

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

By

Kamau, Mercy W.; Mose, Lawrence; Fort, Ricardo; and Ruben, Ruerd

*Contributed Paper presented at the Joint 3<sup>rd</sup> African Association of Agricultural Economists (AAAE) and 48<sup>th</sup> Agricultural Economists Association of South Africa (AEASA) Conference, Cape Town, South Africa, September 19-23, 2010.*

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

Mercy W. Kamau

*Tegemeo Institute of Agricultural Policy and Development, Kenya*

Lawrence Mose

*Kenya Agricultural Research Institute (KARI)*

Ricardo Fort

*Grupo de Analisis para el Desarrollo (GRADE), Peru & Centre for International Studies (CIDIN), Nijmegen University, the Netherlands*

Ruerd Ruben

*Centre for International Studies (CIDIN), Nijmegen University, 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 to 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 to 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.*

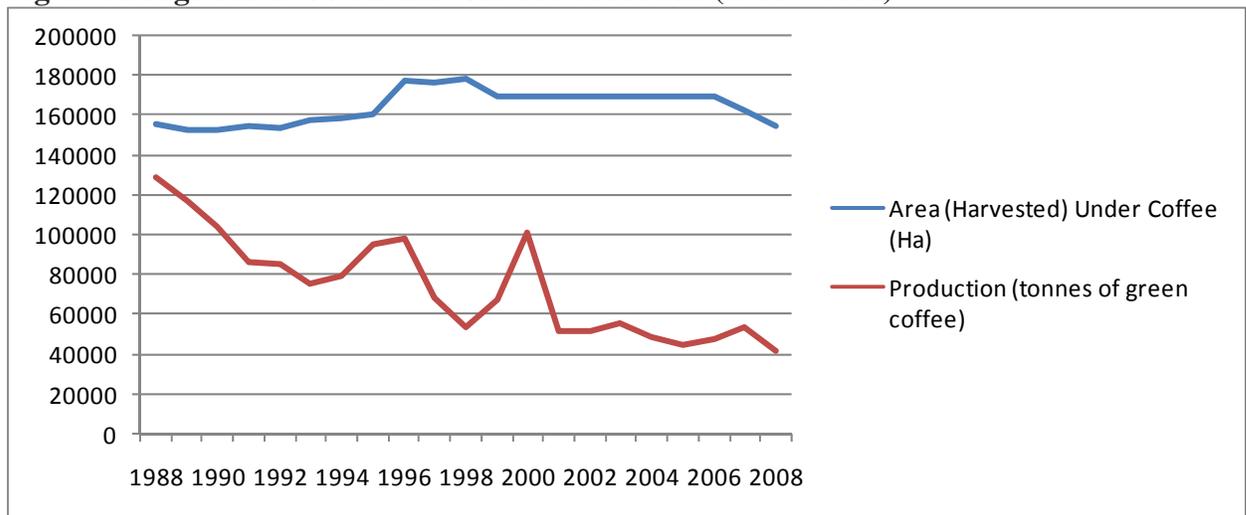
# 1 Introduction

## 1.1 Importance in Kenyan Economy

Over 98 percent of the coffee produced in Kenya is exported and only 1 to 2% is consumed locally. Coffee is currently Kenya's fourth foreign exchange earner after tea, horticulture and tourism, with an annual output of approximately 1 million bags of export coffee. Up to the 1980s, coffee was the leading foreign exchange earner, now overtaken by others due to the low international coffee prices that led to reduced productivity.

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. Coffee is also effective in forming forward and backward linkages to the larger economy. Increased domestic consumption of coffee particularly in urban areas is expected to lead to create more linkages.

**Fig 1: Acreage under Coffee and Coffee Production (1988 – 2008)**



Source of data: FAOSTAT

In spite of the central role which coffee has played in the county's development, Coffee production has shown a steady decline over the last two decades. Coffee production declined from an all time high of about 130,000 metric tons in 1987/88 to a low of about 48,000 metric tons in the 2004/05 coffee calendar year (Figure 1). In 2008, Kenya produced slightly over 40,000 metric tones of green coffee. According to Figure 1, production has declined but area under coffee seemed to have been more less maintained with the exception of the last three years when acreage under coffee started declining. The reason for the decrease in production is therefore a decline in coffee productivity mainly due to one or more of the following: total abandonment of coffee plots, cutting back of coffee trees to give way for other crops, neglect of the coffee bushes and low use of purchased inputs.

In spite of this drop in production, Kenya is still renowned for producing some of the world's top grade Arabica coffee beans, highly valued as a mild acidic blending coffee. This is normally used in small quantities by international roasters to moderate and improve their standard blends. The increasing demand for quality coffees is likely to yield benefits for smallholder farmers who are able to match this demand.

Today, the major challenges to increased coffee production among the smallholder may be summarized as: competition from other enterprises, high population density, low productivity and high costs/low returns. At the cooperative level, deliveries of cherry to societies are low as farmers still try to avoid loan<sup>1</sup> repayment. The utilization of pulping facilities is still below capacity (21%) and hence the cost of pulping and overheads are high compared with the estates.

## **1.2 Certification Programs**

There is an increasing awareness/recognition of the high potential that the coffee industry has in forming forward and backward linkages within the Kenyan economy. This has motivated the initiation of programs that are directed towards further development of the coffee industry. Such initiatives include the Coffee development fund, Re-structuring of Coffee Board of Kenya and promotion of value addition and branding of Kenyan coffee.

