academicJournals

Vol. 13(16), pp. 821-833, 19 April, 2018
DOI: 10.5897/AJAR2018.12992
Article Number: 560012156743
ISSN 1991-637X

http://www.academicjournals.org/AJAR

African Journal of Agricultural Research

Full Length Research Paper

Towards being equal to them: Impact of organic certified production systems on women empowerment in agriculture

Oscar Ingasia Ayuya

Department of Agricultural Economics and Agri-Business Management, Egerton University, P O Box 536-20115, Egerton, Kenya.

Received 13 January, 2018; Accepted 26 February, 2018

The objective of the study was to determine the degree of women empowerment in agriculture as well as examine the effect of organic certification and other socio-economic and cultural factors on women empowerment in agriculture in Kenya. This objective was achieved using data from peri-urban vegetable and rural honey producing households. It followed the innovative multidimensional measurement of women empowerment in agriculture, and the univariate and multivariate two limit Tobit models was used to assess the determinants of women empowerment. The two limit Tobit models results affirmed the hypothesis that organic certification opens up knowledge space for women empowerment in agriculture in some domains but had more impact among women in vegetable producing households. However, the variation of the degree of women empowerment in agriculture was also influenced by men, women and household socioeconomic and cultural characteristics. Policies geared towards enhancing women's social capital and ownership of assets will improve the women household bargaining power and subsequently women empowerment in Agriculture.

Key words: Women empowerment in agriculture, organic certification, peri-urban, rural, knowledge space.

INTRODUCTION

Recently, developing countries have experienced proliferation of local market oriented organic production systems due to growing local demand for organic products resulting from the increasing income and urbanization (Hattam et al., 2012; Probst et al., 2012).

The consumers in this market niche are concerned with the food attributes thus willing to pay premium prices for organic products (Hattam et al., 2012). This trend has shifted the marketers focus from promotion of food products to the promotion of food attributes among consumers and potential consumers (Stolzenback et al., 2013; Costanigro et al., 2014) through certification of the processes along the agricultural value chains. On the producers end, certified organic production is achieved through adoption of sustainable production and produce handling techniques with the aim of reaping economic,

E-mail: ingasiaoa@yahoo.com.

social and cultural benefits from the certified processes (UNCTAD, 2006; Blackman and Naranjo, 2012; Hattam et al., 2012).

The potential of organic agricultural systems has made it an attractive business model in developing countries aimed at improving the livelihood of smallholder agricultural producers through farmer led organization. Consequently, governmental agencies, local and international non-governmental organizations, international donors and other development partners in the Sub-Saharan Africa have been involved in encouraging the adoption of organic production systems as a developmental pathway for smallholder agriculture (Hattam et al., 2012). One of the important outcomes of certified organic agriculture is women empowerment in agriculture (WEIA, hereafter)[1] which has gained much interest among policy makers and researchers (Farnworth and Hutchings, 2009; Arestoff and Djemai, 2013). This is as a result of women constituting up to 75% of agricultural producers in the Sub-Saharan Africa and yet their role is unrecognized (World Bank, 2008).

Several studies (Doss, 2006; Ellis et al., 2007; Fantahun et al., 2007; World Bank, 2008; Chhay, 2011; Swaminathan et al., 2012) have highlighted the importance of empowering women in the society. Swaminathan et al. (2012) found that empowering women in India through home and land ownership increased mobility of women and their decision making ability regarding their own expenditure, health and work.

In Ghana, Doss (2006) found that increasing resources in the hands of the women had positive effects on the children welfare while Chhay (2011) finds that increased women control on at least part of household income, is associated with better household nutrition, health, and education levels. Women empowerment was found to reduce under-five mortality (the fourth Millennium Development Goal) in Ethiopia, a common problem in most developing countries (Fantahun et al., 2007).

Food and Agriculture Organization (FAO) (2006) and World Bank (2008) also strongly link WEIA with food improved food security In developing countries. In the sub-Saharan region, specifically Kenya, Tanzania and Ethiopia, World Bank (2005) reports on 10 to 20% increase in output if women entrepreneurs and producers are given the same education and inputs as men. Further, findings by Ellis et al. (2007) in Kenya are that elimination of the gender-based inequalities in accessing agricultural inputs and education had the potential of increasing the country's Gross Domestic Product (GDP) by 4.3% points, and sustained increase of year-on-year in GDP growth of 2-3.5percent points.

Proponents of women empowerment argue that certified organic production systems provides one of the vivacious ways of addressing social inequities, exploitative relationship and dependencies which conventional production systems is propagating (Farnworth and Hutchings, 2009). This theory is further advanced by Trauger (2004), that sustainable production system provides spaces of knowledge to marginalized women unlike the conventional production systems. However, this hypothesis is still not clear in empirical literature. Further, Farnworth and Hutchings (2009) reports on existence of anecdotal empirical evidence on the impact of organic certification on WEIA in literature. Thus, this suggests a fundamental need to explore in greater depth the relationship between organic certification and women empowerment which is important for project planners and policy analysts.

In Kenya, like other countries in the Sub-Saharan region, studies have reported on low levels WEIA attributed to gender-related constraints and vulnerabilities of women compared to men (World Bank, 2008; FAO, 2011). However, the "low" level in WEIA is also not clear in empirical literature. Further, if it is low, the interest of the policy makers, developmental planners and partners would be to understand how the socio-economic and cultural characteristics influence the level of women empowerment in order to make decisive interventions. However such information is scarce in empirical literature, partly attributed to lack of a clear tool to measure WEIA in the face of renewed interest in agriculture as the engine for growth and development (FAO, 2011; Alkire et al., 2013).

It is on this background that this study aims to fill this knowledge gaps with an exploratory study on local oriented market consisting of certified organic and noncertified vegetable and honey producers in Kenya. Therefore, the objective of the study was to provide micro level empirical evidence on the degree of women empowerment and to examine the impact of organic certification and other socioeconomic and cultural factors that influence of WEIA. The study provides a test of the hypothesis that organic certification positively influence WEIA on the premise that it provides spaces of knowledge to women compared to the conventional systems. This was within a context of acknowledgement that WEIA is multidimensional. Thus, the measurement of WEIA was through the innovative methodology proposed by Alkire *et al.* (2013), with some modification in the methodology and using econometric tools. The study contributes to literature in three aspects:

(1) It provides a micro level evidence of degree of WEIA in two production systems consisting of peri-urban and rural area producers;
(2) It makes a methodological contribution to the Alkire et al. (2013) on the measurement of the dimensions of empowerment. In particular, the study borrows from the business world on how to measure women empowerment in leadership domain by adapting the authentic leadership measurement by Walumbwa et al. (2008) as opposed to

[1] In this study empowerment follows Kabeer (2001) definition that it is "the expansion of people's ability to make strategic life choices in a context where this ability was previously denied to them". The study limits itself to women

the group and public speaking methodology proposed by Alkire et al. (2013);
(3) It uses the two limit multivariate modeling approach used mostly in demand estimation to determine the impact of organic certification after controlling for potential endogeneity and other socio-economic and cultural factors among vegetable and honey producers on the different domains of WEIA thus allowing for domain interactions of the unobservables.

