CORA Cork Open Research Archive
Cartlann Taighde Oscailte Chorcaí

Title	Table banking plus certified organic agriculture: an integrated microfinance approach to sustainable livelihoods
Authors	Canwat, Vincent;Onakuse, Stephen
Publication date	2022-06-22
Original Citation	Canwat, V. and Onakuse, S. (2023) 'Table banking plus certified organic agriculture: an integrated microfinance approach to sustainable livelihoods', Journal of Development Effectiveness, 15(2), pp. 165–182. Available at: https://doi.org/10.1080/19439342.2022.2089200
Type of publication	Article (peer-reviewed)
Link to publisher's version	10.1080/19439342.2022.2089200
Rights	© 2022, Informa UK Limited, trading as Taylor & Francis Group. This is an Accepted Manuscript of an item published by Taylor & Francis in Journal of Development Effectiveness on 22 June 2022, available online: https://doi.org/10.1080/19439342.2022.2089200
Download date	2026-11-04 14:15:47
Item downloaded from	https://hdl.handle.net/10468/13442



UCC
University College Cork, Ireland
Coláiste na hOllscoile Corcaigh

Table banking plus certified organic agriculture: an integrated microfinance approach to sustainable livelihoods

Vincent Canwat[ab] and Stephen Onakuse[a]

[a]Department of Food Business and Development, University College Cork, Ireland

[b]Department of Development Studies, Gulu University, Uganda

Correspondence to be sent to Vincent Canwat

[b]Department of Development Studies, Gulu University, P.O. Box 166, Gulu Uganda, email: v.canwat@gu.ac.ug

3rd March, 2022

Abstract

The understanding of integrated microfinance effects has been limited by variability in the sector and microfinance component studied. While sectors ranged from health, education, business to agriculture and microfinance components varied from special-licensed banks to non-governmental organizations; table banking plus organic agriculture received no research attention. This study analyzed the effects of table banking plus certified organic agriculture on sustainable livelihoods. Using propensity score matching, the study found that table banking plus certified organic agriculture increases social and financial capital, but reduces incomes and food consumption during the lean period. Social capital increased because the participatory guarantee system of organic certification promoted group formation and trust relations, which provided platforms for operating table banking, leading to the increased access of group members to financial services. Incomes are reduced because organic conversion reduces yield and farm-gate marketing attracts low price premiums. The study implies that table banking plus certified organic agriculture extends access to financial services to rural areas, but it requires market and non-market coordination for the achievement of livelihood outcomes.

Keywords: integrated microfinance, table banking, certified organic agriculture, sustainable livelihoods, propensity score matching

1.0 Introduction

Since its evolution in the 1980s, microfinance has increasingly gained popularity because of the significant role it plays in development. It provides financial services to low-income households and microenterprises that have been excluded from traditional banking (Lensink et al., 2018; Biosca et al., 2014; Balkenhol and Hudon 2011). In both developing and transition economies, microfinance has increasingly been positioned as one of the most important poverty reduction and local economic and social development policies[i]. The interventions were driven majorly by a minimalist model that focuses only on financial services (credit, savings, and insurance) rather than by a maximalist approach (integrated microfinance) where clients receive both financial and non-financial (social and business development) services. Proponents of the minimalist model assumed that financial services 'automatically establish a sustainable economic and social development trajectory animated by the poor themselves' (Bateman and Chiang, 2009:1). They discouraged the maximalist model based on the argument that its non-financial services would affect financial sustainability negatively, divert attention on a financial goal and require additional skills and other resources, which microfinance institutions often lack (Lensink et al., 2018; Flores and Serres, 2009). However, there is an increasing realization that the minimalist model falls short of delivering sustainable development (Reed, 2011: Bateman and Chiang, 2009). Instead, the maximalist model ensures financial sustainability and increases clients' welfare, business success, and loan quality (Lensink et al., 2018).

Many scholars investigated the roles of the maximalist intervention model in development, including its roles in promoting community and local development. However, the understanding of the effect of the intervention has been limited by variability in the sector and microfinance component of the intervention. While sectors of studies ranged from health, education, business

to agriculture, including organic farming; focus on microfinance varied from special-licensed banks, non-governmental organizations to informal savings and credit groups, including village savings and loan associations. Previous studies widely assessed variants of the maximalist model integrating financial services with health and education. Notably, studies assessing microfinance and health education (Lorenzetti et al., 2017), microfinance and reproductive health (Population Council, 2016), microfinance and access to health services (Annan et al. 2013; Swarts et al. 2010) as well as credit and education (MkNelly et al., 1998; MkNelly et al., 1999). On the contrary, the combination of microfinance and agriculture received less research attention, especially the integration of village savings and lending schemes with organic agriculture.