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 programmes that are being implemented namely, Fair Trade, 4Cs, Nespresso and Café Practices. It is expected that more certification programmes will be introduced in Kenya as the battle intensifies for the good coffees produced in the region.

The expected benefits from such programs include: strengthening of farmer organisations in terms of good governance and increased efficiency in provision of technical as well as commercial services; greater accessibility of farmers to technical services, farm inputs, credit and hence higher productivity, higher producer prices and higher enterprise and farm incomes, higher disposable incomes, and consequently greater investments on-farm and in other areas/activities that improve the welfare of household members.

---

<sup>1</sup> Loans given under the Smallholder Coffee Improvement Program (SCIP)

### **1.3 Objective of study**

The broad objective of this study was to estimate the impact of UTZ certification on the welfare of coffee farming households. The specific objectives of the study are to:

- Estimate the impact of certification on income, wealth and expenditures of farm households.
- 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.

This paper discusses the approach and its application and provides a summary of key findings from two case studies. The cases studied were smallholder coffee farmers in Nyeri and Kiambu districts in Central Province of Kenya. The remainder of this paper is structured as follows: Section 2 details the methodology used in impact evaluation which includes the sampling strategy. In section 3, results of the two case studies are presented. In section 4 a general discussion of the results from the two case studies and conclusions from the study are made.

## 2 Methodology

### 2.1 Impact Assessment Approaches

The hypothetical question in this impact evaluation exercise is “what would have happened to a household if the household would not have participated in the UTZ certification program?” In the literature, there are several methods available to estimate the impacts of interventions or development programs. Some of the commonly used approaches are:

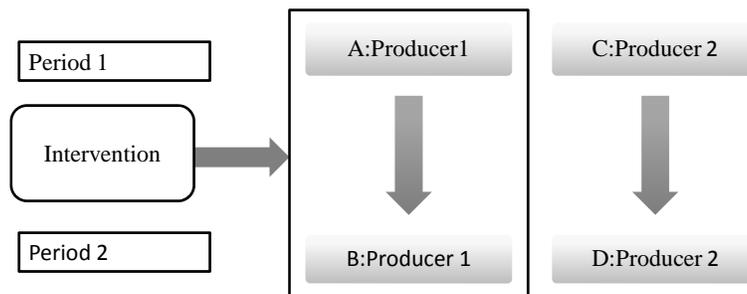
*before and after appraisal*: in which addresses changes in living conditions over a specified time period. An example is where a baseline is compared with an ex-post survey.

*with and without appraisal*: in which differences are estimated between the target 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.

*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 change<sup>2</sup> 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). The “difference in difference” estimator requires data panel which is often unavailable particularly from rural households in Africa.

The absence of historical data encourages studies on impact assessment that use cross sectional data to estimate the difference or observed changes between the treatment and control group. The weakness in such assessments is the failure to correct for differences in farm household characteristics (Ruben, 2008). For example, if farmers that are more knowledgeable and better informed are 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).

Some of the reasons that suggest the presence of a selection bias in UTZ certification are: the process of certification may result to the exclusion of some farmers/cooperatives because it is costly and may require external resources and relationships with others in the coffee value chain. Such barriers suggest that not all farmers/cooperatives can be certified.

#### *Propensity Score Matching*

Cross-section data were to be used for impact assessment of the UTZ program since a baseline was lacking. In order to correct for selection bias often inherent in the “with and without” and in the “before and after” techniques, this study follows the “matching approach” as used in the impact assessment of fair trade (Ruerd et al., 2008). 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.

This matching of households in treatment and control groups was based on a balancing score  $b(x)$  which is a function of the covariates X. The balancing score used was based on the likelihood of participation in the UTZ program given the observed characteristics X. To operationalise this technique which is commonly referred to as Propensity Score Matching (PSM), the sequential steps below were followed:

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). A probit regression (treatment =1; 0 otherwise) on the covariates aimed at determining variables that influenced participation of household in the program or

---

<sup>2</sup> 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 in the key way between the groups (Mose, 2007).

intervention was estimated. From the collected data, variables or covariates that influence the probability of a household participating either in UTZ were selected. In order to get unbiased groups for certified and non-certified, we relied on a set of exogenous variables i.e. those that are not influenced by participation in UTZ programs.

The 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.

### Matching Estimators

These differ in the definition of the "neighbourhood" for treated households and also wrt weights assigned to "neighbours". Different techniques 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.

## **2.2 Sampling and Data Collection**

Solidaridad, the agency funding UTZ certification programs for smallholder farmers, gave an indication of the UTZ certified coffee cooperatives. The study team then searched for cooperatives in the same zone that would serve as a control group in the impact evaluation study. This was achieved through researcher-guided discussions with the management of the UTZ certified cooperative and management in the other coffee cooperatives in the zone. Two non-certified cooperatives were chosen in each zone to act as a control. For comparability, the non-certified cooperatives selected had 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. 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.

A pre-determined household sample was chosen from the population of each cooperative. The sample size chosen for the treated cooperative was 80 farm households. Given the need for matching, a greater number of households would be needed in the control group. Consequently, the sample size for the near- certified or newly certified cooperative was set at 100 households while that of a cooperative which has not considered joining any certification program was set at 120 households. A sampling frame was prepared for each of the cooperatives included in the study and it included all members from all wet mills which are affiliated to the cooperative. To facilitate a better match, the number of coffee trees owned by members of the treatment cooperative was used as an indicator of uniformity.

