

EGERTON

UNIVERSITY



**TEGEMEO INSTITUTE OF AGRICULTURAL
POLICY AND DEVELOPMENT**

WPS 47/2011

**The Impact of Certification on Smallholder Coffee
Farmers in Kenya: The case of UTZ program**

**Mercy Kamau, Lawrence Mose, Ricardo Fort and Ruerd
Ruben**

**The Impact of Certification on Smallholder Coffee Farmers in
Kenya: The case of ‘UTZ’ certification program**

**Mercy Kamau, Lawrence Mose, Ricardo Fort and Ruerd
Ruben**

WPS 47/2011

Tegemeo Institute of Agricultural Policy and Development

P. O. Box 20498-00200, Nairobi, Kenya.

Tel: +254-20-2717818/76; Fax: +254-20-2717819

Email: Egerton@tegemeo.org

Tegemeo Institute

Tegemeo Institute of Agricultural Policy and Development is a Policy Research Institute under Egerton University with a mandate to undertake empirical research and analysis on contemporary economic and agricultural policy issues in Kenya. The institute is widely recognized as a centre of excellence in policy analysis on the topical agricultural issues of the day, and in its wide dissemination of findings to government and other key stakeholders with a view to influencing policy direction and the decision making process. Tegemeo's empirically based analytical work, and its objective stance in reporting and disseminating findings has over the past decade won the acceptance of government, the private sector, civil society, academia, and others interested in the performance of Kenya's agricultural sector.

Published 2011

© Tegemeo Institute of Agricultural Policy & Development

Kindaruma Lane, off Ngong Road

P.O. Box 20498, 00200, Nairobi, Kenya

Tel: +254 20 2717818/76; Fax: +254 20 2717819

E-mail: egerton@tegemeo.org

URL: <http://www.tegemo.org>

Tegemeo Institute acknowledges the resources support for its research programmes from key partners including the United States Agency for International Development (USAID), Michigan State University (MSU), and Egerton University, Njoro Kenya. Financial support to carryout this study was provided by Solidaridad through the Centre for Development Studies (CIDIN), Radboud University, Nijmegen, the Netherlands.

Abstract

Increased awareness among coffee consumers of the impact of their consumption habits on the people and environment in coffee producing countries has resulted in implementation of certification programs in the coffee sector as an assurance of good practices in production and marketing of coffee. The UTZ certificate was the first to be introduced in the Kenyan coffee industry and this study provides the first quantitative assessment of its impact on smallholder farmers. The propensity score matching technique was used because it solves the 'selection bias' problem in assessment of the impact of development programs. The impact of the certification program differed between the two regions where it is being implemented probably due to the differences in bio-economic characteristics. Overall, the impact of the program ranges from higher coffee prices and coffee incomes, increased access to greater amounts of credit for agricultural purposes, increased incomes from other crop enterprises or off-farm activities, greater savings by households and increased investments on land. UTZ certification also resulted in better service provision by the cooperative societies. The perception by certified households that their economic situation has not changed may be attributed to the short period that the certification program has been in existence and also to the reference period (2008) which was a difficult year in Kenya due to the post election and economic crises.

Key Words: impact, certification, PSM, coffee cooperative, Kenya

Acknowledgements

We would like to thank the Director of CIDIN for giving us an opportunity to participate in this study and to the Director of Tegemeo Institute for the institutional support which enabled us to carry out the study. We acknowledge also the support our team received from the directors and management of the participating coffee cooperatives. We thank the sampled coffee farmers for unreservedly opening their homes and farms to our team and for sharing with us vital information without which this study would have been impossible. We acknowledge the support received from Solidaridad office in Nairobi and Coffee Management Services for sharing their insights & experiences and for facilitating the meetings with various coffee farmers' cooperatives. We acknowledge the Team at Tegemeo Institute and the enumerators who so ably collected, cleaned and processed the data.

Table of Contents

Abstract.....	iv
Acknowledgements	v
List of Tables	vii
1 Introduction.....	1
2 Methodology	3
2.1 Impact Assessment Approaches	3
2.2 Empirical Estimation.....	7
3 Results and Discussion	9
3.1 Characteristics of Small holder Coffee Farmers in Kiambu District	9
3.2 Characteristics of Small holder Coffee Farmers in Nyeri District.....	10
3.3 Factors Influencing the Likelihood of Participation in UTZ Program.....	13
3.4 Difference Analysis for Kiambu.....	13
3.5 Difference Analysis for Nyeri.....	17
4 Conclusions and Policy Recommendations	21
References.....	24
Appendices.....	25

List of Tables

Table 1: Households characteristics in the treatment and control groups in Kiambu.....	9
Table 2: Households characteristics in the treatment and control groups in Nyeri	12
Table 3: Differences between Ndumberi Coffee Farmers Cooperative (UTZ Certified) and Farmer Cooperatives that are Not certified (<i>Kiambaa & Mekari</i>).....	15
Table 4: Differences between Tekangu Coffee Farmers Cooperative (UTZ Certified) and Farmer Cooperatives that are Not Certified (<i>Rugi & Kiama</i>)	19

1 Introduction

Over 98 percent of the coffee produced in Kenya is exported (with an annual export output of approximately 1 million bags) and only 1 to 2% is consumed locally. Six million people are employed in the coffee industry (CBK, 2010) and because it is a labour intensive crop enterprise, it remains an important source of employment in rural Kenya. In spite of the central role it has played in the county's development, coffee production has steadily declined over the years; from an all time high of about 130,000 metric tons in 1987/88 to a low of about 40,000 metric tonnes of green coffee in 2008, partly due to a declining productivity. However, the increasing demand for quality coffee, which Kenya produces used in blending other coffees, is likely to yield benefits for smallholder farmers who are able to match this demand.