Village savings and loan associations emerged in 1991 from interventions of Care International in Niger. Since then, the microfinance model has increasingly become one of the popular financial systems of the poor. The financial model inspired many development agencies and they propagated it worldwide under different names (Burlando *et al*., 2016). In Kenya, the financial model became known as 'table banking' because 'members place their savings and loan repayments on the table and immediately borrow all the monies placed on the table except a small percentage for the administration' (Kariuki and Ngugi, 2014). Administration expenses include buying cashboxes, record books, and padlocks. Today, table banking is often packaged within organic agricultural intervention in Kenya, making the intervention integrated microfinance referred to as table banking plus certified organic agriculture. This study analyses the effects of table banking plus certified organic agriculture on sustainable livelihoods.

The study contends that table banking plus certified organic agriculture improves livelihoods by increasing livelihoods assets and household incomes. This follows from previous findings. Firstly, microfinance provides access to financial services for the poor excluded from traditional banking (Lensink et al., 2018; Biosca et al., 2014; Balkenhol and Hudon 2011). Secondly, the poor use their financial services for managing household emergencies and investment in business enterprises, health, education, and assets, resulting in higher household incomes, improved health outcomes, and reduced vulnerability (Lorenzetti, 2017; Weldeslassie, 2017; Littlefield et al., 2003; Pitt and Khandker, 1999). The microfinance services are, therefore, expected to enhance the potential of certified organic agriculture to increase livelihood assets and household incomes.

2.0 Agricultural credit markets and organic certification in Kenya

2.1 Access to agricultural credits in Kenya

Cooperatives and Agricultural Finance Corporation played an important role in providing credits to farmers during the first two decades of independence. The government established the Agricultural Finance Corporation to provide long-term credit for financing farm acquisition and improvement and seasonal credit for production (GOK, 2009; Kibaara and Nyoro, 2007). Cooperatives became instrumental in implementing government socio-economic policies, including subsidized credits (Gamba and Komo, 2014; GOK, 2009; Wanyama, 2009; Wanyama, 2007). However, these institutions are no longer important sources of agricultural credits today because of their decline and collapse, which arose from mismanagement and failure to adapt to challenges created by liberalization such as competition, and withdrawal of financial support (GOK, 2009). Although the Agricultural Finance Corporation was revived, it serves only large-scale producers (Ngare *et al*., 2015; Kibaara and Nyoro, 2007). Today, farmers receive financial

services mainly from banks, savings and credit cooperatives (SACCOs), non-governmental organizations, and community-based lending institutions (GOK, 2009; Athieno, 2001).

Accessing credit services from banks is still a big challenge for smallholder producers in Kenya (GOK, 2009). Firstly, banks consider farmers as risky borrowers because of the risky nature of farming and a notorious culture of default, bred by corruption, political clientelism, and a past dysfunctional court system (GOK, 2009). Thus, banks charge farmers high-interest rates, which many farmers cannot afford. Secondly, there is limited use of land as collateral because of unfavorable land laws and tenure systems (GOK, 2009). Thirdly, rural areas have very few banks, leading to limited credit supply and high-interest rates because of limited or no competition for borrowers (GOK, 2009). Unlike commercial banks, many cooperatives operate in rural areas. Kenya has over 10,800 registered co-operatives, with 46 percent being Agricultural, 38 percent financial-based (SACCOs), and, 16 percent others (Bwana and Mwakujong, 2013). Although SACCOs are a significant supplier of agricultural credits, wrangles and mismanagement undermine their services (Kibaara and Nyoro, 2007).

Non-governmental organizations (NGOs) improve access to financial services for the poor by directly providing financial services to them or by building their capacity to provide financial services to each other. The direct intervention of NGOs in the market entails lending to groups, which in turn lend to their members and the members repay to their groups, which then repay the NGO (Athieno, 2001). For the indirect intervention, non-governmental organizations provide training for the poor to operate their financial systems. This includes the establishment of savings groups like table banking.

2.2 Smallholder organic certification mechanism in the domestic market

Organic certification for smallholder producers supplying the domestic market takes place mainly under a participatory guarantee system (PGS). The PGS is a 'locally focused quality assurance system', which certifies producers based on 'active participation of stakeholders and a foundation of trust, social networks, and knowledge exchange' (Dittrich, 2012:11). In Kenya, the PGS system engages a range of stakeholders, including NGOs and the Kenya Organic Agriculture Network (KOAN), which is an umbrella body of organic promoters, producers, and exporters, which coordinates the subsector. In close collaboration with the KOAN secretariat, non-governmental organizations organize producers into groups, which enforce compliance of their members to PGS organic standards and processes. The compliance of every organic producer is assessed by a group of stakeholders through farm inspection conducted annually. PGS principle requires continuous learning and knowledge exchange. This occurs during group meetings, which are regularly held to share farming experiences, by advising and learning from one another during rotational farm visits. It is during the regularly conducted meetings that table banking functions are also executed.