After the removal of the outliers, the range for the number of coffee trees owned by members of the treatment cooperative was determined and a random sample of 80 farming households randomly drawn. The sampling frame for each control cooperative was conditioned to fall within the range of the treatment group. It was from this pre-conditioned range that a random sample of 100 and 120 was randomly generated using STATA<sup>3</sup> program.

Previous researcher experience with household surveys in Kenya show that despite all necessary prior arrangements, some respondents will either be absent on the date of interview or change their minds regarding participation or partially participate (leaving questionnaires partially filled). For this reason, in addition to the original sample selected, a replacement sample of up-to 20% was availed to the enumerators. The replacement sample was also randomly generated from each cooperative's sample frame less the selected sample. In a few cases a second replacement sample was necessary. This was occasioned by deaths or out migration and also due to problems with registers of cooperative membership.

Primary data were collected through single farm visit interviews using structured questionnaires administered to respondents (mainly the household head) by enumerators. A farm household was defined as a social entity that collectively makes productive and consumptive decisions and often eats from the same granary. 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

The data collection exercise was during the month of November 2009 and covered coffee production and marketing activities for the 2008 coffee calendar year i.e. the period between September 2008 to August 2009

### **2.3 Selection of Cooperatives**

Solidaridad<sup>4</sup>, the funding agency for smallholder certification programmes was instrumental in selection of the treatment groups which in the case of Nyeri District, Tekangu coffee farmers cooperative was selected while in Kiambu, Ndumberi Coffee farmers cooperative was picked. The study team was tasked with searching for possible Cooperatives in the District that would serve as a control group in the impact evaluation study.

---

<sup>3</sup> A statistical software

<sup>4</sup> Dutch NGO

In Kiambu, discussions with various management committees resulted to Kiambaa<sup>5</sup> cooperative being chosen as an ideal control since its members shared very similar initial characteristics with Ndumberi. The cooperative had just initiated the process of getting FT certification. Kiambaa cooperative was therefore chosen as a soon to be certified coop. The search for a control cooperative that would not be starting any certification scheme yet was more complicated because many of them are already on their way to certification. Mekari farmers cooperative seemed to be the only possible control that shared some similar initial characteristics with Ndumberi. Mekari<sup>6</sup> was chosen as the yet to be certified cooperative.

Similarly in Nyeri, potential coffee cooperatives that would serve as the control group in the impact evaluation study were selected after elaborate discussions with local key informants. Rugi<sup>7</sup> cooperative which had just initiated an application for Fair Trade certification was considered as an appropriate control inspite of having more wet mills and more members than Tekangu. Kiama<sup>8</sup> Cooperative which was not yet seeking to join any certification program was chosen as an appropriate second control.

### **3 Results**

#### **3.1 Characteristics of small holder coffee farmers**

##### ***3.1.1 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. These two groups differ significantly in the following ways: Households in the treatment group differ from households in the control group in the following ways: the households have lived in the 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

---

<sup>5</sup> *Kiambaa FCS*: The society was registered in 1954 and built its first factory in 1957. Three factories are affiliated to this society namely Gititu, Kanunga and Gici.

<sup>6</sup> Mekari FCS has 1 wet mill

<sup>7</sup> Rugi FCS: The factories affiliated to the society are eight namely; Mihuti, Gatatha, Giathugu, Mweru, Kanyariri, Gumba, Mutitu and Karundu. The society was registered in 2005 (provisional) and has 5,769 active members.

<sup>8</sup> Kiama FCS: The society was registered (provisional) in 2005. The factories affiliated to the society are five namely: Ihwagi, Kiangundo, Gachuiro, Ichuga and Kiamaina factory. The factory has 3842 members.

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 mbuni<sup>9</sup>, 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.

**Table 1: Characteristics of households in the treatment and control groups**

	N	Control Mean	N	Treatment Mean	t-test (p> t )	
<b>Household characteristics</b>						
Age of the head	220	62.22	79	65.82	0.044	**
Gender of head	220	1.31	79	1.42	0.095	*
Marital status of head	220	2.94	79	3.10	0.394	
Highest education level	220	6.55	79	4.30	0.041	**
HH size (sum persons)	220	4.52	79	4.46	0.818	
HH size (sum adult equiv.)	220	3.92	79	3.84	0.763	
HH years of educ (sum years)	220	35.10	79	34.91	0.950	
Farming experience (yrs)	220	33.96	79	38.13	0.027	**
Years lived in locality	220	38.15	79	44.25	0.004	***
<b>Accessibility</b>						
Distance to nearest wet mill	220	2.17	79	2.12	0.823	
Distance to the wet mill where coffee is delivered.	220	2.27	79	2.24	0.905	
Distance to nearest electricity supply	220	0.10	79	0.09	0.820	
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	**
Nearest wet mill	220	2.17	79	2.12	0.823	
Distance to wet mill where coffee delivered	220	2.27	79	2.24	0.905	
Distance to major market for farm produce	220	4.00	79	4.82	0.051	**
<b>Land</b>						
Acreage at HH inception	220	2.39	79	1.89	0.123	
Acreage owned now	220	2.20	79	1.89	0.556	
Number of coffee parcels	220	1.05	79	1.08	0.333	
Number of coffee plots	220	1.05	79	1.08	0.333	
coffee variety	220	1.27	79	1.34	0.391	
Acreage under coffee	220	0.74	79	0.54	0.003	***
Coffee acreage - monocrop	220	0.25	79	0.24	0.851	