METHODOLOGY

Study area

This study used two local market oriented case sites in Kenya; vegetables production in Ongata Rongai district located in peri-urban area and organic honey production in Mwingi district in the rural areas. Ongata Rongai district has both the conventional and certified vegetable farmers and lies on coordinates 1°21'34"S 36°39'44"E bordering Nairobi the capital city of Kenya (KCIDP, 2013).

Farmers supply of organic vegetables to hotels and restaurants, supermarkets, several organic shops and others are sold directly to organic consumers in flea market in Nairobi (Kamau et al., 2018). Community Sustainable Agriculture and Healthy Environmental Program (CSHEP) and government extension providing women empowerment integrated extension services to the organic farmers. The production processes and marketing are certified by Encert Kenya. The organic certification project is coordinated by Kenya Organic Agricultural Network (KOAN) and includes components of women empowerment by integrating women in agricultural production and marketing trainings and leadership in the farmer led organizations. Women are also facilitated to access the markets for organic products. For comparison, similar conventional farmers in the area were sampled.

Mwingi district is among the high quality honey producers in Kenya and is located in 0° 56' 0" South, 38° 4' 0" East and is a semi-arid region, a highly food insecure and livelihood of the residents depends on rain fed agro-pastoralism and honey production. About 60% of the population living in area lives below the poverty line (Galu et al., 2010). Honey production in the district is classified as organic because of minimal or no usage of external inorganic inputs for crop or livestock farming and the presence of surrounding forest buffer zones. International Fund for Agricultural Development (IFAD) and The International Centre of Insect Physiology and Ecology (ICIPE) jointly initiated the project of commercializing organic honey production involving over 2000 households. This led to establishment of Mwingi Honey Place and several honey collection centers to undertake value addition and marketing of processed honey and wax as the main by product. Production, processing and marketing activities are certified by Kenya Organic Agriculture Network (KOAN) and Institute of Marketecology (IMO), Switzerland.[2] The woman empowerment component includes involving women production and marketing of honey through intensive and frequent trainings in farmer groups that includes men and women. Women are also involved in the leadership of the marketing group and the individual farmer groups. Some disadvantaged women are given beehives by the project to enable them engage in commercial honey production.

Data were collected from 237 and 232 households involved in vegetables and honey producing households respectively selected using multi-stage sampling approach. However, the sample reduced to 203 and 207 households among vegetables and honey producers respectively due to unavailability of some women during the survey period in the months of June and July 2013 and the exclusion of single and widowed women from original sample because of the need to include the impact of men characteristics in the analysis. Among the 203 households in vegetable production system, 62% were conventional farmers and 38% were certified organic farmers while for honey producers 49% were noncertified and 51% were certified organic producers. The study used a semi-structured questionnaire through in-depth face-to-face interviews to sampled households by trained enumerators. Contextual data was collected through focus group discussion conducted in each case study sites.

Measuring WEIA

The study adopted the methodology of measuring WEIA as proposed by Alkire et al. (2013) since it reflects the diverse aspects in empowerment literature[3]. However, some modifications are made to how the different domains are measured. The five domains that constitute WEIA are production, income, resource, leadership and time. The production domain was composed of;

(1) The woman input in production decisions involving cash and food crop farming, livestock keeping and aqua farming, and
(2) Autonomy in production involving agricultural and livestock production, type of crops to grow, type of inputs to use, when and who to deliver the produce to the market.

However, instead of the ranked scale and binary variables used to measure the levels of empowerment by Alkire et al. (2013), the study opted for a range between 0 and 10% which was later transformed to 0 and 100%. This was found necessary in getting stated actual level of woman participation in the decision making in the various components and reducing measurement errors involving limited ranked scales. This mode of measurement was used in all the subsequent components of the domains of women empowerment.

In the resource domain, the indicators comprised of ownership of land, other assets, decision on sale purchase and the transfer of land and other assets besides decisions regarding credit. The income domain was used to measure the decision making of the woman involving income generated in the household. The subcomponents of the domain were;

(1) The woman's participation in decisions on income generated from cash and food crop farming, livestock keeping and aqua farming, and
(2) The woman feelings on making decisions regarding her salaried or wage employment, major and minor household expenditure if she wanted.

The leadership domain saw a major change in its components. Instead of using the group and speaking in public as proposed by Alkire et al. (2013), the study opted for the authentic leadership measurement by Walumbwa et al. (2008) which captures four important aspects of leadership; self-awareness, relational transparency, internalized moral perspective and balanced

[2] For more details on the project visit ICIPE website at: http://www.icipe.org/index.php/component/content/article/62-commercial-insects programme/402-wild-silk-and-honey-bee-farming-for-income-generation-and-biodiversity-conservation-through-value-chain-approach.html. *Accessed on 9th October 2013*.

[3] See the article by Alkire *et al* (2013) for the review of other studies on women empowerment measurement and the details of weights for each subcomponent in different domains for brevity purposes.

processing of the woman.[4] The deviation was that the leadership indicators of belonging to a group proposed by Alkire et al. (2013) according to the study could be inadequate indicator since group membership results more to social capital formation than leadership (Christoforou, 2011; Tumbo et al., 2013). The time domain was measured by the level of satisfaction on the available time for leisure and the work load for the woman. The overall index was computed from the five domains using the equal weights of each domain as proposed by Alkire *et al*. (2013).

Modeling the determinants of women empowerment domains

To determine the factors that influence the five domains of women empowerment in agriculture, the study used the multivariate two limit Tobit analysis. The use of the ordinary least square would have been possible but the presence of the zero observation in some domains and the presence of lower and upper limits would lead to biased and inconsistent estimates (Ma et al., 2006).

The Tobit model estimates are consistent because of truncation of the domains at zero. The study opted for the two limits multivariate Tobit model in contrast to individual domain Tobit model because it allows for the unobservables that determine women empowerment in one domain have a likelihood of being correlated to those of other domains. Very few studies have used this methodology in agriculture (Gillespie and Mishra, 2011; Ali et al., 2012) and is mostly used in economics in demand estimation (Ma et al., 2006). Let the 5 domains of WEIA be donated by d with n observation and X a vector of variables including the organic certified production participation (*ocertprod)* variable hypothesized to be determining d, then the observed WEIA domains we_{ih} are determined by;

$$we_{ih}^{*} = X_{ih}^{'}\beta_i + \varepsilon_{ih}, 1 \le i \le d, 1 \le h \le n \quad (1)$$

$$we_{ih} = \begin{cases} we_{ih}^{*} & if \quad we_{ih}^{*} > 0 \\ 0 & if \quad we_{ih}^{*} \le 0 \end{cases} \quad (2)$$

where we_{ih}^{*} is the latent variable and $\varepsilon_h = (\varepsilon_{1h}, \varepsilon_{2h}, ..., \varepsilon_{dh})' \sim N_d(0, \Omega)$. The dimensions of the β_i is $s_i \times 1$ and Ω is a $d \times d$ symmetric positive matrix. The observed value of we_{ih} equals the true value of if $we_{ih}^{*} > 0$; otherwise, the observed value of we_{ih} is left censored to be zero (Ma et al., 2006). The latent women empowerment index for the i^{th} domain of the h^{th} woman is denoted by we_{ih}^{*} and the observed index of empowerment is we_{ih}, which is either positive or zero. Huang (2001) expressed the systems of equations as;

$$\begin{bmatrix} we_{1h}^{*} \\ we_{2h}^{*} \\ \vdots \\ we_{dh}^{*} \end{bmatrix} = \begin{bmatrix} X_{1h}^{'} & 0 & \cdots & 0 \\ 0 & X_{2h}^{'} & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & X_{dh}^{'} \end{bmatrix} \otimes \begin{bmatrix} \beta_1 \\ \beta_2 \\ \vdots \\ \beta_h \end{bmatrix} + \begin{bmatrix} \varepsilon_{1h} \\ \varepsilon_{2h} \\ \vdots \\ \varepsilon_{dh} \end{bmatrix} \quad (3)$$