Increased awareness among coffee consumers of the impact of their consumption habits on the people and environment of coffee producing countries has resulted to development of initiatives in the coffee sector which seeks to assure consumers of good practices in production. Such certification programs in Kenya were first introduced in the floriculture and horticultural industries and more recently in the tea and coffee (the last 5 years) industries. Certification programs advocate for good practices in an endeavour to protect the consumer, the environment as well as the producer. The UTZ certificate was the first to be introduced in the Kenyan coffee industry. Currently there are four other certification programs that are being implemented namely, Fair Trade, 4Cs, Nespresso and Café Practices. However, it is not clear what benefits have accrued from these certification programs and to what extent. Therefore, this study sought to estimate the impact of UTZ certification on the welfare of coffee farming households. The specific objectives of the study are to (1) estimate the impact of certification on income, wealth and expenditures of farm households, and (2) assess changes in farm household's perception of their economic situation, willingness to invest, risk attitude and loyalty to their coop that is arising from certification programs.

The paper applies the propensity score matching (PSM) approach in two case studies of smallholder coffee in the central region of Kenya. The remainder of this paper is

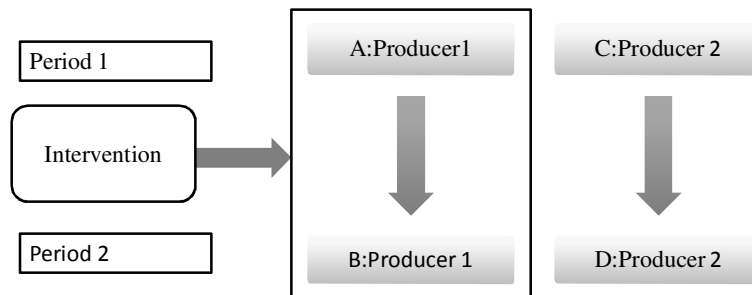
structured as follows: Section 2 details the methodology used in impact evaluation including the sampling strategy. Results of the two case studies are presented in section 3 while section 4 provides a general discussion of the results from the two case studies and conclusions.

2 Methodology

2.1 Impact Assessment Approaches

The hypothetical question in an evaluation is “how much better are the households or individuals who participated in a development program?” The treatment effect literature suggests methods of estimating the effect of the treatment w on a specified outcome y . Some of the commonly used approaches are: (1) *before and after appraisal* which addresses changes in outcomes over a specified time period. An example is where a baseline is compared with an ex-post survey; (2) *with and without appraisal* in which differences are estimated between the treatment and a control group. In this approach, the situation amongst the control group is the counterfactual to the situation attained in the target or treatment group and *difference in difference*, a combination of the “before and after” with the “with and without” approaches gives a difference in difference estimator. It compares the change in outcome in the treatment group before and after the intervention to the change in the outcomes in the control group.

Figure 2: Impact assessment approaches



- Before-After Comparison: $B - A$
 - All change due to intervention?
- Need to observe change in similar producer without Intervention: i.e. $D - C$
- Net effect: $(B - A) - (D - C)$

The change¹ in the control group is an estimate of the true counterfactual i.e. what would have happened to the intervention group if the intervention had not been implemented. This is the net effect which according to Figure 2 is given by (B-A)-(D-C). This “difference in difference” estimator requires a panel of data which is often unavailable particularly from rural households in sub-Saharan Africa. In the absence of historical data or baselines, with and without appraisals that use cross sectional data to estimate the difference or observed changes between the treatment and control group are used. The hypothetical question in this kind of assessment is “what would have happened to a household if the household would not have participated in the development program?”, also commonly referred to as the counterfactual.

To test the usefulness of a coffee certification program in improving productivity and welfare of smallholder coffee farmers, we tested the hypothesis that coffee farmers belonging to certified (treated) coffee cooperatives have done better compared with those who belong to non-certified (un-treated) coffee cooperatives. Formally, if we assume y represents the outcome of interest e.g. income or yields, and $w = (1, 0)$ the treatment, $w = 1$ if household is in certified cooperative and $w = 0$ if household belongs to a non-certified cooperative. Y_c is outcome for households in the treated group and y_{nc} the outcome for untreated. The effect of the certification program may be obtained as follows:

$$E[y_c | w = 1] - E[y_{nc} | w = 0]$$

Thus, we compare means of the outcome/s in the treated and untreated group.

The weakness in such an assessment is the failure to correct for differences in farm household characteristics (Ruben, 2008). According to Wooldridge (2003), care must be taken in evaluation of programs since the control and treatment groups are not randomly assigned. For example, if farmers that are more knowledgeable and better informed are

¹ This comparison of changes controls for characteristics that do not change over time within the treatment and control groups, as well as characteristics which change over time between the groups (Mose, 2007).

more likely to be in the treated group, then a major part of the observed effect may be attributable to these initial characteristics. This bias is likely to lead to an overestimation of the outcomes from an intervention (White and Bamberger, 2008).

There are reasons to believe that selection of coffee cooperatives for certification is non-random and hence the process of certification may result to the systematic exclusion of some coffee cooperatives. Selection or admissibility of coffee cooperatives to join a certification program depends on factors like its credit rating, governance or management of a cooperative. Successful certification depends on the creation of strong partnerships in the coffee value chain, is costly and depends on external resources to prepare farmers and wet mills for certification. Certification also depends on the willingness of a cooperative to participate in the program. Because of such barriers, not all farmers/cooperatives can or could have been certified.