<sup>9</sup> Dried coffee beans. 7kg of cherry to get 1kg mbuni

	N	Control Mean	N	Treatment Mean	t-test (p> t )	
Number of mature coffee trees	220	374.07	79	284.27	0.004	***
<b>Assets</b>						
Asset owned in 2006	220	7.10	79	6.86	0.536	
Value of asset in 2009	220	107,900.00	79	182,700.00	0.09	*
Items owned 3 years ago	220	7.10	79	6.86	0.536	
Total asset value	220	102,400.00	79	177,500.00	0.089	*
Total livestock units in 2006	187	4.83	66	6.96	0.359	
<b>Input use</b>						
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	*
<b>Productivity &amp; sales</b>						
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	***
Cherry kg rejected at wet mill	220	8.44	79	6.76	0.126	
<b>Income</b>						
coffee income (reported price)	220	23,820.00	79	18,070.00	0.105*	
coffee income (coop mean price)	216	24,530.00	73	18,900.00	0.117	
Income from other crops	220	9,978.00	79	5,871.00	0.322	
Net income from other crops	220	2,362.00	79	1,392.00	0.812	
Net income from coffee	220	14,020.00	79	11,450.00	0.415	
Total gross HH income	220	257,500.00	79	303,900.00	0.381	
Total expenditure	220	115,800.00	79	118,300.00	0.902	
Net HH income	220	141,800.00	79	185,600.00	0.351	
Coffee income per acre	220	33,370.00	79	34,360.00	0.802	
Net coffee income per acre	220	19,810.00	79	20,490.00	0.864	
<b>Perception</b>						
Member in group	220	0.97	79	0.97	0.773	
Number of groups HH is in	219	1.37	79	1.35	0.871	
If HH is in farmer organization	220	1.01	79	1.01	0.786	
Perception of economy vs 5yrs ago	220	1.50	79	1.39	0.27	
Perception of economy vs 5yrs to come	220	1.87	79	2.00	0.29	
Satisfaction with technical services	220	3.23	79	3.65	0.022**	
Satisfaction with commercial services	220	3.12	79	3.39	0.136	
<b>Gender and environment</b>						
Number of decisions made by head	182	4.37	66	4.62	0.591	

	N	Control		Treatment		t-test (p> t )
		Mean	N	Mean	N	
Number of decisions by spouse	182	0.74	66	0.82	66	0.640
Number of decisions by both	182	2.62	66	2.32	66	0.473
Risk attitude						
Risk attitude	220	2.09	79	2.08	79	0.681

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

### 3.1.2 Nyeri District

The basic characteristics, pre-treatment variables and potential outcome variables for the treatment and control households were compared and results are presented in Table 2. The t-test was used to determine whether there are significant differences between the two groups.

Basic household characteristics of the two groups do not differ. 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 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: Sample characteristics**

	Control		Treatment		t-test (p> t )
	N	Mean	N	Mean	
<b>Household characteristics</b>					
Age of the head	221	57.86	80	56.1	0.343
Gender of head	221	1.23	80	1.15	0.129
Highest education level	220	6.78	80	7.73	0.207
HH size (sum persons)	221	3.99	80	4.31	0.186
HH size (sum adult equiv.)	221	3.43	80	3.75	0.146
HH Years of educ (sum of educ yrs)	221	28.76	80	30.99	0.347
Farming experience	221	29.43	80	30.46	0.607
Years lived in locality	221	25.92	80	31.66	0.426
<b>Land</b>					
Acreage at HH inception	221	1.83	80	1.69	0.593

	Control		Treatment		t-test	
	N	Mean	N	Mean	(p> t )	
Acreage owned now	221	1.66	80	1.8	0.593	
Number of coffee parcels	221	1.08	80	1.13	0.303	
Number of coffee plots	221	1.08	80	1.13	0.303	
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	**
<b>Accessibility</b>						
Distance to nearest electricity supply	221	0.47	80	0.54	0.505	
Distance to the nearest dairy	221	1.18	80	2.25	0.001	***
Distance to extension advice	221	3.18	80	2.51	0.111	
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	***
<b>Wealth</b>						
Number of assets owned in 2006	221	6.29	80	7.4	0.002	***
Value of asset in 2009	221	84,360.00	80	117,200.00	0.58	
Total asset value	221	58,300.00	80	106,600.00	0.239	
Total livestock units in 2006	190	2.5	67	2.14	0.205	
<b>Input use</b>						
Coffee input cost per acre	189	16,080.00	76	18,380.00	0.143	
Coffee labour per acre	145	17,500.00	62	22,200.00	0.103	*
<b>Productivity &amp; sales</b>						
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	***
<b>Income</b>						
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	***
Gross income from other crops	221	14,010.00	80	46,960.00	0.188	
Net income from other crops	221	4,894.00	80	37,940.00	0.185	
Net income from coffee	221	14,550.00	80	19,530.00	0.081	*
Total gross HH income	221	182,600.00	80	235,100.00	0.147	
Total expenditure	221	53,120.00	80	68,800.00	0.021	*
Net HH income	221	129,500.00	80	166,300.00	0.267	
Coffee income per acre	221	60,320.00	80	71,390.00	0.062	*
Net coffee income per acre	221	35,090.00	80	36,730.00	0.766	