This can be rewritten as;

$$we_h^{*} = X_h\beta + \varepsilon_h, \; h = 1, 2, \cdots, n \quad (4)$$

Where $we_h^{*} = (we_{1h}^{*}, we_{2h}^{*}, ..., we_{dh}^{*})'$,

$X_h = diagram(X_{1h}^{'}, X_{2h}^{'}, \cdots X_{dh}^{'})$, and

$\beta = (\beta_1^{'}, \beta_2^{'}, \cdots \beta_d^{'})'$ is a $s \times 1$ vector with $s = \sum_{i=1}^{h} h_i$.

However, it should be noted that in all this specification that some women might not be having zeros level of empowerment in any domain specific is in the domains which implies there will be censoring points at point zero. Therefore, possible combination of the WEIA at censoring points is 2^d represented by a $2^d \times 1$ vector C_s, c =1, 2, …, 2^d. The likelihood function is accounting for all the censoring combination of all observations is specified as;

$$L(WE; \beta, \Omega) = \prod_{h=1}^{n} \prod L_h^{C_s}(we_h; \beta, \Omega) \quad (5)$$

where WE= $(we_1^{'}, we_2^{'}, \cdots, we_n^{'})'$ and $L_h^{C_s}$ C shows the likelihood combination that the domain specific women empowerment index of woman h falls in regime s.

However, the inclusion of the dummy variable organic certification (*ocertprod*) as an explanatory variable in equations 3 or 4 would be a potential source of endogeneity leading to errors in the estimated parameters. To control endogeneity problem in the study, the probit model for participation in certified organic farming was estimated for vegetable and honey producers. This was followed by the prediction of the propensity scores for participation variable that was later used in equation 3 or 4 in estimating the impact of organic certified farming on each of the domains of WEIA (Ma et al., 2006; Grootendorst, 2007). However, it should be noted that since the overall index is derived from all the five domain of WEIA, it would be erroneous to estimate its determinants together with domain specific determinants. Its estimation is modeled in the next section.

Modeling the determinants of the overall WEIA index

To determine the relationship between overall WEIA and organic certification and other socioeconomic and cultural variables, the study used the univariate Two-Limit Tobit model and its structural equation is written as;

$$owe_i^{*} = X_i\alpha + \upsilon_i \quad (6)$$

where, owe_i^{*} is a latent variable of overall WEIA for the i[th] woman, X is a vector of independent variables postulated to be determining the intensity of women empowerment including the

[4] See attached questionnaire on how the study measured the leadership domain in appendix 1. Questionnaire modified from the sample in the National University blog by Walumbwa and associates.

Table 1. Variables for determinants of women empowerment in agriculture.

Variable	Description of the variable	Mean for vegetable producers	Mean for honey producers
Offarm_man	Off-farm activity participation by the husband , 1=Yes 0=No	0.62 (0.49)	0.58 (0.50)
Offarm_fem	Off-farm activity participation by the wife, 1=Yes 0=No	0.40 (0 .49)	0.43 (0.50)
Educ_ man [a]	Education level of the husband	2.78 (1.11)	2.51 (0.94)
Educ_ fem [a]	Education level of the wife	2.25 (1.05)	1.85 (0.95)
Female age	Age of the household head (years)	45.40 (13.56)	48.41 (12.27)
Head _ fem	Whether the wife is the household head, 1=Yes 0=No	0.23 (0.42)	0.11 (0.16)
Marry age	Age the wife was married in years	27.71 (4.58)	20.42 (4.30)
Age gap	Spousal age gap in years (husband age-wife age)	4.45 (7.69)	9.13 (7.78)
Wgroup_het[bc]	Group heterogeneity index	0.68 (0.15)	0.12 (0.30)
Wmeet index[b]	Meeting attendance index (meetings attended/ scheduled meetings)	0.73 (0 .30)	0.79 (0.34)
Wdensity [b]	Number of active groups household involved in 2012	1.28 (0.94)	1.69 (0.83)
Wtrust [b]	Level of trust in groups (0-100%)	6.60 (3.53)	8.15 (1.68)
ocertprod	Propensity to be organic certified producer	0.43 (0 .38)	0.53 (0.38)

Figures in parenthesis are standard errors of the respective means.
[a]Education measured in terms of 1=not gone to school 2=primary 3=secondary 4= tertiary 5= university; [b]Women level social capital dimensions; [c]The woman heterogeneity index derived from questions of whether members in women groups were from the same neighborhood, occupation, kingroup, economic status, religion, gender, education level and age group.

organic certified propensity scores estimated by probit model in section 2.3 as the participation variable.

The $\alpha's$ are parameters of the independent variables to be estimated and ε is the error term and independently distributed error term assumed to be normally distributed with a mean of zero and a constant variance. The univariate two limit Tobit model takes into account the censoring both from below and above. The observed is defined by the following generic measurement equation:

$$owe_i = owe^* \ \ if \ \ owe^* > \tau$$
$$owe_i = \tau_{owe} \ \ if \ \ owe^* \le \tau \quad (7)$$

Typically, the two Limit Tobit model assumes that τ = 0 which means the data is censored at zero. However, the overall WEIA for farmers range between 0% and 100% (Tobin, 1958).Thus, substitute τ in equation 7 results into:

$$owe_i = owe^* \ if \ \ 0 < owe^* < 1$$
$$owe_i = 0 \ \ if \ \ owe^* \le 0$$
$$owe_i = 1 \ \ if \ \ owe^* \ge 1 \quad (8)$$

Therefore, the model assumes that there is an underlying women empowerment index equal to $x_i\alpha + \upsilon_i$ which was observed only when it is some number between 0 and 100%; otherwise owe_i^* qualifies as an unobserved latent variable (Green, 2002). The empirical univariate two limit Tobit model was estimated among vegetable and honey producers and took the form of:

$$owe_i^* = \alpha_0 + \sum_{n=1}^{n} \alpha_n X_i + \upsilon_i \quad (9)$$

The independent variables X included in univariate and multivariate two limits Tobit models are described in the next section.

Variables included in the models

As described earlier, the probit model was used to derive the propensity scores to be used in the univariate and the multivariate obit models in determining the impact of organic certification on domain specific and overall WEIA. This was for the purposes of correcting for potential endogeneity. The variables included in the probit model, their measurement and the descriptive statistics for vegetable and honey producers are reported in Appendix 2. However, the main interest of the study was on measuring the degree of WEIA and on impact of organic certification and other socio-economic and cultural factors that determines the degree of women empowerment in agriculture, thus, much focus was given to this variables. The variables and their descriptive statistics are presented in Table 1.