2.3 Table banking plus certified organic agriculture in Kenya

Certified smallholder organic intervention in Kenya epitomizes an integrated microfinance approach. The integrative approach provides a range of financial and social intermediation, enterprise development, and social services (de Klerk, 2008; Ledgerwood, 1999). The social service component includes the promotion of organic farming as a means of ensuring food security and encourages eating organic foods as healthy diets, free from harmful chemicals. Group formation and training for table banking are also conducted as means of social

intermediation. In terms of enterprise development services, civil society organizations provide a wide range of services, including training on organic standards and certification, production practices, and marketing. The civil society organizations also link organic producers to markets, create public awareness about organic foods and advocate for organic policy. Meanwhile, financial intermediation takes place mainly through table banking, which provides savings, credit, and microinsurance services.

Financial intermediation began as rotating savings and credit associations (ROSCA) among organic producer groups. Later, it was upgraded to a table banking scheme because of the limited scope of financial services that ROSCA offers. Table banking receives external training on how to operate the banking system, but no external funding. Groups engaged in table banking mobilize savings through the regular purchase of shares by all members at meetings held monthly, biweekly or weekly. Members also contribute to a social fund to help cope with unexpected emergencies. From the accumulated savings, the groups provide short-term and long-term loans to their members at agreed interest rates, normally not more than 10 percent. Group members are allowed to borrow twice or thrice as much as their savings. The loans are also backed by two guarantors who are group members and sometimes by valuable personal assets such as vehicles. Members can also get welfare money from the social fund. Operations of table banking are governed by group constitutions and restricted within a cycle whose length is agreed upon by group members. At the end of each cycle, accumulated savings and interests are shared according to the savings of each group member. Because table banking receives no external funding, the banking system is self-sufficient and sustainable.

3.0 Materials and methods

3.1 Analytical framework

Using a probit model to assess the effects of table banking plus certified organic agriculture on livelihoods is flawed by endogeneity bias. This has been confirmed by a Durbin–Wu–Hausman test. The bias renders non-organic (control) an inadequate counterfactual because the control and treated (organic) differ not only in terms of treatment assignment mechanism but also concerning omitted factors. The factors are relegated to the error terms, rendering the estimates unreliable because they are asymptotically inconsistent;

$$\mathrm{E}(\mathrm{Y}_1|\mathrm{t}=1)-\mathrm{E}(\mathrm{Y}_0|\mathrm{t}=0)=\mathrm{ATE}+\mathrm{Bias}. \qquad (1)$$

Where $E(Y_1|t=1)$ are outcomes of the treated units; $E(Y_0|t=0)$ are outcomes of control units and ATE is the average treatment effect on the overall study population. Because of the unreliable probit estimates, propensity score matching (PSM) techniques are applied.

The PSM generates counterfactuals by creating a matching group based on the probability of being treated (propensity score). Propensity scores were generated from a probit model. For i individuals with j options, the likelihood of participating in certified organic production (y_{ij})was specified as a function of pre-treatment covariates and a latent variable (y_{ij}^{*}), which is also a function of pre-treatment covariates (x_{ij}).

$$y_{ij}=\begin{cases}1 \;\; if\, y_{ij}^{*}=\beta_1 x_{ij}+\mu_{ij}>0\\ 0 \;\; if\, y_{ij}^{*}=\beta_0 x_{ij}+\mu_{ij}\leq 0\end{cases}, \text{ where j=2 (0, 1).} \qquad (2)$$

Where β_j is a model parameter; μ_{ij} is the error term and y_{ij} is only observed when the latent variable is greater than zero.

The model covariates included education, age, gender, farm size, distance to the main road, and location dummies. Local dummies were included to control for fixed effects. Distance to the main road affects access to high-value markets (Miyata and Minot, 2009, Reardon et al, 2009). Farm size affects adoption (Fernandez-Cornejo *et al*., 2001; Akinwumi and Baidu-Forson, 1993). The education of household heads reflects farm management quality (Asfaw *et al.*, 2010). The age of the household head relates to risk consciousness (Migliore *et al*., 2012; Zhang *et al*., 2008). The estimated propensity scores were then used in matching to generate comparison groups. The matching employed near neighbor, caliper, and kernel methods.