	Control		Treatment		t-test	
	N	Mean	N	Mean	(p> t )	
<b>Perception and participation</b>						
Member in group	221	0.98	80	0.96	0.48	
Number of groups HH belongs to	212	1.26	79	1.27	0.919	
If HH is in farmer organization	221	1.06	80	1.05	0.771	
Perception of economy vs 5yrs ago	221	1.40	80	1.60	0.030	
Perception of economy vs 5yrs to come	221	1.69	80	1.71	0.854	
Satisfaction with technical services	221	3.97	80	3.86	0.469	
Satisfaction with commercial services	221	4.06	80	3.83	0.121	
<b>Gender and environment</b>						
Number of decisions made by head	162	4.67	57	4.25	0.281	
Number of decisions by spouse	162	0.65	57	0.70	0.686	
Number of decisions by both	162	2.03	57	2.47	0.255	
<b>Risk attitude</b>						
Risk attitude	221	2.18	80	2.13	0.308	

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

Comparison of the means of outcomes amongst treated and control groups as an approximation of impacts generates a selection bias because treatment and control groups may have differed before the intervention i.e. before certification. The matching approach was adopted as a solution to this bias. The basic idea is to find among the control group, households with similar characteristics as the households in the treatment group. Once identified, outcomes for this “matched” control group are compared with outcomes for the treated group and the difference attributed to interventions through the UTZ certification program. The PSM matching procedure is based on balancing scores.

### **3.2 Factors Influencing the Likelihood of Participating in UTZ Program**

A commonly used balancing score is the probability of participating in a program given observed characteristics (p-score) which we 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.

### **3.3 Difference analysis**

#### **3.3.1 Kiambu District**

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 (here referred to as 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 & 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
<b>Acreage and trees</b>									
Number of parcels with coffee	0.01	0.2	76	0.13	0.3	76	0.03	1.0	76
Number of plots with coffee	0.01	0.2	76	0.13	0.3	76	0.04	1.0	76
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
Acreage under mono-crop coffee	0.05	0.7	76	0.03	0.5	76	0.02	0.3	76
Number of mature coffee trees	(50.49)	-1.3	76	(54.77)	-1.7	* 76	(63.05)	-2.2	** 76
Number of unproductive coffee trees	12.58	1.2	76	11.5	1.2	76	6.37	0.7	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
<b>Financial markets</b>									
Total savings	22,232.00	1.2	60	23,558.00	1.4	60	20870.00	1.3	60
Credit received	139,683.00	2.2	** 23	137,465.00	2.2	** 23	143,543.00	2.2	** 23
<b>Input use &amp; costs</b>									
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
Input cost in other crops	(400.20)	-1.1	50	(204.60)	-0.7	50	(577.68)	-1.6	50
Cost of seed for other crops	(249.20)	-0.7	71	(294.00)	-1.0	68	(320.73)	-1.1	68
If HH used hired labour in other crop	0.11	1.2	76	0.04	0.5	76	0.02	0.2	76
If HH used hired labour in coffee	0.09	1.1	76	0.09	1.2	76	0.11	1.6	76
If HH used hired labour	0.07	0.8	76	0.06	0.9	76	0.09	1.4	76
Hired labour cost in coffee	(3,323.00)	-1.1	49	(1,257.00)	-0.5	49	(2,617.47)	-1.4	49

	one to one with replacement			one to one no replacement			kernel		
	difference	T-stat	N	difference	T-stat	N	difference	T-stat	N
Cost of hired labour in coffee per acre	1,616.00	0.3	49	3972.00	1.0	49	2,821.39	0.7	49
Hired labour cost (total)	(7,615.00)	-2.0	** 23	(3,652.00)	-1.4	23	(7,964.01)	-3.8	** 23
Costs in livestock production	(5,599.00)	-0.2	58	(6,953.00)	-0.4	58	3,402.58	0.2	58
<b>Productivity and sales</b>									
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
<b>Income</b>									
Income from coffee (reported prices)	(1,645.00)	-0.4	76	(5,551.60)	-1.2	76	(4,594.69)	-1.3	76
Income from coffee (coop mean prices)	(1,687.00)	-0.4	70	(4,839.00)	-1.1	70	(2,722.04)	-0.8	70
Coffee income per acre (gross)	3,614.00	0.7	76	-812.20	-0.1	76	2,777.72	0.6	76
Net coffee income	4,430.00	1.2	76	(3,123.00)	-0.7	76	(233.88)	-0.1	76
Net coffee income per acre	8,149.00	1.5	76	(1,472)	-0.3	76	3,708.70	0.8	76
Income from other crops	(9,591.00)	-1.3	76	(5,455.80)	-1.0	76	(2,659.36)	-0.7	76
Net crop income	(5,920.00)	-0.8	76	(2,830.00)	-0.5	76	(9.10)	0.0	76
Gross income from livestock	(13,295.00)	-0.5	76	(8,668.00)	-0.4	76	(14,701.26)	-0.7	76
Net livestock income	(7,931.00)	-0.3	76	(3,797.00)	-0.2	76	(16,296.33)	-0.9	76
Off farm income 2009	176,736.00	2.1	** 55	170,237.00	2.0	** 55	153,611.90	1.8	* 55
Gross hh income	84,567.00	1.1	76	88,739.60	1.1	76	75,155.50	1.0	76
Net hh income	73,104.00	1.0	76	73,925.20	1.0	76	59,420.08	0.9	76
<b>Household Expenditure</b>									
Expenditure on food	111.00	1.5	76	104.80	1.6	76	106.49	1.7	* 76
Expenditure on education	24,734.00	1.4	38	24,346.00	1.6	38	25,477.02	1.8	* 38
Expenditure on basic needs	12,337.00	0.6	76	12,502.90	0.6	76	14,233.58	0.7	76
Expenditure on energy	55.68	0.3	74	74.00	0.4	74	24.08	0.2	74