Membership to coffee cooperatives is by choice whereby coffee farmers choose their cooperative. Important decisions² are made by members of a cooperative hence members of a coffee cooperative decide whether to participate in a certification program and the extent of their participation. Characteristics of households in treated and untreated cooperatives may therefore be systematically different (age, education level, their access to information and other services). If this is the case, then these households are not truly comparable. As earlier mentioned, the consequence of the selection problem is that the estimators of impact are biased and do not reflect the true effect of participation in a development program and hence should not be ignored and influencing factors need to be controlled for if they are systematically different across the treated and non-treated households. This problem may be eliminated by inclusion of the factors correlated with selection in the regression equation. Where such initial conditions cannot be observed matching methods such as the Propensity Score Matching (PSM) are recommended.

² Such decisions are normally passed during annual general meetings

Propensity Score Matching

Propensity score matching technique is increasingly used to deal with the problem of unobserved differences in an evaluation. The approach solves the “selection” problem (Rubin, 1974; Rosenbaum and Rubin, 1983; Rubin and Thomas, 1996; Heckman et al., 1997; Smith, 1997) by identifying from among the non-target group, households with similar pre-treatment characteristics X as those of the target group. Any differences in outcomes in the target and control groups are assigned to the intervention. The matching of households in treatment and control groups is based on a balancing score $b(x)$ which is a function of the covariates X . The balancing score used is based on the likelihood of participation in a development program given the observed characteristics X . This technique is basically a reconstruction of an experiment from a non-random quasi-experimental design (Chapoto, 2009) where a sub-sample also referred to as common support is created by matching observations in the two groups based on a propensity score. Propensity scores are estimated from the initial conditions using a probit model specified as follows:

$$prob(w^c = 1|x) = \theta(\beta + \delta X + \varepsilon)$$

Where:

w^c is a dichotomous variable taking a value of one if household belongs to a treatment group and zero otherwise

θ represents a normal cumulative distribution function

β & δ are parameters to be estimated

X represents household characteristics that are hypothesized to influence households belonging to a treatment group.

ε is an error term

This equation is estimated in STATA using a maximum likelihood procedure.

Matching Estimators

There are various matching approaches/techniques and these differ in the definition of the “neighbourhood” for treated households and also with respect to weights assigned to “neighbours”. Kernel matching is a nonparametric estimator and uses weighted average

of all individuals in control group; one to one matching chooses for each observation in target group, an observation in control group with the closest p-score.

2.2 Empirical Estimation

To operationalise the Propensity Score Matching (PSM), data were collected from households that are members of a certified cooperative (treatment group) as well as from households that did not participate in the UTZ program (control group). To select respondents, the study employed a multi-stage sampling procedure as follows. First, two cooperatives in two different zones (one each in Nyeri and Kiambu) were selected with the assistance of Solidaridad (the agency supporting UTZ certification programs for smallholder coffee farmers). Two non-certified cooperatives were chosen in each zone to act as a control. Tekangu and Ndumberi were selected in Nyeri and Kiambu, respectively. For comparability, the non-certified cooperatives with similar characteristics in terms of number of wet mills, membership and governance structures as the certified cooperative at the time of the latter's certification were randomly selected from a sampling frame of non-UTZ certified cooperatives. In each zone, one of the selected cooperative was either newly certified or in the process of certification while the second cooperative was yet to consider joining any certification program. Rugi and Kiama were selected in Nyeri while Kiambaa and Tekangu were selected in Kiambu. Using each cooperative household sample frame, 80 farm households were randomly selected from each of the certified cooperatives and 100, and 120 were randomly selected from the near certified or newly certified, and not certified cooperatives, respectively; since for matching, a greater number of households would be needed in the control group.

Data were collected through single farm visit interviews using structured questionnaires administered to respondents (mainly the household³ head) by enumerators during the month of November 2009 and covered coffee production and marketing activities for the

³ A farm household was defined as a social entity that collectively makes productive and consumptive decisions and often eats from the same granary.

2008 coffee calendar year i.e. the period September 2008 to August 2009. The main data types collected included:

- Household characteristics (age, gender, education, size, membership to organizations, employment characteristics etc)
- Household consumption, saving and investment characteristics
- Farm household characteristics (farm size, access to markets and other services)
- General agricultural production characteristics
- Coffee production and marketing characteristics
- Household perceptions (benefits of FT, risk assessment, etc)
- Investments in the on-farm and off-farm

A probit regression (treatment =1; 0 otherwise) on the covariates was estimated to determine factors that influenced participation of household in the program or intervention. In order to get unbiased groups for certified and non-certified, we relied only on exogenous variables i.e. those that are not influenced by participation in UTZ programs. A propensity score was estimated for each household in the complete sample by using Probit's regression predicted probability of having UTZ certification. The "common support" or matched group was established by eliminating observations in the non-participating group with a p-score lower than the minimum p-score in the participating group, and the observations in the participating group with a p-score higher than the maximum p-score in the non-participating group. Using only the observations that belong to the common support, comparison was made between outcome variables of farmers in target group with farmers in the control group. Different techniques (kernel matching and one-to-one) were used mainly to check on robustness of the matching results. Kernel matching is a nonparametric estimator and uses weighted average of all individuals in control group; one to one matching chooses for each observation in target group, an observation in control group with the closest p-score.