The effectiveness of the propensity score matching was assessed by verifying its assumptions of unconfoundedness, common support, and balance property. Unconfoundedness stipulates that a treatment assignment is unconfounded if, given pre-treatment variables; potential outcomes are independent of treatment assignment. The common support assumes that every covariate has a positive probability of being both treated and untreated. The balance property requires that both treated and untreated covariates are balanced to ensure their comparability. To assess the assumption of conditional independence, the sensitivity of treatment effects to hidden bias was verified using Mantel-Haenszel bounds. An overlap plot was used to assess the common support assumption. The balance property was assessed using a t-test. Results for assessing common support and balance property are presented in appendix 1 and Table 2 respectively.

3.3 Data collection

This paper is based on a study conducted in Kenya. A sample of 334 (222 organic and 112 non-organic) vegetable farmers was generated from counties of Kajiado, Kiambu, Machakos, and Bungoma. As figure 2 shows, counties of Kajiado, Kiambu, and Machakos border Nairobi City, but Bungoma County is situated farther away in western Kenya.



The study areas were purposefully chosen because many vegetable farmers in these counties are engaged in organic production. Organic and non-organic producers were sampled to compare livelihoods in the two groups. The organic producers were randomly selected from a list of organic producers supported by two non-governmental organisations. Non-organic producers,

nearest to organic producers were selected. For interviewing the sample vegetable producers, a structured questionnaire was used. Data were generated on household and farm characteristics, production output, market information, and group activities. Production outputs and prices were used to compute income. The incomes were estimated as gross incomes, which are products of outputs and selling prices. The collection of data took place in three phases, with intervals of at least six months. This, therefore, accounts for time-varying sources of bias.

4.0 Results and discussions

4.1 Sample description of organic and non-organic producers

Table 1 and Table 2 present descriptive and inferential statistics of sample characteristics of organic and non-organic producers. Table1 shows that organic producers have higher membership in table banking groups than non-organic producers. This is reflected in group trust which is higher among organic than non-organic producers. It is also reflected in credit uptake from the table banking group, which is higher among organic than non-organic producers. However, organic and non-organic producers do not differ in their credit uptake from other sources. Credit use for farming and education is higher among organic than non-organic producers, but there is an insignificant difference concerning credit use for business.

Table 1: Group membership, credit uptake and use of organic and non-organic producers

Variable	All	Norg	Org	t-value
Received credit in the last1year=1, 0 otherwise	0.63	0.61	0.64	-0.48
Received credits from group=1, 0 otherwise	0.41	0.32	0.45	-2.20**
Received credit from NGO=1, 0 otherwise	0.13	0.17	0.12	1.26
Received credits from banks=1, 0 otherwise	0.12	0.14	0.11	0.79
Received credits from buyers=1, 0 otherwise	0.01	0.01	0.01	0.57
Received credits from friends=1, 0 otherwise	0.01	0.01	0.01	0.07
Credit used for farming=1, 0 otherwise	0.40	0.44	0.39	0.95
Credit used for education=1, 0 otherwise	0.26	0.27	0.26	0.35
Credit used for business=1, 0 otherwise	0.09	0.15	0.06	2.24**
Group membership=1, 0 otherwise	0.73	0.25	0.95	-18.70***
Savings group membership=1, 0 otherwise	0.70	0.26	0.98	-55.54***
Have high trust in the group=1, 0 otherwise	0.38	0.13	0.51	-7.42***

Notes: Norg is non-organic; Org is organic; HHH is the household head; *** p<0.01; **p<0.05

Table 2 shows that organic producers also differ from non-organic producers concerning gender composition, education of the household head, and farm size. The composition of women is higher in organic than non-organic production. Organic producers have bigger farm sizes than non-organic producers. Household heads with primary education are also more among organic than non-organic producers. However, the results show that after matching, no significant differences exist between covariates of organic and non-organic producers.

Table 2: Covariates of organic and non-organic producers before and after matching

Variable	Before matching			After matching		
	Organic	Non-org	t-value	Organic	Non-org	t-value
Kiambu	0.08	0.26	4.53***	0.09	0.07	0.62
Kajiado	0.28	0.37	1.48	0.34	0.26	1.61
Machakos	0.16	0.11	-1.33	0.17	0.17	-0.00
Ln(distance to main road)	-0.03	-0.33	-1.79*	-0.01	-0.04	-0.37
HHH (25-54) years old	0.45	0.60	2.49**	0.54	0.62	-1.60
HHH (55-64) years old	0.23	0.21	-0.30	0.20	0.17	0.87
HHH has secondary education	0.30	0.22	-1.40	0.33	0.37	-0.71
HHH has tertiary education	0.22	0.44	4.13***	0.27	0.21	1.19
HHH education unknown	0.27	0.27	-0.01	0.27	0.31	-0.74
Ln(land size in hectare)	-0.43	-0.90	-3.60***	-0.58	-0.48	-0.79
Land tenure is secure	0.52	0.71	2.96***	0.62	0.62	0.11
Farmer is female	0.68	0.52	-2.73***	0.61	0.61	0.00