	one to one with replacement			one to one no replacement			kernel		
	difference	T-stat	N	difference	T-stat	N	difference	T-stat	N
Philanthropic expenditure	(4,399.00)	-1.1	76	(3,442.50)	-1.1	76	(4,192.91)	-1.6	76
Expenditure on transport	1,812.00	0.5	71	1040.00	0.32	68	(1,260.37)	-0.4	68
Total expenditure	11,463.00	0.3	76	14,814.30	0.5	76	15,735.42	0.6	76
<b>Investments</b>									
Any land attached investments?	-	0.0	76	0.4	0.6	76	(0.01)	-0.2	76
Any capital investments?	(0.07)	-1.0	76	(0.01)	-0.2	76	(0.04)	-0.8	76
If new coffee was planted	(0.01)	-1.0	76	(0.01)	-1.0	79	(0.01)	-0.7	76
Value of land attached investments	(6,581.00)	-0.9	18	(10,881.00)	-1.2	18	(17,933.55)	-2.9	** 18
Value of capital investments	3,455.00	0.9	33	4544.00	1.4	33	2,926.71	0.8	33
<b>Assets</b>									
Assets owned in 2009	(0.28)	-0.5	76	(0.08)	-0.2	76	(0.04)	-0.1	76
Value of assets in 2009	(52,786.00)	-1.2	76	5486.71	0.14	76	(28,200.57)	-0.8	76
Value of furniture in 2009	46,005.00	1.4	73	50,032.00	1.6	73	40,432.83	1.2	73
Value of durable assets	44,699.00	1.4	76	49,702.00	1.5	76	38,150.86	1.1	76
Value of agricultural assets	(53,507.00)	-1.2	76	4,183.00	0.11	76	(27,820.07)	-0.8	76
Total livestock units owned	0.82	1.3	69	0.88	1.5	69	0.72	1.2	69
Value of livestock owned	9,667.00	0.5	63	4,326.00	0.3	63	208.81	0.0	63
<b>Perception and participation</b>									
Number of groups HH belongs to	0.03	0.3	76	0.08	0.6	76	0.07	1.0	76
If HH is a member of Farmer organisation	0.01	1.0	76	0.01	1.0	76	0.01	0.7	76
Perception of economy vs 5yrs ago	-0.09	-0.64	76	0.05	0.34	76	-0.20	-1.72	* 76
Perception of economy vs 5yrs to come	-0.03	-0.15	76	-0.06	-0.54	76	0.03	0.22	76
Satisfaction with technical services	0.43	1.69	* 76	0.40	1.85	* 76	0.33	1.66	* 76
Satisfaction with commercial services	0.12	0.46	76	0.26	1.2	76	0.17	0.81	76
<b>Gender and environment</b>									
Number of decisions made by head	-0.10	-0.14	63	-0.27	-0.46	63	-0.18	-0.32	63

	one to one with replacement			one to one no replacement			kernel		
	difference	T-stat	N	difference	T-stat	N	difference	T-stat	N
Number of decisions by spouse	0.30	1.24	63	0.30	1.36	63	0.22	0.97	63
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

### **3.3.2 Nyeri District**

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.

Although not significant, farmers in the treatment group seem: less risk averse, more satisfied with the technical and commercial services offered by cooperative but less positive about their current economic situation (but not significant) compared to farmers in control group. The heads of households made more decisions while decisions made jointly by both head and by spouse were fewer than in the control group.

**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
<b>Acreage &amp; trees</b>									
Number of Coffee parcels	-	0.0	77	0.25	0.5	77	0.02	0.4	77
Number of Coffee plots	-	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
Acreage under mono-crop coffee	0.08	1.0	77	0.09	1.4	77	0.08	1.4	77
Number of mature coffee trees	24.88	0.7	77	35.00	1.1	77	35.72	1.2	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
acreage farmed in 2009	(0.32)	-0.6	77	(0.20)	-0.5	77	0.15	0.6	77
acreage under other crops	(0.30)	-0.8	77	(0.19)	-0.8	77	(0.01)	0.0	77
<b>Financial markets</b>									
Total savings	36,925.00	2.1	** 70	32,548.50	2.0	** 59	28,073.29	1.9	* 59
Credit received	17,560.00	0.4	23	30,168.00	0.8	23	42,989.53	1.3	23
<b>Input use &amp; costs</b>									
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
Input cost in other crops	86.81	0.1	70	2.16	0.0	59	(176.71)	-0.3	59
Seed cost in other crops	(142.50)	-0.4	76	(303.60)	-0.98	74	(139.61)	-0.5	74
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
Cost of hired labour in coffee per acre	6,251.00	1.3	59	4,688.00	1.3	59	4,800.09	1.4	58
Total cost of hired labour	(1,648.00)	-0.5	41	(966.60)	-0.5	41	(645.91)	-0.2	41
Costs in livestock production	(20.58)	0.0	67	(575.00)	-0.2	67	(283.51)	-0.1	67
<b>Output</b>									
Kg of cherry sold	211.20	1.5	77	161.20	1.3	77	156.92	1.4	77
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

