

Grower and farm characteristics

- Grower
  - Age
  - Sex
  - Education
  - Household size
  - Membership in national coffee federation
- Farm
  - Tenure
  - Size (no. trees, acreage)
  - Fragmentation (no. distinct lots)
  - Manure (estimated from no. and type farm animals)
  - Capital (index of common items)
  - Coffee varieties (proportions trees)
  - Coffee quality grades (proportion harvest)
  - Buyer (intermediary versus other)
  - Mode transportation
  - On- and off-farm work (proportion household)
  - Location (municipality)

Balance: Participants and matched nonparticipants are quite "similar"

Table 3. Matching quality: Number of covariates achieving balance (N) and median standardized bias (SB) after matching, for five propensity score matching methods[a,b,c]

Method	N	SB
(i) Nearest neighbor 1-1	27	9.513
(ii) Nearest neighbor 1-4	27	5.427
(iii) Nearest neighbor 1-8	28	6.693
(iv) Nearest neighbor 1-16	28	7.364
(v) Kernel	28	4.984

- Why
  - Ratio nonparticipants to participants ~ 75/1

Average Treatment Effect on Treated ($\mu_{C} - \mu_{U}$)

Outcome variable	Significance 5 models	Sign	Effect (percentage points) Range 5 models	Effect (percentage points) Mean 5 models	Robust to endogeneity?
Negative practices					
Chemical fertilizer	**5**	**–**	**32-46**	**38**	**yes**
Insecticide	**5**	**–**	**12-14**	**14**	**yes**
Herbicide	0	–	1-6	3	--
Sewage in fields	4	–	19-28	24	no
Positive practices					
Organic fertilizer	**5**	**+**	**44-60**	**52**	**yes**
Shade	4	+	4-9	3	no

Results */*

Table 4. Negative practices: Average treatment effect on treated (ATT) estimates, by outcome variable and matching method; critical value of Rosenbaum's Γ

Propensity score matching method	**Mean certified**	**ATT**	**S.E.[a]**	**P-value**	**Γ*[b]**
CHEM_FERT					
(i) Nearest neighbor 1-1	0.089	-0.382	0.132	**0.004**	3.6
(ii) Nearest neighbor 1-4	0.089	-0.459	0.102	**0.000**	5.6
(iii) Nearest neighbor 1-8	0.089	-0.361	0.087	**0.000**	4.0
(iv) Nearest neighbor 1-16	0.089	-0.383	0.078	**0.000**	3.8
(v) Kernel	0.089	-0.324	0.094	**0.001**	3.4
INSECTICIDE					
(i) Nearest neighbor 1-1	0.018	-0.127	0.078	**0.105**	2.2
(ii) Nearest neighbor 1-4	0.018	-0.141	0.064	**0.028**	6.6
(iii) Nearest neighbor 1-8	0.018	-0.120	0.055	**0.030**	9.0
(iv) Nearest neighbor 1-16	0.018	-0.170	0.058	**0.003**	10.0
(v) Kernel	0.018	-0.117	0.051	**0.023**	9.2
HERBICIDE					
(i) Nearest neighbor 1-1	0.089	-0.055	0.093	0.558	1.2
(ii) Nearest neighbor 1-4	0.089	-0.045	0.077	0.553	2.2
(iii) Nearest neighbor 1-8	0.089	-0.032	0.063	0.615	2.6
(iv) Nearest neighbor 1-16	0.089	-0.033	0.057	0.565	2.8
(v) Kernel	0.089	-0.006	0.058	0.911	2.6
SEWAGE					
(i) Nearest neighbor 1-1	0.161	-0.200	0.135	0.137	1.4
(ii) Nearest neighbor 1-4	0.161	-0.277	0.112	**0.014**	2.4
(iii) Nearest neighbor 1-8	0.161	-0.264	0.100	**0.008**	1.8
(iv) Nearest neighbor 1-16	0.161	-0.269	0.090	**0.003**	1.6
(v) Kernel	0.161	-0.187	0.089	**0.037**	1.4

Results */*

Table 5. Positive practices: Average treatment effect on treated (ATT) estimates, by outcome variable and matching method; critical value of Rosenbaum's Γ

Propensity score matching method	Mean certified	ATT	S.E.[a]	P-value	Γ*[b]
ORG_FERT					
(i) Nearest neighbor 1-1	0.875	0.600	0.120	**0.000**	7.2
(ii) Nearest neighbor 1-4	0.875	0.555	0.101	**0.000**	8.4
(iii) Nearest neighbor 1-8	0.875	0.441	0.092	**0.000**	5.6
(iv) Nearest neighbor 1-16	0.875	0.474	0.082	**0.000**	12.0
(v) Kernel	0.875	0.538	0.090	**0.000**	8.8
SHADE					
(i) Nearest neighbor 1-1	0.964	0.036	0.089	0.683	1.4
(ii) Nearest neighbor 1-4	0.964	0.055	0.066	0.409	3.0
(iii) Nearest neighbor 1-8	0.964	0.030	0.048	0.542	4.2
(iv) Nearest neighbor 1-16	0.964	0.016	0.040	0.689	6.0
(v) Kernel	0.964	0.024	0.052	0.642	4.6

Sensitivity to endogeneity

- Endogeneity?
  - Unobservables generate selection bias (i.e. influence both decision to certify and to adopt management practices)
  - E.g., environmental consciousness? management skill?
  - Not possible to test magnitude
- Rosenbaum bounds
  - How strongly would unobservables have to affect decision to certify in order to undermine results?
  - Test whether ATT still significant given different assumptions about strength of selection bias
  - Γ = index of strength of selection bias
    - Γ = 1 implies zero influence
    - Γ = 2 implies certified growers 2X more likely to get certified vs. matched uncertified growers due to selection bias
    - Etc.

Comparison to Blackman and Naranjo (2010) study of organic coffee in Costa Rica

- Also finds environmental benefits
- Costa Rica results attributed partly to characteristics of local growers
  - Highly technified, few “de facto organic” growers
  - Therefore, minimal threat that self-selection effects will undermine certification benefits
- But in Cauca
  - more “de facto organic” growers, bigger threat of self-selection, and we still find benefits
- Hence, eco-certification can have benefits in such contexts

Conclusion 6/6

but schemes with these characteristics will discourage participation…