Notes: HHH is household head; Ln is natural logarithms; org is organic; ***p<0.01; **p<0.05; *p<0.10

4.2 Determinants of participation in certified organic vegetable production

Table 3 presents logit model results for factors affecting participation in certified organic production. The result shows that increasing farm size by one percent significantly increases the probability of participating in certified organic production by 0.08. Being a female farmer significantly increases the probability of the certified organic conversion by 0.16. Having primary education also increases the probability of certified organic conversion by 0.16.

Farm size positively correlates with the likelihood of organic conversion, seemingly because of uncertainties surrounding certified organic production. Organic production is a new initiative associated with risks and uncertainty. Risk perceptions and uncertainties associated with innovations are known to reduce adoption by farmers having smaller farm sizes (Fernandez-Cornejo *et al*., 2001). The positive association between risk perception and innovation adoption has also been reported by Akinwumi and Baidu-Forson (1993).

Participation in certified organic production is higher among women than men because women are more interested in organic farming than men. This has been reported by a non-governmental organisation (NGO) promoting organic production in counties bordering Nairobi. The NGO coordinator noted that they target both men and women, but men are more preoccupied with off-farm activities than women (Field survey, 2016). This observation concurs with the finding that more household heads near Nairobi City have off-farm employment compared to their counterparts in the farthest county of Bungoma ($t= 3.34$, $p<0.01$). This confirms that women are more interested in organic production than men.

Farmers with primary education are more likely to participate in certified organic production than those with post-primary education because they are mainly women. Being a woman increases the likelihood of organic conversion. And there are significantly more women with primary education than men ($t = -3.252$, $p<0.01$).

Table 3: Determinants of organic conversion

Variable	Coefficient	S. E	Marginal effect	S. E
Ln(distance to main road)	0.01	0.06	0.001	0.02
HHH has secondary education=1, 0 otherwise	-0.27	0.28	-0.09	0.10
HHH has tertiary education=1, 0 otherwise	-0.71**	0.32	-0.25**	0.12
HHH (25-54) years old=1, 0 otherwise	-0.54**	0.23	-0.18**	0.07
HHH (55-64) years old=1, 0 otherwise	-0.25	0.25	-0.09	0.09
Ln(land size in hectare)	0.21***	0.07	0.07***	0.03
Land tenure is secure=1, 0 otherwise	-0.52**	0.20	-0.18**	0.07
Farmer is female=1, 0 otherwise	0.39**	0.18	0.14**	0.06
Kiambu=1, 0 otherwise	-0.49	0.31	-0.18	0.12
Kajiado=1, 0 otherwise	0.08	0.27	0.03	0.09
Machakos=1, 0 otherwise	0.10	0.29	0.03	0.09
Constant	1.53	0.37	-	-

Notes: HHH is household head; Ln is natural logarithms; ***p<0.01; **p<0.05; S.E is standard error

4.3 Determinants of credit access

Table 4 presents factors affecting access to credit. These factors include the distance from Nairobi, having household heads with primary education, and savings group membership. The subsequent paragraphs present how these factors are related to credit access.

Distance from Nairobi City is positively related to the likelihood of accessing overall and group credits. This suggests that farmers located far away from the City are more likely to access credit than those located nearer to the city. The result is in line with the finding of Nguyen (2019) who

found that the availability of branches of urban financial institutions in rural areas increases access to credit increases in rural areas or places far away from town. The likelihood of accessing credit increases with the increasing distance from Nairobi City because farmers have limited access to credit services from commercial banks, which are mainly concentrated in Nairobi City. Farmers who are domiciled in rural areas resort to rural banking credit services, which are closer to them. The bulk of these credits flows mainly from the table banking schemes.

Saving group membership is positively related to credit access. This suggests that distance from savings group membership increases access to credit. This result is similar to findings reported in Ghana (Sekyi et al, 2020) and other developing countries (Van Eijkel et al., 2011). Group membership increases the likelihood of accessing credit seemingly because of the following reasons. Firstly, financial institutions tend to consider group membership as collateral in terms of collective responsibility against the risk of default. Secondly, group membership tends to reduce transaction costs and overcome the problem of information asymmetry in the credit market. Thirdly, in the group saving scheme, group membership also brings financial services closer to group members because groups provide platforms for operating savings schemes.