3 Results and Discussion

3.1 Characteristics of Small holder Coffee Farmers in Kiambu District

The basic characteristics, pre-treatment variables and potential outcome variables for households in the control (Mekari and Kiambaa combined) and treatment (Ndumberi) groups are presented in Table 1. Households in the treatment group differ from households in the control group in the following ways: the households have lived in the

Table 1: Households characteristics in the treatment and control groups in Kiambu

	N	Control Mean	N	Treatment Mean	t-test (p> t)	
Household characteristics						
Age of the head	220	62.22	79	65.82	0.044	**
Gender of head	220	1.31	79	1.42	0.095	*
Highest education level	220	6.55	79	4.30	0.041	**
Farming experience (yrs)	220	33.96	79	38.13	0.027	**
Years lived in locality	220	38.15	79	44.25	0.004	***
Accessibility						
Distance to the nearest dairy	220	4.78	79	2.94	0.004	***
Distance to extension advice	220	4.06	79	3.04	0.030	**
Distance to vet service	220	3.39	79	2.59	0.036	**
Distance to major market for farm produce	220	4.00	79	4.82	0.051	**
Land						
Acreage under coffee	220	0.74	79	0.54	0.003	***
Number of mature coffee trees	220	374.07	79	284.27	0.004	***
Assets						
Value of asset in 2009	220	107,900.00	79	182,700.00	0.09	*
Total asset value	220	102,400.00	79	177,500.00	0.089	*
Input use						
Coffee input cost per acre	116	6,199.00	35	4,039.00	0.017	**
coffee labour cost per acre	165	13,720.00	52	18,350.00	0.094	*
Productivity & sales						
Kgs of cherry sold	220	936.86	79	541.30	0.004	***
Kgs of mbuni sold	220	79.49	79	28.91	0.005	**
Price per Kg of cherry	210	22.20	73	27.80	0.000	***
Price per Kg of Mbuni	198	37.14	62	83.84	0.000	***
Income						
coffee income (reported price)	220	23,820.00	79	18,070.00	0.105*	
Satisfaction with technical services	220	3.23	79	3.65	0.022**	

	N	Control Mean	N	Treatment Mean	t-test (p> t)
Gender and environment					
Number of decisions by both	182	2.62	66	2.32	0.473
Risk attitude					
Risk attitude	220	2.09	79	2.08	0.681

Note: *significant at 10%; ** significant at 5%; *** significant at 1%.

locality for longer a period and have greater farming experience; headed by slightly older farmers (by 3.5 years), have more households that are headed by persons with lower education level and females. The households have better access to the dairy cooperative where they deliver their milk, veterinary and other extension services. They however have poorer access to a major market. Although the two groups do not differ in the land owned, the treatment group has less acreage under coffee and consequently fewer mature coffee trees. Households in treatment group have more assets (in numbers and value). In coffee production, expenditures by households in treatment group are lower on purchased inputs and higher on labour. Although the treated households received higher prices for both cherry and mbuni⁴, they sold less volume of coffee (both cherry and mbuni) and consequently earned lower income from their coffee enterprise. This group expressed more satisfied with the technical services offered by their cooperative.

3.2 Characteristics of Small holder Coffee Farmers in Nyeri District

Basic household characteristics of the two groups do not differ based on t-tests. The two groups had similar acreages of land but the treatment group had more land allocated to coffee and had a greater number of mature coffee trees. The treatment group had poorer access to wet mills, dairy where they deliver their milk as well as major market for other farm produce. They however had better access to veterinary services. The treatment group had greater number of assets (except livestock) but the value although higher was not found to be significantly different.

The treatment group: produced and sold more coffee and receive higher prices for coffees sold. The rejection rate at the mill was also higher. Higher prices reflect the positive

⁴ Dried coffee beans. 7kg of cherry to get 1kg mbuni

effects of good agricultural practices advocated in the UTZ program as well as the stringent measures enforced by the certified cooperative on quality of coffee. Consequently the treatment group earned higher income from their coffee enterprise (total and per acre).

Table 2: Households characteristics in the treatment and control groups in Nyeri

	Control		Treatment		t-test	
	N	Mean	N	Mean	(p> t)	
Household characteristics						
Age of the head	221	57.86	80	56.1	0.343	
Farming experience	221	29.43	80	30.46	0.607	
Years lived in locality	221	25.92	80	31.66	0.426	
Land						
Coffee variety	221	1.73	80	1.4	0.018	**
Acreage under coffee	221	0.42	80	0.56	0.001	***
Coffee acreage (monocrop)	221	0.28	80	0.39	0.018	**
Number of mature coffee trees	221	215.9	80	267.11	0.023	**
Accessibility						
Distance to the nearest dairy	221	1.18	80	2.25	0.001	***
Distance to vet service	221	2.44	80	1.97	0.101	*
Distance to nearest wet mill	221	1.22	80	1.55	0.004	***
Distance to wet mill where coffee was delivered	221	1.29	80	1.8	0.002	***
Distance to major market for farm produce	221	3.43	80	4.76	0	***
Wealth						
Number of assets owned in 2006	221	6.29	80	7.4	0.002	***
Input use						
Coffee labour per acre	145	17,500.00	62	22,200.00	0.103	*
Productivity & sales						
Kgs of Cherry Sold	221	751.42	80	947.66	0.04	**
Kgs of Mbuni Sold	221	30.08	80	77.81	0	***
Price per Kg of Cherry	213	30.89	78	34.77	0	***
Price per Kg of Mbuni	195	48.2	71	50.76	0.022	**
Cherry kg rejected at wet mill	221	1.14	80	5.16	0	***
Income						
Coffee Income (reported price)	221	24,860.00	80	36,570.00	0.001	***
Coffee income (coop mean price)	214	25,730.00	78	38,260.00	0	***
Net income from coffee	221	14,550.00	80	19,530.00	0.081	*
Total expenditure	221	53,120.00	80	68,800.00	0.021	*
Coffee income per acre	221	60,320.00	80	71,390.00	0.062	*
Gender and environment						
Number of decisions made by head	162	4.67	57	4.25	0.281	
Risk attitude						
Risk attitude	221	2.18	80	2.13	0.308	

Note: *significant at 10%; ** significant at 5%; *** significant at 1%.