The husband characteristics in a marriage could play role in the women empowerment process (Anderson and Eswaran, 2009). The husband's characteristic included were education level and the spousal age gap (the difference between the age of the woman from that of the man) and participation in off-farm activities. The study hypothesis that husbands participation in off-farm and higher education could result to higher levels of empowerment. This was on the premise that they facilitate exposure to information and knowledge which could reduce the subjective opinion on incapability of women involvement in agricultural decision making. Higher spousal age gap is associated in literature with hegemony on the younger spouse (Guilbert, 2013).

Table 2. Mean of dimensions of WEIA (0-100%).

Dimensions	Vegetable producers			Honey producers		
	Noncertified	Certified	Overall	Noncertified	Certified	Overall
Production	40.52 (19.21)	39.15 (23.12)	39.46 (20.32)	37.23 (18.28)	41.97** (22.13)	39.63 (18.92)
Income	35.21 (25.23)	36.13 (19.35)	35.86 (21.10)	27.23 (21.01)	27.78 (20.02)	27.25 (21.05)
Resources	38.35 (24.21)	42.91** (18.23)	40.56 (19.46)	30.96 (20.99)	30.31 (21.11)	30.85 (20.96)
Leadership	37.29 (41.19)	42.28*** (42.84)	39.72 (44.01)	36.34 (29.97)	42.23*** (39.88)	37.54 (36.17)
Time	36.71 (41.23)	31.28*** (39.54)	34.83 (40.82)	39.11 (27.36)	43.21** (28.29)	41.81 (30.82)
Overall women empowerment index	36.41 (16.17)	41.12** (28.36)	38.08 (25.36)	35.43 (23.28)	0.37.51 (32.19)	35.41 (23.26)

Figures in parenthesis are standard deviations. ** and *** indicates that the mean values are significantly different from the noncertified producing households in each product type at 5% and 1% level respectively.

The social and economic woman characteristics of the women were also included. Higher education level of the woman could positively influence empowerment since education increases the status of the woman in a family unit and the skills critical in decision making (Jayaweera, 1997). The participation of the woman in off-farm income is also important in increasing the bargaining power as it contributes to woman's self-reliance (Jayaweera, 1997). The variable of whether the woman is the head of the family was also included on the premise of understanding what the effect to women empowerment is when the woman is the family head.

Age of the woman could also determine WEIA and the study hypothesizes that the effect could be positive or negative; as older women will tend to be more empowered because of their experience in marriage and younger women could be more empowered because higher tendency being exposed and have higher levels of education. The age at which the woman married may affect her decision making ability (Guilbert, 2013), and the study hypothesizes that because early marriages is prone in rural areas, it could negatively influence WEIA among honey producers. The woman social capital dimensions (Grootaert, 1999), were also included because it could be a source of information and a platform to develop the woman's decision making skills. The value of agricultural assets was included as an indicator of wealth to understand how does larger wealth affects women empowerment. Land size could also determine the level of empowerment as women are greatly involved in providing agricultural labour force (Table 2).

The domains specific and the overall of women empowerment index in agriculture descriptive statistics are presented in Table 2. Among vegetable producing households significant difference in women empowerment was observed in the resources, leadership, time and the overall index. Conversely, there was significant difference in women empowerment in production, leadership and time dimensions among noncertified and certified honey producing households. Vegetable producers had higher levels of empowerment in production (39%), resources (41%) and leadership (40%). This could imply that men are still controlling the household income and expenditure leading also the higher levels of dissatisfaction in the workload and time available for their leisure activities.

On the contrary, women in honey producing households had higher levels empowerment in production (40%), leadership (36%) and time (42%) domains. Men were at the realm in resource and income domains possible implying that men could be willing to engage women in decision making more in domains which they consider as less important. In the overall index, women in honey producing households a 35% involvement in decision making compared to 38% of vegetable producing households. This could be attributed to the socio-economic and cultural impediments existing in rural areas.

RESULTS AND DISCUSSION

Determinants of degree of WEIA

Table 3 reports on the Probit models regression used to generate individual propensity scores among vegetable and honey producers to be used in determining the impact of organic certification on women empowerment in agriculture in the Tobit model. The results indicate that younger farmers with higher education level had higher likelihood of participating in certified organic production among vegetable and honey producers.

In honey production systems, larger household size increased the likelihood of participating in certified production probably to cushion their high household expenditure. Further, participating in off farm activities by the household head, higher household assets value and number of agricultural trainings influenced significantly the likelihood of participation in organic vegetable production systems. Shorter distances to produce markets in rural areas significantly increased the likelihood of participating in honey production systems, indicating the importance of market infrastructure in enhancing market participation among smallholder rural farmers.

In general, higher social capitals in the different dimensions (Grootaert, 1999) were also important in increasing the likelihood of participation in organic certified production systems in both production systems. Finally, since livestock manure is important in supplementing soil nutrients in organic production systems, farmers having closed systems of keeping livestock had higher likelihood of participating in certified organic vegetable production. This eases the collection and transportation of manure in the farms.

Tables 4 and 5 presents the results on the determinants of degree of WEIA among vegetable and honey producers, respectively. The multivariate two limit Tobit estimation was used for the WEIA domains and the univariate two limit Tobit used for the overall index. The significant chi square in both tables indicated that the multivariate technique produces efficient estimates of the

Table 3. Determinants of participation in certified organic production systems.

Variable	Vegetable producers		Honey producers	
	Coeff.	Std. err.	Coeff.	Std. err.
Head_age	-0.026*	0.011	-0.044**	0.015
Gender_he	-1.846	0.419	0.849	0.345
Educ_head	0.323**	0.140	0.409**	0.186
Hh size	0.173	0.104	0.350***	0.079
Offarm_he	0.708*	0.329	0.094	0.042
Agric_assets	0.898*	0.150	0.170	0.149
Farm size	0.208	0.439	0.047	0.204
Extetim	0.014	0.016	-0.016	0.019
Trainnum	0.617**	0.325	-0.215	0.363
Mktkm	-0.149	0.055	0.050***	0.056
Credit	0.519	0.378	0.573	0.506
Household social capital				
Density	0.043**	0.166	-0.117	0.063
Meet_index	0.165	0.375	1.216**	0.495
Group_het	0.144***	0.092	0.840**	0.179
Decision	0.189**	0.069	0.273*	0.076
Trust	-0.067	0.066	0.236	0.284
System	0.859**	0.309	-	
Intercept	-8.900***	1.906	-6.099 **	2.177

Figures in parenthesis are standard errors.
*, **, *** correspond to 1, 5 and 10% levels of significance.

domains for WEIA than the univariate estimation. A cursory examination of the results depicts varied effects of the factors that influence the degree of WEIA dimensions and the overall index among vegetable and honey production systems. Husband's participation in off-farm activities was associated with increasing the degree of empowerment in leadership and time domains in vegetable production systems.

In contrast, it significantly influenced positively the degree of women empowerment in resource dimension and income dimension as well as the overall WEIA index among honey producers. This implies that characteristic of the husband do not consistently affect women empowerment in the domains. Note that honey producing households are in rural food insecure region and most of their husbands are in the urban areas engaging in off-farm activities. Hence, women make significant decisions could be as a result of their absence.