Having household heads with primary education is positively associated with credit access. This suggests that being household heads with primary education increases credit access. The finding is particularly true for access to group credits. This result is in line with the finding of Busingye (2015) and Amedi et al. (2020). While those with higher education have better access to financial services, primary graduates do not. They, therefore, resort to informal financial services.

Table 4: Determinants of credit access

Variable	Access to credit			
	Coefficient	S.E	Marginal effect	S.E
Ln(Distance from Nairobi in Km)	0.67**	0.29	0.26**	0.11
HHH (55-64) years old=1, 0 otherwise	-0.05	0.21	-0.02	0.08
HHH (25-54) years old=1, 0 otherwise	0.17	0.19	-0.07	0.07
HHH has primary education=1, 0 otherwise	0.59**	0.25	0.21***	0.08
HHH has secondary education=1, 0 otherwise	0.05	0.20	0.02	0.08
Has off-farm employment=1, 0 otherwise	0.23	0.19	0.09	0.07
Own car=1, 0 otherwise	0.20	0.17	-0.08	0.07
Has phone=1, 0 otherwise	0.51	0.33	0.20	0.13
Land tenure is secure=1, 0 otherwise	0.21	0.17	0.08	0.07
Farmer is female=1, 0 otherwise	-0.23	0.16	-0.09	0.06
Saving group membership	0.37**	0.16	0.14**	0.06
From Kiambu County=1, 0 otherwise	1.01**	0.45	0.32***	0.11
From Kajiado County=1, 0 otherwise	0.42	0.41	0.16	0.15
From Bungoma County=1, 0 otherwise	-1.79***	0.57	-0.63***	0.15
Constant	-2.99**	1.35	-	-
Wald chi2 (14)	42.63***		-	

Notes: *** p<0.01; **p<0.05; * p<0.1; S.E is standard error; Ln is natural logarithms; HHH is household head

4.5 Effects of table banking plus certified organic agriculture on livelihood capitals

Social capital

Table 5 shows that group membership is 48 percent higher among organic than non-organic producers. Interactions among these group members constitute relations of trust. As table 5 shows, trust in the group is 41 percent higher among organic than non-organic producers. These results reveal that organic producers have more social capital than non-organic producers.

Table 5: Social capital of organic and non-organic producers

Variable	Matching method	Organic	Non-organic	Difference	S.E
Group member=1; 0 otherwise	Near neighbor	0.94	0.46	0.48***	0.076
	Radius caliper	0.94	0.41	0.53***	0.071
	Kernel	0.94	0.46	0.48***	0.056
Have high trust in the group=1; 0 otherwise	Near neighbor	0.53	0.12	0.41***	0.061
	Radius caliper	0.56	0.17	0.39***	0.078
	Kernel	0.53	0.12	0.41***	0.056

Notes: S.E is bootstrapped standard error; ***p<0.01; **p<0.05*p<0.1

Social capital is higher among organic than non-organic producers because a participatory guarantee system (PGS) of organic certification encourages group formation and relations of trust. This observation draws support from IFOAM (2019), which argues the participatory guarantee system certifies producers based on a foundation of trust, social networks, and knowledge exchange. It uses social networks as a means of achieving collective responsibility. It also presupposes trustworthiness. Organic group members trust one another as committing to protect nature and consumers' health by farming organically and complying with organic standards; the participatory guarantee system is only limited to expressing and verifying this trust

(IFOAM, 2019). Equally, PGS builds trust by maintaining transparency through peer reviews and information sharing during regular group meetings.

Financial capital

Table 6 presents results of propensity score matching, comparing uptake of credits among organic and non-organic producers. The results show mean values and differences of credit uptake between organic and non-organic producers. Overall, organic producers have a 33 percent higher credit uptake than non-organic producers. The uptake of group credit is 37 percent higher among organic than non-organic producers. In terms of gender, the overall credit uptake of women and men is respectively 23 percent and nine percent higher among organic than non-organic producers. Meanwhile, uptake of group credit by women and men is respectively 28 percent and nine percent higher among organic than non-organic producers.