3.3 Factors Influencing the Likelihood of Participation in UTZ Program

A commonly used balancing score is the probability of participating in a program given observed characteristics (p-score) which was estimated using the Probit model. Only exogenous variables i.e. those that may not be influenced by participation in the UTZ program were included in the models. In Kiambu, wealthier households in terms of initial land owned were less likely to be participating in the UTZ program. However greater physical assets owned before certification programs began positively influenced participation in the UTZ program. Households located closer to extension service providers and to a dairy were more likely to participate in UTZ certification program. Households located further from a major market had a higher likelihood of participating in UTZ programs. Similarly, households that had lived in their locality for a longer duration had a higher likelihood of participating in the UTZ certification program.

In Nyeri, the likelihood of participation or membership in UTZ certification programs was higher for households that are located further from a major market, a dairy and a wet mill. The likelihood to participate in the UTZ certification program was also higher for households that were located nearest to an extension service provider.

3.4 Difference Analysis for Kiambu

After matching, 134 households were maintained from the Kiambu cluster (the common support). Out of these, 58 households were from the control group and 76 households were from the treatment group.

A comparison was made between Ndumberi farmers who have an UTZ certificate here referred to as the treatment group and Kiambaa and Mekari farmers who had not joined the UTZ program (the control group). The difference and t-test for statistical significance of this difference are presented in Table 3. Results from three matching techniques (one to one matching without replacement, one to one matching with replacement and kernel matching) are presented as a test for the robustness of the results.

The most robust results i.e. where there is convergence in two to three matching techniques show that the treatment group: had lower acreage under coffee, lower cost of inputs in coffee (total amount and intensity); sold less coffee (cherry (220 to 323 kg) and mbuni), had a lower proportion of rejected coffee. This group received a higher price for their coffee (KSh. 5.00 to 6.00 per kg of washed coffee and KSh. 46.00 to 48.00 for mbuni). The higher coffee price received by the treatment group does not translate to higher coffee income for the treatment group. However the effect of a higher price was positive in that it resulted to an insignificant difference in coffee income even though the control group had sold a significantly higher volume of coffee. In addition, the treatment group received greater amounts of credit, used less hired labour in other crops, had greater income from off-farm sources and had a higher expenditure for food. Farmers in treatment group expressed greater satisfaction with the technical services offered by their cooperative but their perception of the commercial services is not different. Other significant differences although weaker (because significant in a single matching technique) are: the treatment group: owns less land and cultivated less land, has fewer coffee trees, had higher expenditure on education. They made lower valued land-attached investments but made capital investments of greater value. They also seem to own furniture and durable assets of greater value. The treatment group was more positive (weakly) about their current economic situation as compared with five years ago. These differences that only emerge with one matching technique suggest that perhaps the matching may not have yielded a perfect common support group. Although decision making appears not to be significantly different between the two groups, it is noteworthy that in the treatment group, spouses appear to be making more decisions than the heads.

Table 3: Differences between Ndumberi Coffee Farmers Cooperative (UTZ Certified) and Farmer Cooperatives that are Not certified (*Kiambaa & Mekari*)

	one to one with replacement				one to one no replacement				kernel			
	difference	T-stat		N	difference	T-stat		N	difference	T-stat		N
Acreage and trees												
Coffee variety	0.24	3.0	**	76	0.19	2.6	**	76	0.13	1.5		76
Total acreage under coffee	(0.14)	-1.7	*	76	(0.14)	-2.2	**	76	(0.14)	-2.4	**	76
Number of mature coffee trees	(50.49)	-1.3		76	(54.77)	-1.7	*	76	(63.05)	-2.2	**	76
Acreage farmed in 2009	(1.59)	-1.3		76	(0.74)	-0.8		76	(0.98)	-1.8	*	76
Acreage under other crops	(0.27)	-1.7	*	76	(0.23)	-1.7	*	76	(0.17)	-1.4		76
Acreage owned in 2009	(1.55)	-1.2		76	(0.62)	-0.7		76	(0.92)	-1.8	*	76
Financial markets												
Credit received	139,683.00	2.2	**	23	137,465.00	2.2	**	23	143,543.00	2.2	**	23
Input use & costs												
Input cost in coffee	(1,456.00)	-2.4	**	34	(1,553.00)	-2.6	**	34	(1,559.51)	-2.5	**	34
Input cost in coffee per acre	(2,037.00)	-2.1	**	34	(1,968.00)	-2.4	**	34	(1,766.11)	-2.2	**	34
Hired labour cost (total)	(7,615.00)	-2.0	**	23	(3,652.00)	-1.4		23	(7,964.01)	-3.8	**	23
Productivity and sales												
Kg of cherry sold	(220.30)	-1.6		76	(317.00)	-1.9	*	76	(323.10)	-2.5	**	76
Kg of mbuni sold	(45.57)	-1.6		76	(61.25)	-2.6	**	76	(40.27)	-2.4	**	76
Kg of coffee rejected at wet mill	(3.82)	-2.4	**	76	(2.86)	-1.9	*	76	(1.97)	-1.6		76
Price received for kg of cherry	6.43	7.2	**	70	5.13	6.5	**	70	5.67	7.5	**	70
Price received for kg of Mbuni	48.07	13.4	**	60	46.92	12.9	**	60	46.87	11.3	**	60
Income												
Income from coffee (reported prices)	(1,645.00)	-0.4		76	(5,551.60)	-1.2		76	(4,594.69)	-1.3		76
Off farm income 2009	176,736.00	2.1	**	55	170,237.00	2.0	**	55	153,611.90	1.8	*	55
Household Expenditure												
Expenditure on food	111.00	1.5		76	104.80	1.6		76	106.49	1.7	*	76