	one to one with replacement				one to one no replacement				Kernel			
	difference	T-stat		N	difference	T-stat		N	difference	T-stat		N
Price per kg of Mbuni	2.87	1.8	*	68	2.80	2.0	**	759	2.81	2.3	**	59
<b>Income</b>												
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
Net coffee income	4,653.00	1.0		77	2,957.00	0.8		77	3,971.19	1.1		77
Coffee income per acre (gross)	13,515.00	1.6		77	10,546.00	1.4		77	11,003.02	1.6		77
Net coffee income per acre	1,096.00	0.1		77	(853.20)	-0.12		77	1,062.90	0.2		77
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 from livestock	708.30	0.1		77	(1,220.00)	-0.2		77	(9,936.68)	-1.5		77
Gross income from livestock	589.30	0.1		77	(1,889.00)	-0.2		77	(10,459.04)	-1.4		77
Off farm income in 2009	(37,900.00)	-0.8		68	269.80	0.0		59	669.64	0.0		59
Gross household income	(57,376.00)	-1.3		77	(19,653.00)	-0.5		77	(24,310.96)	-0.7		77
Net income for household	(72,253.00)	-1.8	*	77	(33,016)	1.0		77	(37,794.54)	-1.3		77
<b>Household Expenditure</b>												
Expenditure on food	(76.21)	-1.0		77	(37.00)	-0.6		77	(76.84)	-1.2		77
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
Expenditure on education	8,439.00	1.3		43	4831.00	0.8		43	4,243.08	0.6		43
Expenditure on transport	(303.00)	-0.4		74	(375.50)	-0.7		74	0.73	0.0		74
Philanthropic expenditure	2,261.00	1.3		77	1,173.00	0.7		77	1,919.20	1.2		77
Total household expenditure	14,877.00	1.5		77	13,362.00	1.7	*	77	13,483.58	1.8	*	77
<b>Investments</b>												
Any land attached Investment?	0.17	3.4	**	77	0.14	2.9	**	77	0.14	2.6	**	77
Any capital investments?	0.04	0.7		77	0.03	0.6		77	0.03	0.8		77
Value of land attached investments	3,513.00	1.0		28	4,538.00	1.4		30	3,128.55	0.9		28
Value of capital investments	8,117.00	1.6		34	7017.00	1.3		34	6,037.76	1.1		34
<b>Wealth/Assets</b>												
Acreage owned in 2009	(0.41)	-0.7		77	(0.22)	-0.6		77	0.13	0.5		77
Assets owned in 2009	0.44	0.8		77	1.0	2.9	**	77	0.63	1.6		77
Value of assets in 2009	3,198.00	0.2		77	(41,488)	-0.7		77	(24,432.56)	-0.6		77
furniture value in 2009	(268.60)	-0.1		70	(2,303.40)	-0.4		59	708.44	0.1		59
value of durable assets	(366.70)	-0.1		77	(1,289)	-0.2		77	(414.17)	-0.1		77
value of agricultural assets	2,568.00	0.2		76	13383.80	0.99		74	(23,583.60)	-0.5		74

	one to one with replacement			one to one no replacement			Kernel		
	difference	T-stat	N	difference	T-stat	N	difference	T-stat	N
Total livestock units	(0.23)	-0.5	73	(0.19)	-0.6	71	(0.17)	-0.6	71
Value of livestock	(5,022.00)	-0.5	70	(2,596.00)	-0.3	70	(3,165.60)	-0.5	70
<b>Perception and participation</b>									
Number of groups HH belongs to	0.04	0.5	76	0.05	0.7	74	0.03	0.4	74
If HH is a member of a farmer organization	-	0.0	77	(0.02)	-0.6	77	0.01	0.2	77
Perception of economy vs 5yrs ago	0.08	0.51	77	0.05	0.38	77	0.07	0.64	77
Perception of economy vs 5yrs to come	0.04	0.24	77	0.17	1.4	77	0.01	0.12	77
Satisfaction with technical services	0.10	0.46	77	0.04	0.2	77	0.10	0.63	77
Satisfaction with commercial services	0.03	0.11	77	-0.33	-0.2	77	0.01	0.07	77
<b>Gender and environment</b>									
Number of decisions made by head	0.22	0.37	54	0.22	0.46	54	0.07	0.15	54
Number of decisions by spouse	0.13	0.61	54	0.03	0.22	54	0.15	1.00	54
Number of decisions by both	-1.61	-0.97	54	-0.21	-0.66	54	-0.30	-0.68	54
<b>Risk attitude</b>									
Risk attitude	-0.07	-0.97	77	-0.09	-1.4	77	-0.03	-0.56	77

## 4 General Discussion and Conclusion

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 Coop level (observable and unobservable) that may be difficult to control for. This notwithstanding, the results do 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 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 were higher than control for households in Nyeri and vice versa in Kiambu Districts. The probable cause of this maybe the higher<sup>10</sup> 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

---

<sup>10</sup> Due to their unique characteristics in relation to natural climatic characteristics

have been more strict in Tekangu a which tallies with the higher proportion of coffees rejected at the wet mill in Tekangu 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 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.

Gains from certification were mainly observed through increased prices (and incomes). 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 Programme. *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.

Kinoti, 2005.....