Table 6: Credit uptake and use by organic and non-organic producers

Variable	Matching method	Organic	Non-organic	Difference	S.E
Taken credit in the last 1year=1; 0 otherwise	Near neighbor	0.82	0.47	0.35***	0.077
	Radius caliper	0.80	0.42	0.38***	0.090
	Kernel	0.82	0.49	0.33***	0.052
Taken group credit in the last 1 year=1; 0 otherwise	Near neighbor	0.74	0.37	0.37***	0.077
	Radius caliper	0.73	0.32	0.41***	0.075
	Kernel	0.74	0.37	0.37***	0.066
Savings (table banking) group membership	Near neighbor	0.78	0.34	0.44***	0.07
	Radius caliper	0.78	0.34	0.44***	0.08
	Kernel	0.78	0.33	0.45***	0.06

Notes: S.E is bootstrapped standard error; ***p<0.01; **p<0.05*p<0.1

Credit uptake is higher among organic than non-organic producers because organic producers have higher access to financial services. This is reflected in the fact that membership to the table banking group is higher among organic than non-organic producers. As table 6, table banking group membership is 45 percent higher among organic than non-organic producers. This is because synergies that exist between the organic certification mechanism and table banking facilitate the establishment of table banking among and by organic producers. Since financial services have come closer to organic producers, their access to financial services increased.

Table banking provides financial services to organic producers. However, table banking depends on the participatory guarantee system (PGS) of organic certification for operational resources and platforms. Firstly, the PGS promotes group formation as a basis for organic certification. This explains why table 5 shows 48 percent higher group membership among organic than non-organic producers. Groups formed for organic certification provide a platform for operating table banking. Secondly, the participatory guarantee system generates and relies on trust during the organic certification. Table 5 also attests to this because it shows 41 percent higher trust in the group among organic than non-organic producers. The trust built among the organic group members facilitates the establishment and operation of table banking. It serves as a criterion for screening group members and collateral for the group loan (de Klerk, et al 2008; Severson, 2012). Thirdly, the participatory guarantee system involves a continuous learning process, which takes place through regular group meetings. The meetings facilitate table banking because it is during the meetings that groups also conduct table banking activities of saving and provision of credits and micro-insurance funds. This is reflected in the positive correlation that exists between group meeting attendance and credit uptake ($r = 0.28$, $p<0.05$).

In terms of gender, uptake of credit by women is higher among organic than non-organic producers partly because of their composition. While the composition of women is 34 percent higher among organic than non-organic producers, that of men is only 14 percent. It appears that women have more credit demand than men because of their limited uptake of formal credit services. This follows from Armendáriz de Aghion and Morduch (2010), who argue that women are more likely to take microcredit because they are more credit-constrained than men. It could also be explained by the higher composition of women among organic producers.

4.6 Effects of table banking plus certified organic agriculture on income and food security

Table 7 presents results of propensity score matching, comparing production income among organic and non-organic producers. The results show that the income is 24535 lower among organic than non-organic producers. Reduction in income upon organic conversion appears to arise from yield reduction and low price premium. Organic conversion tends to reduce yield in vegetables (Seufert *et al*. (2012). Yield reduction could be offset by price premium. However, more organic than non-organic organic producers sell their produce at the farm gate ($t(294) = -2.101$, $p = 0.037$), which attracts a lower price premium.

Table 7 also presents results of propensity score matching, comparing the food security status of organic and non-organic producers. The results show that table banking plus certified organic agriculture reduces the number of daily meals during the lean period, but it has an insignificant effect on the number of daily meals during the normal period. The reduction in the number of daily meals during the lean period is associated with the lack of investment in irrigation kits. This is because ownership of irrigation kits significantly predicts the number of

daily meals during lean periods (β=0.19, p<0.01). However, access to credit insignificantly predicts ownership of irrigation kits by organic producers (β=-0.06, p>0.05).

Table 7: Income and food security status of organic and non-organic producers

Outcome variable	Matching method	Organic	Non-organic	Difference	S.E
Income (in Kenyan Shillings)	Near neighbor	41823	81123	-39301***	14321
	Radius caliper	40679	74889	-34210**	14124
	Kernel	41823	66358	-24535**	9513
Number of daily meals during normal period	Near neighbor	1.09	1.11	-0.02	0.03
	Radius caliper	1.09	1.11	-0.02	0.03
	Kernel	1.10	1.11	-0.01	0.02
Number of daily meals during lean period	Near neighbor	0.69	0.88	-0.19**	0.09
	Radius caliper	0.69	0.88	-0.19**	0.08
	Kernel	0.69	0.84	-0.15**	0.07

Notes: S.E is bootstrapped standard error; ****p<0.01; **p<0.05; *p<0.1

4.10 General Discussion

Effects of table banking plus certified organic agriculture on sustainable livelihoods

In summary, table banking plus certified organic agriculture increased financial and social capital, but reduced farm incomes and the number of daily meals during the lean period. Synergies between table banking and organic agriculture supported the operations of table banking among organic producers, leading to greater credit access by organic than non-organic producers because financial services have been brought closer to them. Social capital increased

upon organic conversion because the participatory guarantee system promoted group formation for certification purposes. In turn, regular interactions among group members created the trust.