	one to one with replacement			one to one no replacement			kernel			
	difference	T-stat	N	difference	T-stat	N	difference	T-stat	N	
Expenditure on education	24,734.00	1.4	38	24,346.00	1.6	38	25,477.02	1.8	*	38
Investments										
Value of land attached investments	(6,581.00)	-0.9	18	(10,881.00)	-1.2	18	(17,933.55)	-2.9	**	18
Assets										
Value of assets in2009	(52,786.00)	-1.2	76	5486.71	0.14	76	(28,200.57)	-0.8		76
Perception and participation										
Perception of economy vs 5yrs ago	-0.09	-0.64	76	0.05	0.34	76	-0.20	-1.72	*	76
Satisfaction with technical services	0.43	1.69	* 76	0.40	1.85	* 76	0.33	1.66	*	76
Gender and environment										
Number of decisions by both	-0.22	-0.36	63	0.03	0.06	63	-0.04	-0.08		63
Risk attitude										
Risk attitude	-0.08	-1.40	76	-0.06	-1.27	76	-0.07	-1.60		76

3.5 Difference Analysis for Nyeri

After matching, 128 households were maintained from the Nyeri cluster (the common support). Out of these, 51 households were from the control group and 77 households were from the treatment group.

A comparison was made between Tekangu farmers who have an UTZ certificate (treatment group) to Rugi and Kiama farmers who had not joined the UTZ program (control group). Unlike results presented in Table 2, the results presented in Table 4 are observed in the matched sample. The results (the difference and t-test for statistical significance) from various matching techniques (one to one matching without replacement, one to one matching with replacement and kernel matching) are presented. Statistical significance from more than one matching technique signifies a more robust or strong difference while significance in only one matching technique is interpreted as a weak difference.

The most robust results i.e. where there is convergence in two to three matching techniques show that the treatment group: had greater acreage under coffee (0.11 to 0.12), invested in coffee by planting new coffee trees, less likely to use hired labour on coffee or other crops but those who did hire, spent more on hired labour in coffee, had a higher proportion of their coffee rejected (1 to 3.5%) at the factory. the treatment group received a higher price for cherry (KSh. 4.50 to 4.70) and Mbuni (KSh. 2.80 to 3.30), had higher input costs in coffee but also greater net income from coffee (KSh. 10,700 to 12, 300).

Although weakly significant, the treatment group had fewer unproductive coffee trees and earned more from an acre coffee (KSh. 11,000 to 13,500) and had higher costs (hired labour and purchased inputs) per acre of coffee.

The treatment group: earned greater income from other crop enterprises, had greater household expenditures, had higher total savings (28,000 to 37,000), had more households who made land attached investments and the value of these investments was higher (the latter is not significant).

Other weakly significant differences (brought out by a single matching technique) are that that the treatment group: planted a different coffee variety, had fewer unproductive coffee trees and earned more from an acre coffee (KSh. 11,000 to 13,500) and had higher costs (hired labour and purchased inputs) per acre of coffee.

Table 4: Differences between Tekangu Coffee Farmers Cooperative (UTZ Certified) and Farmer Cooperatives that are Not Certified (*Rugi & Kiama*)