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. *Bimetrika* 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

[www.coffeeboard.co.ke](http://www.coffeeboard.co.ke)

[www.utzcertified.org](http://www.utzcertified.org)

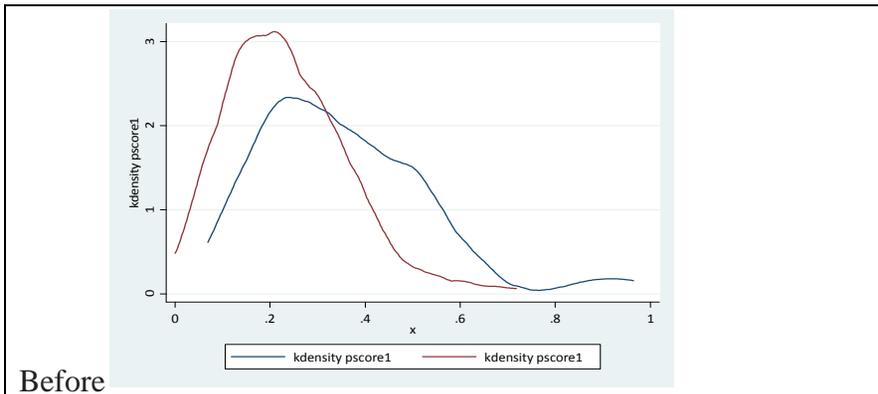
### **Acknowledgements**

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 Karugu Macharia of Solidaridad in Nairobi and Kamau Kuria of Coffee Management Services for sharing their insights & experiences and for facilitating the various meetings with the farmers' cooperatives.

We acknowledge the Team at Tegemeo Institute and the enumerators who so ably collected, cleaned and processed the data.

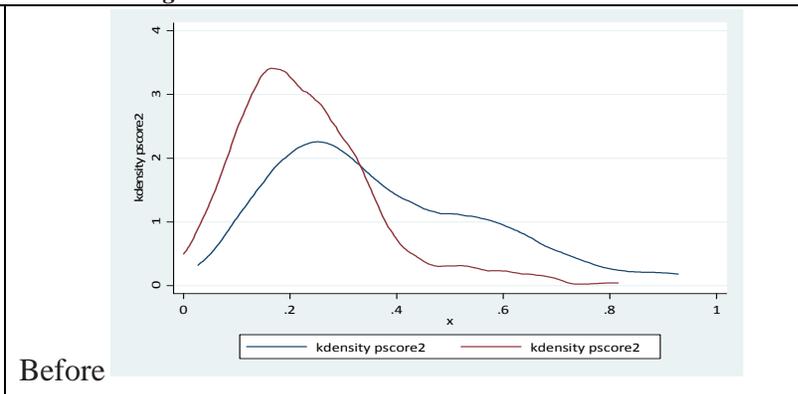
# Annex 1: Distribution of Propensity Scores Before and after Matching

*Ndumberi*

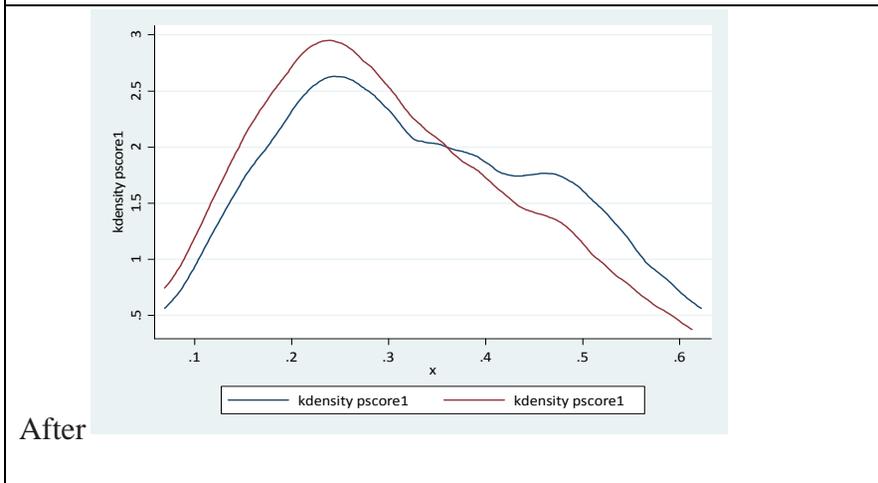


Before

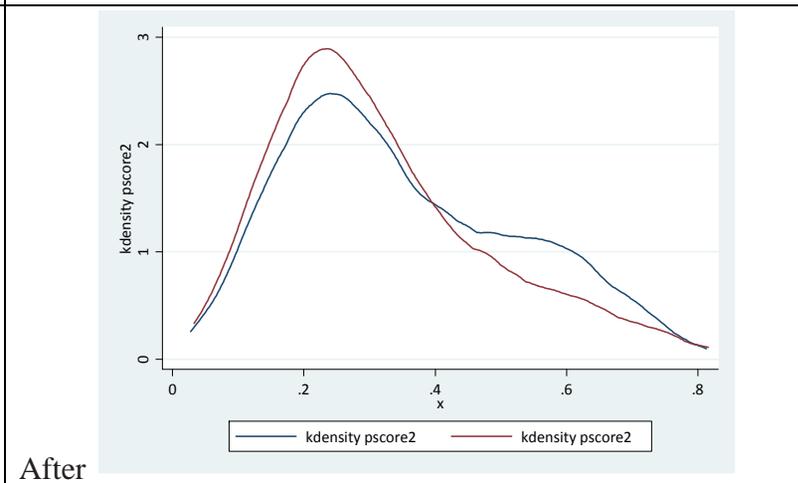
*Tekangu*



Before



After



After