Women participation in off-farm activities increases the empowerment in income domain in both production systems and production domain among honey producing households. Off-farm activities provide a source of income which the woman can invest in agriculture and assets thereby increasing her bargaining power in the household. However, the income effect in honey production system is interesting in presence of limited opportunities for off-farm activities in rural areas. This raises a policy issue on how to open up opportunities for the rural women as a forward gear towards their empowerment. Anderson and Eswaran (2009) reports that direct income in women hands in Bangladesh positively influenced their decision making power. Further, Agarwal (2001) notes that women participation in off-farm activities in India enhances their ownership of assets leading to increased bargaining power. Likewise, Jayaweera (1997) notes that woman's own earning increasing her self-confidence and self-reliance.

Increase in husband education level significantly increased the level of WEIA in leadership and time domain but decrease WEIA in the overall index among vegetable producing households. The implication of this is that highly educated men tend to recognize the need for time and leadership skills of women but still control the income, resource and production activities at the household level. In contrast, increase in the education level of the husband significantly reduced the degree of women empowerment in production, income and resource dimensions among the honey producer. However, comparing the effect of men and woman education level on WEIA, the picture tends to change.

The effect of increasing women education level supersedes the negative effects of increasing the men education level in both production systems. Education is imperative in knowledge development and being able to

Table 4. Determinants of women empowerment among vegetable producers.

Variable	Multivariate two limit Tobit model of the dimensions of women empowerment					Univariate Tobit
	Production	Income	Resource	Leadership	Time	Overall index
Offarm_man	-0.032 (0.023)	0.001 (0.036)	0.033 (0.035)	0.048** (0.082)	0.046* (0.037)	0.012 (0.024)
Offarm_fem	0.488 (0.031)	0.115*** (0.035)	-0.017 (0.034)	-0.007 (0.078)	-0.017 (0.035)	0.003 (0.023)
Educ_ man	-0.094 (0.016)	-0.018 (0.018)	-0.011 (0.018)	0.067** (0.041)	0.017** (0.018)	-0.013** (0.012)
Educ_ fem	0.057 (0.017)	0.019 (0.019)	0.033** (0.018)	0.086 (0.043)	-0.037** (0.019)	0.019** (0.013)
Female age	0.009 (0.001)	0.022*** (0.001)	0.000 (0.001)	0.001 (0.003)	0.003** (0.001)	0.021*** (0.001)
Head _ fem	0.185 (0.041)	0.005 (0.047)	-0.050 (0.045)	-0.121 (0.105)	-0.064 (0.048)	0.058 (0.031)
Marry age	0.013 (0.003)	0.003 (0.004)	-0.007** (0.004)	-0.009 (0.009)	-0.002 (0.004)	-0.003 (0.003)
Age gap	-0.041** (0.002)	-0.012 (0.002)	-0.002 (0.002)	-0.002** (0.005)	-0.001 (0.002)	-0.001 (0.001)
Group_ het	0. 832 (0.095)	0.070** (0.107)	-0.064 (0.104)	0.003 (0.241)	0.012* (0.109)	0.015 (0.072)
Meet index	0.078 (0.046)	0.085** (0.051)	0.018** (0.050)	0.529*** (0.116)	0.100** (0.052)	0.123*** (0.035)
Density	-0.184 (0.015)	-0.013 (0.017)	0.026* (0.017)	0.044 (0.038)	0.006** (0.017)	0.004 (0.011)
Trust	0.075** (0.004)	0.001 (0.005)	0.000 (0.004)	0.068*** (0.010)	0.071** (0.005)	0.029*** (0.003)
Agric_ asset	-0.195 (0.017)	-0.006 (0.019)	-0.005 (0.018)	-0.045 (0.042)	-0.034* (0.019)	-0.022* (0.013)
Farm size	0.036 (0.011)	-0.031 (0.012)	0.009 (0.012)	-0.001 (0.028)	0.019** (0.013)	-0.002* (0.008)
ocertprod	0.105 (0.071)	0.054 (0.079)	0.124*** (0.077)	0.314** (0.179)	-0.017*** (0.081)	0.169** (0.053)
Intercept	0.724*** (0.228)	0.169 (0.256)	0.683*** (0.249)	0.307 (0.579)	0.281 (0.261)	0.433 (0.172)
Correlation	-	-	-	-	-	-
Production	1.000	-	-	-	-	-
Income	-0.080	1.000	-	-	-	-
Resource	0.095	-0.156	1.000	-	-	-
Leadership	0.006	0.051	0.142	1.000	-	-
Time	-0.075	0.173	0.078	0.189	1.000	-

Numbers in parenthesis are standard errors of the coefficients. *, **, *** correspond to 1, 5 and 10% levels of significance. H_0: There is no correlation between the error terms LR chi-square (10) = -476.556(p-value =0.000).

defend one's stance. Hence, educated women tend to be self-confident and assertive which enhances their ability and participation in decision making at the household level. However, Jayaweera (1997) concluded that existing gender ideologies, social and economic constraints concerning women education reduces their degree of empowerment.

Age of the woman had also interesting results. Older woman had higher likelihood of being empowered in income, time and the overall index among vegetable producers and in time dimension among the honey producers. This implies that the decision making in agriculture progressively increases as the woman gets older probably because of the experience and information gained which makes her accustomed to the her role in marriage. This is more so when women empowerment process is visualized as stock that has to be accumulated with time. The results on older women in time dimension depict an impression of them being "contented" with their farming activities as they are highly immobile and having lesser opportunities in off-farm activities compared to the younger women.

The age at marriage significantly influenced positively empowerment of women only among the honey producing households in production, income, resource and the overall empowerment index. This could be attributed to the lower age in marriage among honey producers which is located in the rural areas compared to the vegetable producers in the peri-urban set up their is breakage of one's cultural beliefs. Engelen and Kok (2003) argue that higher age at marriage in urban areas is associated with inability of the migrants in the new environment to find social connections. The plausible explanation could be that early married women tend to be less self-confident intoning their opinions and experience difficultly in developing their own identity.

Rural areas are associated with early marriages because of the lower education levels and cultural conditioned beliefs. This result provides evidence on the missing link in literature between early marriage and the level of women empowerment in agriculture. Brickell and Chant (2010) notes that young women in marriage tend to have physical and emotional distress and low esteem because of the new environment which negatively affects the decision making at the household level during the initial years in marriage. A delay in the year of marriage in Bangladesh by one year, led to a 6.5% higher likelihood of literacy and 0.3 additional schooling years (Ambrus

Table 5. Determinants of women empowerment among honey producers.