	one to one with replacement			one to one no replacement			Kernel		
	difference	T-stat	N	difference	T-stat	N	difference	T-stat	N
Acreage & trees									
Number of Coffee parcels	-	0.0	77	0.25	0.5	77	0.02	0.4	77
Coffee variety	(0.04)	-0.3	77	(0.15)	-1.1	77	(0.24)	-1.7	* 77
Total acreage under coffee	0.11	1.5	77	0.12	2.0	** 77	0.12	2.0	** 77
Num of unproductive coffee trees	(22.57)	-1.5	77	(8.20)	-0.9	77	(13.67)	-2.3	** 77
If new coffee was planted	0.09	2.4	** 77	0.04	1.7	* 77	0.03	2.3	** 77
Financial markets									
Total savings	36,925.00	2.1	** 70	32,548.50	2.0	** 59	28,073.29	1.9	* 59
Input use & costs									
Input cost for coffee	3,068.00	3.3	** 73	2,683.50	3.5	** 71	2,013.58	2.5	** 71
Input cost in coffee per acre	3,903.00	1.6	73	4,452.00	2.4	** 71	2,226.08	1.2	71
If HH used hired labour in other crop	(0.18)	-1.9	* 77	(0.20)	-2.6	** 77	(0.21)	-3.0	** 77
If HH used hired labour in coffee	(0.12)	-1.3	77	(0.10)	-2.1	** 77	(0.11)	-1.6	77
If HH used hired labour	(0.10)	-1.2	77	(0.14)	-2.0	** 77	(0.13)	-2.1	** 77
Cost of hired labour in coffee	4,890.00	1.6	59	3,508.70	1.5	59	3,673.41	1.8	* 58
Productivity and sales									
Kg of Mbuni sold	44.01	3.2	** 77	41.90	3.5	** 77	44.89	3.9	** 77
Kg of coffee rejected at wet mill	1.34	0.7	77	3.56	2.2	** 77	2.95	2.0	** 77
Price per kg of cherry	4.49	5.4	** 75	4.52	5.8	** 73	4.64	6.3	** 73
Price per kg of Mbuni	2.87	1.8	* 68	2.80	2.0	** 759	2.81	2.3	** 59
Income									
Income from coffee (reported prices)	12,373.00	2.4	** 77	10,406	2.3	** 77	10,696.75	2.6	** 77
Income from Coffee (coop mean prices)	12,780.00	2.5	** 75	10,497.00	2.3	** 75	11,409.59	2.7	** 75
Income from other crops	(10,953.00)	-2.6	** 77	(11,242.00)	-3.7	** 77	(7,253.90)	-3.1	** 77
Net crop income	(11,472.00)	-2.9	** 77	(10,960.00)	-3.7	** 77	(7,928.14)	-3.2	** 77
Net income for household	(72,253.00)	-1.8	* 77	(33,016)	1.0	77	(37,794.54)	-1.3	77
Household expenditure									
Expenditure on basic needs	3,571.00	2.0	* 77	2,818.00	1.6	77	2,590.85	1.2	77
Expenditure on energy	108.80	1.4	75	110.50	1.6	73	118.72	1.8	* 73
Total household expenditure	14,877.00	1.5	77	13,362.00	1.7	* 77	13,483.58	1.8	* 77
Investments									
Any land attached Investment?	0.17	3.4	** 77	0.14	2.9	** 77	0.14	2.6	** 77
Value of capital investments	8,117.00	1.6	34	7017.00	1.3	34	6,037.76	1.1	34
Wealth / assets									
	0.44	0.8	77	1.0	2.9	** 77	0.63	1.6	77

	one to one with replacement			one to one no replacement			Kernel		
	difference	T-stat	N	difference	T-stat	N	difference	T-stat	N
Assets owned in 2009									
Perception and participation									
Number of groups HH belongs to	0.04	0.5	76	0.05	0.7	74	0.03	0.4	74
Satisfaction with commercial services	0.03	0.11	77	-0.33	-0.2	77	0.01	0.07	77
Gender and environment									
Number of decisions by both	-1.61	-0.97	54	-0.21	-0.66	54	-0.30	-0.68	54
Risk attitude									
Risk attitude	-0.07	-0.97	77	-0.09	-1.4	77	-0.03	-0.56	77

4 Conclusions and Recommendations

UTZ certification is known to be one of the most difficult and costly to achieve, and requires strong cooperation from different partners (pers com). The selection of Ndumberi as the first cooperative in Kenya to get this aid is likely to have been related to their initial performance as well as a strong leadership. Something similar might have happened with the selection of Tekangu in Nyeri District. This issue might imply a selection bias, at least at the cooperative level, particularly when compared with cooperatives that have not even initiated any certification program. The propensity score matching approach does reduce this potential bias particularly at the household level. However, there might still be some initial characteristics at the cooperative level (observable and unobservable) that may be difficult to control for. This notwithstanding, the results show some differences between the treatment and control groups that are important indications of the impact of the UTZ certification program.

In both Kiambu and Nyeri districts, the exogenous factors which seem to have influenced the likelihood of household's participation in the certification program were access to extension services and markets. The land owned at inception of the household negatively influenced households participation in UTZ program (significant in Ndumberi). This suggests that households in the UTZ program were more likely to have had smaller initial land sizes. Other initial household characteristics like the total asset value and the period a household had stayed in the locality positively influenced household participation in the UTZ program. In both locations, households that are located further from the markets and a wet mill but nearer to veterinary and general extension service provider were more likely to be in the program. Although not significant, gender, education level and farming experience of household head had an inverse relationship to participation in the certification program in Kiambu and Nyeri. Greater education and experience had negative influence in Kiambu but a positive one in Nyeri whilst being male in Kiambu increased the likelihood of participation but reduced this likelihood in Nyeri.

Among the expected outcomes from participation in the certification programs, the major success that cuts across all households involved in the two cooperatives that have been UTZ certified (the treatment group) was a higher price for coffee. In Nyeri, households belonging to the UTZ certified cooperative sold more coffee than their non-certified counterparts, had higher household savings and made more land investments. In Kiambu, households belonging to an UTZ certified cooperative received more credit, had more off-farm income (closer proximity to Nairobi) and made more capital related investments.

The input costs in coffee in the treated group were higher than control for households in Nyeri and vice versa in Kiambu Districts. The probable cause of this maybe the higher⁵ pests and diseases incidence in Nyeri district (due to differences in the natural environment) which makes pest control an important cost in production of high quality coffees. In addition, it could be that enforcement of input use and other practices (production and processing) may have been stricter in Tekengu a fact which tallies with the higher proportion of coffees rejected at the wet mill in Tekengu and not in Ndumberi.

Although the higher coffee price received by the treatment group did not translate to higher incomes for the Ndumberi farmers, it did have a positive impact in that there was no significant difference in the income earned from coffee yet the control group (Mekari & Kiambaa) had larger acreage under coffee and sold significantly higher volume of coffee.