Variable	Multivariate two limit Tobit model of the dimensions of women empowerment					Univariate Tobit
	Production	Income	Resource	Leadership	Time	Overall index
Offarm_man	-0.008 (0.033)	0.034* (0.020)	0.033** (-0.210)	0.081 (0.082)	0.034 (0.037)	0.018** (0.027)
Offarm_fem	0.061** (0.031	0.066** (0.032)	0.035 (0.031)	-0.041 (0.078)	0.010 (0.035)	0.030* (0.026)
Educ_ man	-0.033* (0.017)	-0.029** (0.018)	-0.029* (0.017)	-0.002 (0.043)	0.020 (0.020)	-0.018 (0.014)
Educ_ fem	0.038** (0.016)	0.045*** (0.016)	0.042*** (0.016)	0.019 (0.039)	0.042** (0.018)	0.043*** (0.013)
Female age	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)	-0.001 (0.003)	0.012* (0.001)	0.000 (0.001)
Head _ fem	0.150 (0.033)	0.168 (0.034)	0.119 (0.033)	0.036 (0.082)	0.052 (0.037)	0.106 (0.027)
Marry age	0.008** (0.003)	0.010*** (0.003)	0.007** (0.003)	0.003 (0.008)	-0.005 (0.004)	0.016** (0.003)
Age gap	-0.002 (0.002)	-0.122** (0.002)	-0.012 (0.002)	-0.125** (0.005)	-0.001 (0.002)	-0.021 (0.002)
Group_ het	0.001 (0.059)	-0.013 (0.062)	0.031 (0.059)	0.015 (0.148)	0.147 (0.068)	0.073 (0.049)
Meet index	-0.001 (0.049)	-0.018 (0.051)	-0.011 (0.049)	0.055 (0.122)	0.062** (0.056)	0.015 (0.040)
Density	0.007 (0.019)	0.009 (0.020)	0.003 (0.019)	-0.040 (0.047)	0.037* (0.021)	0.003 (0.016)
Trust	-0.001 (0.008)	0.005 (0.009)	-0.009 (0.008)	0.024 (0.021)	-0.006 (0.009)	0.001 (0.007)
Agric_ asset	0.011 (0.014)	0.014 (0.015)	0.014 (0.014)	-0.015 (0.035)	-0.004 (0.016)	0.004 (0.012)
Farm size	-0.028 (0.019)	-0.027* (0.020)	-0.014 (0.019)	-0.093** (0.047)	-0.018 (0.022)	-0.029* (0.016)
Ocertprod	0.127** (0.049)	0.016 (0.051)	0.019 (0.049)	0.056*** (0.122)	0.050** (0.056)	0.051 (0.041)
Intercept	0.373** (0.199)	0.318 (0.207)	0.340 (0.200)	0.644 (0.498)	0.367* (0.227)	0.356** (0.165)
Correlation	-	-	-	-	-	-
Production	1.000	-	-	-	-	-
Income	0.958	1.000	-	-	-	-
Resource	0.853	0.878	1.000	-	-	-
Leadership	0.013	0.050	0.088	1.000	-	-
Time	0.164	0.178	0.161	0.188	1.000	-

Numbers in parenthesis are standard errors of the coefficients. *, **, *** correspond to 1, 5 and 10% levels of significance. H_0: There is no correlation between the error terms LR chi-square (10) =-432.174 (p-value =0.006).

and Field, 2008).

Turning to spousal age gap, increase in spousal age gap led to significant decline in women empowerment in production and leadership dimensions among vegetable producing households and income, leadership and the overall index among the honey producing households. This could be due to larger spouse age gap makes women more vulnerable and reclusive hence they cannot develop and portray their decision making and leadership skills. Thus, this makes the men more dominant in decision making in the family circle. Findings by Carmichael (2011) are that larger spousal age gap in marriage disempowers the younger spouse in decisions in the household and the community at large due to lack of or inadequate self-confidence. Further, Guilbert (2013) notes that negative effect of larger spousal age gap on women empowerment is exacerbated with early marriages which is characterized by low education levels.

Women social capital dimensions measured by density of membership, group heterogeneity index, meeting attendance index and level of trust among the group members was found to have more significant positive effect in empowering women in vegetable producing households than their counterparts. Women in vegetable producing households benefited most from social networks because the groups are highly heterogeneous in the composition resulting from acculturation in peri-urban areas compared to the honey producers who are in rural areas. This could be the possible explanation for the differences in the effect in the two production systems.

However, most notable was the positive significant effect of the four dimensions of social capital among vegetable producers and meeting attendance index and density of membership among honey producers in influencing leadership domain. This demonstrates the transformative role of social capital in leadership development as it accords women and men a platform for exchanging information, experiences and knowledge spirited to develop leadership and decision making skills in agriculture. Fantahun *et al.* (2007) reports on the importance of higher social capital in Ethiopia in empowering women resulting in reduced under-five mortality and De Silva and Harpham (2007) emphasizes on the importance of maternal social capital in enhancing child nutrition status in developing countries.

Value of agricultural assets was used in the study as a proxy for wealth and the result was surprising. Increasing the value of agricultural assets and farm size led to a

decline in the degree of empowerment on the time domain and the overall index among vegetable producers. The significant results on the time could be attributed to the extra care for the assets is required, which increases the work load and limits her leisure activities. However, this could also show that in wealthy households, the male heroine as a breadwinner could be dominant which limits women involvement in decision making compared to less well-off households where there could be sharing of the breadwinner role between husband and wife. This possible could be the explanation for the insignificant results on the honey producers because of low asset base.

On the contrary, a unit increase in the farm size led to a significant decline in the income and leadership domains and the overall index among honey producers. Possibly, this could be attributed to the higher spousal gap, lower education level of the women and the extra work load in terms of labour which limits women in discovering their abilities. Similar agreement is advanced by Bacon (2010) on woman empowerment being negatively affected by heavy work load with commercialized agriculture and is aggravated further with fulltime domestic chores.

To the link between certified organic production and women empowerment, the study observes mixed result between the two production systems. Among the vegetable producers, organic certification after controlling for potential endogeneity had significant positive impact on the production, resource and leadership domains and the overall index of WEIA. However, participating in certified organic farming reduced significantly the level of empowerment in the time domain possible because of being labour intensive and thus would involve more commitment to the farming activities and delivery of the products to the destined markets. Similar finding were reported by Kabeer (2001), that microfinance increased women's asset ownership and income but also increased women's workload in Bangladesh. Anderson and Eswaran (2009) found that women had no control on the income generated from the farms even though they have contributed to its generation in Bangladesh. Further, Allendorf (2007) and Chhay (2011) argue that income in the hands of women compared to those in men had more positive effects to the welfare of their families, women and the community at large.

In contrast, production leadership and time domains are significantly influenced positively by organic certification among honey producers. This could be explained by the trainings the women are involved in relating to production activities which also builds their leadership skill. Further, the interaction among themselves improves the time dimension of the farming activities as the possible leisure activity in many rural areas. Though insignificant, organic certification had a positive effect in resource and income dimensions implying that the women are reaping some benefits which makes them more satisfied in farming thus explaining the positive effect of the time dimension. However, in general, the social, cultural and economic constraints in the rural areas seems still limits WEIA in honey producing households because of their location in rural areas compared to their counterparts in peri-urban areas.

CONCLUSION AND POLICY IMPLICATIONS

The study has provided a micro level evidence of the degree of WEIA and the impact of certified organic agriculture and other social, economic and cultural on the degree of women empowerment in vegetable and honey producing households in Kenya. This was achieved using a modified innovative Alkire et al. (2013) multidimensional methodology of measuring WEIA among vegetable producers in the peri-urban areas and the honey producers in the rural areas in Kenya. Evaluating the organic certification effect on women empowerment was deemed important in the face of proliferation of organic certified schemes meant to commercialize smallholder agriculture and tackle gender related and cultural constraints that thwarts women empowerment in developing countries. The study was keen to understand the level of decision making of women at the household level and the community which eventually determined their level of empowerment in agriculture as well as the determinants of their level of empowerment.

The study empirically determined the "low" empowerment question in empirical literature. On average, women involvement in decision making was about 38% and 35% among vegetable and honey producers respectively. The results of the univariate and multivariate two limit Tobit models confirmed Farnworth and Hutchings (2009) hypothesis that organic certified production systems opens up knowledge spaces for women hence contributing to their empowerment but in some domains of WEIA after controlling for potential endogeneity. The study accentuates the importance of knowledge space in women empowerment process. For public policy and program planners, the importance of information through efficient extension service delivery mechanism and this could be achieved using customized techniques and knowledge areas targeting specific domains of WEIA. However, such social norms changing initiatives should also include the both men and women to demystify the negative subjective opinion of WEIA as a "women affair" but as a step towards better family and community livelihood.

The degree of WEIA was also influenced by several socioeconomic and cultural factors differently in the vegetable and honey production systems. The findings in both production systems on the man and women education on WEIA demonstrated a policy issue on more efforts on girl child education in fighting gender inequality while not neglecting the boy child education. This helps reduces the low age at marriage and the higher spousal

gap increasing their bargaining powers, as education allow for further mental development building self-confidence and self-assertiveness of women. Women participation in off-farm income activities could prove essential in enhancing WEIA particularly in rural areas. The implication to public policy would be on how to open rural areas to create more off-farm activities opportunities for women to induce further their empowerment.

The effect of wealth measured in terms of value of agricultural assets to WEIA was surprising in the vegetable producing households. Increased wealth was associated with decreasing empowerment levels attributed to men commanding ownership of the wealth making them dominant in household decision making. Hence, though assets were not influencing WEIA in rural areas, a lesson has to be learnt from such findings. The study recommends that even if the women are involved in production and the whole income from their production goes to direct consumption; it does not improve the bargaining power of the women at the household level unless part of the income is invested in assets owned jointly or solely by the woman. The importance of social capital through groups was also demonstrated in enhancing the degree of women empowerment particularly in the leadership domain, as gives men and women a better platform to share ideas, knowledge and demonstrate their decision making capabilities important for changing perception.

Despite the limitation of the study by being cross sectional survey it provides a ground breaking empirical evidence and the study proposes need for further comprehensive studies using time series data which will capture the dynamics of WEIA at household level. Though the study has assessed the level and determinants of WEIA, further studies are required to evaluate the effect of WEIA on agricultural productivity and food security at household level.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

REFERENCES

Agarwal B (2001). Gender inequality, cooperation, and environmental sustainability. *In economic inequality, collective action and environmental sustainability*. ,ed. P. Bardhan, S.Bowles and J.M. Baland. Princeton University Press.

Ali A, Abdulai A, Goetz R (2012). Impacts of tenancy arrangements on investment and efficiency: evidence from Pakistan. Agric. Econ. 43(1):85-97.

Alkire S, Meinzen-Dick R, Peterman A, Quisumbing A, Seymour G, Vaz A (2013). The women's empowerment in agriculture index. World Dev. 52:71-91.

Allendorf K (2007). Do women's land rights promote empowerment and child health in Nepal? World Dev. 35(11):1975-1988.

Ambrus A, Field E (2008). Early marriage, age of menarche, and female schooling attainment in Bangladesh. J. Pol. Econ. 116(5):881-930.

Anderson S, Eswaran M (2009). What determines female autonomy? Evidence from Bangladesh. J. Dev. Econ. 90(2):179-191.

Arestoff F, Djemai E (2013). The empowerment of women in Sub Saharan Africa: Cohort differences in perceptions. Selected paper presented in the DIAL Development Conference "Institutions and Development" June 27th - 28th 2013, Université Paris-Dauphine, LEDa, UMR DIAL, 75016 Paris, France.

Bacon CM (2010). A spot of coffee in crisis Nicaraguan Smallholder cooperatives, fair trade networks, and gendered empowerment. Lat. Am. Persp. 37(2):50-71.

Blackman A, Naranjo MA (2012). Does eco-certification have environmental benefits? Organic coffee in Costa Rica. Ecol. Econ. 83:58-66.

Brickell K, Chant S (2010). The unbearable heaviness of being': Expressions of female altruism in Cambodia, Philippines, The Gambia and Costa Rica. Prog. Dev. Stud. 10(2):145-159.

Carmichael S (2011). Marriage and power: Age at first marriage and spousal age gap in lesser developed countries. Hist. Fam. 16(4):416-436.

Chhay D (2011). Women's economic empowerment through microfinance in Cambodia. Dev. Pract. 21(8):1122-1137.

Christoforou A (2011). Social capital across European countries: Individual and aggregate determinants of group membership. Am. J. Econ. Soc. 70(3):699-728.

Costanigro M, Kroll S, Thilmany D, Bunning M (2014). Is it love for local/organic or hate for conventional? Asymmetric effects of information and taste on label preferences in an experimental auction. Food Qual. Prefer. 31:94-105.

De Silva MJ, Harpham T (2007). Maternal social capital and child nutritional status in four developing countries. Health Place 13:341-355.

Doss C (2006). The effects of intrahousehold property ownership on expenditure patterns in Ghana. J. Afr. Econ. 15(1):149-180.

Ellis A, Cutura J, Dione N, Gillson I, Manuel C, Thongori J (2007). Gender and economic growth in Kenya - Unleashing the power of women. The World Bank. Washington DC.

Engelen T, Kok J (2003). Permanent celibacy and late marriage in the Netherlands, 1890-1960. Population-E 58(1):67-96.

Fantahun M, Berhane Y, Wall S, Byass P, Hogberg U (2007). Women's involvement in household decision-making and strengthening social capital-crucial factors for child survival in Ethiopia. Acta Paediatr. 96:582-589.

Farnworth CR, Hutchings J (2009). Organic agriculture and womens' empowerment. International federation of organic agriculture movements (IFOAM). Accessed on 01/11/2017 at https://static1.squarespace.com/static/551bb3ade4b0404100c31678/t/5628f31ce4b00d6d1577c4d0/1445524252516/Organic+Agriculture+Womens+Empowerment++Farnworth+and+Hutchings.pdf

Food and Agriculture Organization (FAO) (2006). Agriculture, trade negotiations, and gender. Rome, Italy. Available at: http://www.fao.org/docrep/009/a0493e/a0493e00.htm

Food and Agriculture Organization (FAO) (2011). The state of food and agriculture: women in agriculture: closing the gender gap for development. Rome, Italy. Available at: http://www.fao.org/docrep/013/i2050e/i2050e.pdf

Galu G, Kere J, Funk C, Husak G (2010). Case study on understanding food security trends and development of decision- support tools and their impact on vulnerable livelihood in East Africa. United Nations Global Assessment Report II.

Gillespie J, Mishra A (2011). Off-farm employment and reasons for entering farming as determinants of production enterprise selection in US agriculture. Aust. J. Agric. Resour. Econ. 55(3):411-428.

Grootaert C (1999). Social capital, household welfare and poverty in Indonesia. Local Level Institutions Study, Working Paper No. 6, Social Development Department, World Bank, Washington D.C.

Grootendorst P (2007). A review of instrumental variables estimation of treatment effects in the applied health sciences. Health Serv. Outcomes Res. Methodol. 7(3-4):159-179.