The UTZ certification program is being implemented in different locations having unique characteristics in relation to: the natural resource endowment e.g. climate, access to markets, opportunities and population pressure. The potential impact of the certification program may therefore differ between localities as is demonstrated by the different impacts the program has had in the two regions i.e. Nyeri & Kiambu. In Kenya, the impact of the program ranges from higher coffee prices and coffee incomes, increased access to greater amounts of credit for agricultural purposes, increased incomes from other crop enterprises or off-farm activities, greater savings by households and increased

⁵ Due to their unique characteristics in relation to natural climatic characteristics

investments on land. The program may also lead to increased household expenditures (total or on specifics like basic needs) and spending on hired labour and hence may lead to the development of rural markets. UTZ certification program may also lead to better service provision by the cooperative societies.

The perception of certified households that their economic situation has not changed much may be attributed to the short period the certification program has been in existence but also because the reference period (2008) was a difficult year due to the post election and economic crises.

References

- Coffee Management Services, 2006: Coffee Sustainable Farming Handbook. First Edition
- Ric Heckman, J., H. Ichimura and P. Todd (1997). Matching as an Econometric Evaluation Estimator: Evidence from Evaluating a Job Training Program. *Review of Economic Studies* 64: 605-654.
- Karanja, A. M., 1998: Effects of Liberalisation Measures Undertaken in the Coffee Industry on Coffee Production, Quality and Profitability in Kenya. Kenya Coffee, volume 63 number 743
- Kenya Coffee Traders Association, 2008: Kenya Coffee Directory.
- Mose, L.O. 2007. Who gains, who loses? The impacts of market liberalization on rural households in Northwestern Kenya. PhD Thesis. Wageningen University, The Netherlands.
- Rosenbaum, P. and D. Rubin (1983). The Central Role of Propensity Score Matching in Observational Studies for Causal effects. *Biométrica* 70: 41-50.
- Ruben, R. (ed.). 2008. The Impact of Fair Trade. Wageningen Academic Publishers, The Netherlands.
- Rubin, D. (1974). Estimating Causal Effects to Treatments in Randomised and Non-randomised Studies. *Journal of Educational Psychology* 66: 688-701
- Rubin, D. and N. Thomas (1996). Matching Using Estimated Propensity Scores: Relating Theory to Practice. *Biometrics* 52: 249-264.
- Talbot, John M. 2004: Grounds for agreement. The political economy of the coffee commodity chain. Lanham, MD: Rowman and Littlefield Publishers.
- White, H. and M, Bamberger (2008). Impact Evaluation in Official Development Agencies. Special Issue on Impact Evaluation. *IDS Bulletin* 39: 1-11
- Wooldridge, J. M., (2003). Introductory Econometrics: A Modern Approach, 2e. Thompson Learning Publishers

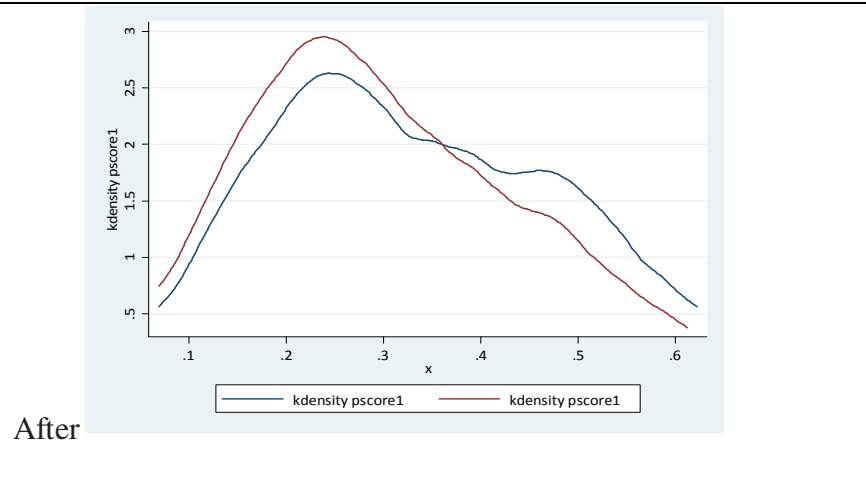
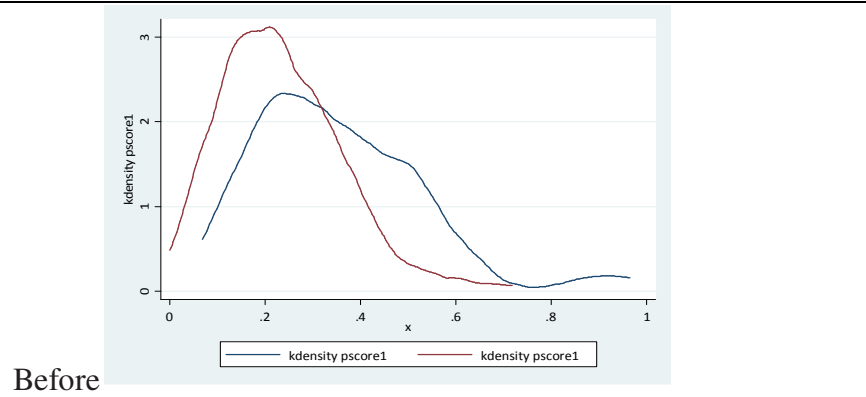
www.coffeeboard.co.ke

www.utzcertified.org

Appendices

Annex 1: Distribution of Propensity Scores Before and after Matching

Ndumberi



Tekangu