Guilbert N (2013). Early marriage, women empowerment and child mortality: married too young to be a good mother. Selected paper presented in the DIAL Development Conference "Institutions and Development" June 27th - 28th 2013, Université Paris-Dauphine, LEDa, UMR DIAL, 75016 Paris, France.

Hattam CE, Lacombe DJ, Halloway GJ (2012). Organic certification, export market access and the impacts of policy: bayesian estimation of avocado smallholder “time- to-organic certification” in Michoacán Mexico. Agric. Econ. 43:441-457.
Huang HC (River) (2001). Bayesian analysis of the SUR Tobit model. App. Econ. Lett. 8:617-22.
Jayaweera S (1997). Women, education and empowerment in Asia. Gender Educ. 9(4):411-424.
Kabeer N (2001). Conflict over credit: Re-evaluating the empowerment potential of loan to women in rural Bangladesh. World Dev. 29(1):63-84.
Kamau JW, Stellmacher T, Biber-Freudenberger L, Borgemeister C. (2018). Organic and conventional agriculture in Kenya: A typology of smallholder farms in Kajiado and Murang'a counties. J. Rural Stud. 57:171-185.
KCIDP (2013). Kajiado County Integrated Development Plan 2013-2017. Government of Kenya, Nairobi.
Ma H, Huang J, Fuller F, Rozelle S (2006). Getting rich and eating out: consumption of food away from home in urban China. Can. J. Econ. 54(1):101-119.
Probst L, Houedjofonon E, Ayerakwa HM, Haas R (2012). Will they buy it? The potential for marketing organic vegetables in the food vending sector to strengthen vegetable safety: a choice experiment study in three West African cities. Food Policy 37:296-308.
Stolzenback S, Bredie WLP, Christensen RHB, Byrne DV (2013). Impact of product information and repeated exposure on consumer liking, sensory perception and concept associations of local apple juice. Food Res. Int. 52:91-98.
Swaminathan H, Lahoti R, Suchitra JY (2012). Women’s property, mobility, and decision-making: Evidence from rural Karnataka, India. International Food Policy Research Institute discussion paper no. 01188, Washington, DC: IFPRI.
Tobin J (1958). Estimation of relationships for limited dependent variables. Econometrica 26:24-36.
Trauger A (2004). Because they can do the work: women farmers and sustainable agriculture. Gend. Place Cult. 11(2):289-307.
Tumbo SD, Mutabazi KD, Masuki KFG, Rwehumbiza FB, Mahoo HF, Nindi SJ, Mowo JG (2013). Social capital and diffusion of water system innovations in the Makanya watershed, Tanzania. J. Sociol. Econ. 43:24-36.
United Nations Conference on Trade and Development (UNCTAD) (2006). Organic agriculture: a trade and sustainable development opportunity for developing countries, UNCTAD Trade and Environment Review 2006. UNCTAD/ DITC/TED/2005/12. ed. United Nations New York and Geneva pp. 161-223.
Walumbwa FO, Avolio BJ, Gardner WL, Wernsing TS, Peterson SJ (2008). Authentic leadership: development and validation of a theory-based measure. J. Manage. 34(1):89-126.
World Bank (2005). Gender and ‘shared growth’ in Sub-Saharan Africa: Briefing notes on critical gender issues in Sub-Saharan Africa, 2005-1, World Bank, Washington, DC.
World Bank (2008). Gender in agriculture sourcebook. Food and Agriculture Organization (FAO), World Bank, and International Fund for Agricultural Development (IFAD). Washington DC.

Appendix 1: Leadership

Instructions to the enumerator: This section aims at understanding the leadership potential of the woman. Probe to get honest answers on the questions as no answer is correct or wrong. Use the following scale of; 1 = Strongly disagree 2= Disagree 3= Neutral 4=Agree 5=Strongly agree to indicate the scale that accurately describes the woman from the answers she gives. Illustrate some questions with the appropriate community groups and assets that are available to gauge if;

S/N	Question	Rank
1.	She can list her three greatest weaknesses as a person[a]	-
2.	Her actions in the family and the community reflects here core values [b]	-
3.	She seeks other peoples opinion before making up her mind [c]	-
4.	She openly shares her feelings with others in the family and community [d]	-
5.	She can list her greatest three strengths [a]	-
6.	She does not allow group pressure to control her actions [b]	-
7.	She rarely “lie” in front her friends , family and community members [d]	-
8.	She accepts her feelings about herself [a]	-
9.	In controversial family and community issues , people normally know my stand [b]	-
10.	She is guided by her morals in undertaking community and family duties as leader [b]	-
11.	She listens to others in the community and family ideas before making up her mind [c]	-
12.	Once she makes mistakes in the family and community, she admits [d]	-
13.	She listens critically on the ideas of those who disagree with her ideas in the family and community [c]	-
14.	She seeks feedback on what truly she is as a person in the family or community [d]	-
15.	She does not emphasize her point at the expense of others in the family and community [c]	-
16.	She does seek feedback to understand her leadership [a]	-

a, b, c and d relates to questions regarding self-awareness, internalized moral perspective, balanced processing and relational transparency respectively. The figures of the rank are summed and transformed to 100%.

Appendix 2. Sample statistics for the probit model for organic farming participation.

Variable	Description of the variable	Mean for vegetable producers	Mean for honey producers
Head_age	Age of the household head(Years)	48.85 (13.42)	52.54 (11.70)
Offarm_he	Off-farm activity participation by the household head , 1=yes 0=no	0.62 (0.49)	0.50 (0.50)
gender_head	Gender of the household head, 1=male 0=female	0.77 (0.42)	0.89 (0.46)
Educ_head [a]	Education level of the household head	3.68 (1.11)	2.41 (0 .94)
Hhhsize	Household size, numbers	4.57 (1.60)	6.15 (2.29)
Agric_assets	Value of agricultural assets (KES ,000)	268.42 (245.32)	167.14 (29.24)
Farm_size	Farm size in acres	0.82 (0.86)	3.45 (1.36)
Extetim	Number of contacts with extension service providers in 2012	2.76 (5.38)	1.22 (2.10)
Trainnum	Number of trainings received in the year 2012	6.65 (4.96)	10.60 (1.29)
Mktkm	Distance to the nearest produce market (KMS)	3.41 (2.72)	9.89 (6.11)
Credit	Accessed credit in 2012, 1 accessed credit, 0 no credit	0.18 (0.38)	0.10 (0 .30)
Density[b]	Number of active groups household involved in 2012	1.34 (1.03)	1.74 (1.09)
Meet_index [b]	Meeting attendance index, (meetings attended/ scheduled meetings)	0.89 (0.56)	0.67 (0 .34)
Group_het [bc]	Group heterogeneity index	0.43 (0.15)	0.87 (1.48)
Decision [b]	Household involvement in group decisions making , 0-100%	0.67 (3.41)	0.56 (2.57)
Trust [b]	Level of trust in groups (0-100%)	0.58 (3.53)	0.64 (1.67)
System	System of livestock keeping, 1=closed, 0=open	0.49 (0.49)	2.25 (1.02)

Figures in parenthesis are standard errors of the respective means.
[a]Education measured in terms of 1=not gone to school 2=primary 3=secondary 4= tertiary 5= university; [b]Household level social capital dimensions; [c]The heterogeneity index derived from questions of whether members were from the same neighborhood, occupation, kingroup, economic status, religion, gender, education level and age group.