While table banking plus certified organic agriculture increased social and financial capitals, the financial capital accumulation appears to have negligible effects on farm income and the number of daily meals during the lean period. This concurs with Swain and Varghese (2010) and Augsburg (2008) who argue that livelihood capital accumulation may not necessarily result into a positive livelihood outcome because attaining livelihood outcome depends on many factors. For example, they associated limited contribution of livelihood capitals to income with a higher composition of livelihood capital being non-productive resources having no positive impact on income in the short run and/or with the fact that income generation has more requirements, including, marketable goods, infrastructure, and other factors.

The integrated microfinance reduced farm income seemingly because of yield reduction upon organic conversion and limited access to a premium market. Organic conversion tends to reduce the yield of vegetables. This follows from Seufert et al (2012) and Canwat et al (2021). Based on a global meta-analysis, Seufert et al found a significantly lower yield in organic than non-organic vegetables. Canwat et al also reported lower revenue efficiency among organic than non-organic kale producers in Kenya and they attribute it to yield reduction upon organic conversion. The yield reduction could be offset by price premium as noted by Qiao et al (2015) and Oelofse et al (2010). However, many of the farmers certified using the participatory guarantee system sell their products at the farm gate, which attracts a lower price premium. This, therefore, translates into lower farm income among organic than non-organic producers.

Comparison with other studies

Findings that table banking plus certified organic agriculture increases financial and social capital conforms to Ayuya et al (2015), Kamau et al (2018), and Abid et al (2020). Kamau et al and Ayuya et al associate organic agriculture in Kenya with a stronger network and group, which are created to facilitate certification and compliance with the organic standards. In terms of financial capital, Kamau et al. recorded a stronger association between group membership and credit access in Kenya. Abid et al also found a stronger linkage between financial access and trust relations and governance structure among organic agriculture in Pakistan.

The study also supports DFID (1999) and Scoones (1998) because it confirms sequencing relationships that exist among livelihood capitals in the sustainable livelihood framework. For example, groups formed (social capital) facilitated trust-building (social capital). While the groups provided a platform for operating table banking, the trust facilitated the provision of credits by enforcing credit contracts (Financial capital).

However, the effect of table banking plus certified organic agriculture on the number of daily meals during the lean period contrasts with Doocy et al. (2005), Hamad & Fernald (2015), Imai & Azam (2012), and Moseson et al. (2014), which report positive relationships between borrowing and household food consumption. The effect of table banking plus certified organic agriculture on farm income also sharply contrasts with the conceptual and sustainable livelihood framework, which contends a positive relationship between livelihood capitals and livelihood outcome. The finding also differs from Kamau et al (2018) and Ndungu (2013). Contrary to our

finding, Kamau et al reported higher income among organic than non-organic producers in Kenya. This appears to be because the organic farmers are market-oriented compared to the PGS-certified farmers who sell their produce locally at the farm gate. In the study of Ndungu, there was an increase in income (profit) upon organic conversion in Kale. The work of Ndungu also contrasts with our study in that it took into consideration production costs.

Nevertheless, the study concurs with Brett (2006) and Crépon et al. (2015), which report a reduction in the quantity and quality of household meals. The study also concurs with Bali Swain and Varghese (2010), Ranganathan et al., (2019), and Augsburg (2008). Bali Swain and Varghese found an increase in livelihood capitals, but not income among beneficiaries of microfinance plus training and group formation. Ranganathan et al also reported a reduction in the welfare of women who benefited from credits plus gender training. Augsburg also recorded reduced income among beneficiaries of microfinance plus training, but income became slightly insignificant upon accounting for market linkage. The study, therefore, draws support from the literature showing that microfinance plus services per se are less impactful. For integrated microfinance to achieve desired livelihood outcomes, financial services need to be combined with vital services. For example, Augsburg (2008) recorded reduced income among beneficiaries of microfinance plus training, but income became slightly insignificant upon accounting for market linkage. Ranganathan et al. (2019) found a reduction in the welfare of women who benefited from credits plus gender training, but Krenz et al. (2014) noted that integrating microfinance with other vital services greatly improved the welfare of women. The paper, therefore, reiterates the concern of scholars who acknowledge narrow short-run positive

outcomes of microfinance and doubt its poverty-reduction contributions and much wider long-run positive outcomes.

Equally, findings that table banking plus certified organic agriculture increases financial and social capital conform with Ayuya et al (2015), Kamau et al (2018) and Abid et al (2020). Kamau et al and Ayuya et al also associate organic agriculture in Kenya with a stronger network and group formation, which are established to facilitate certification and compliance with the organic standard. Kamau et al. recorded a stronger association between group membership and credit access in Kenya. Abid et al also found stronger associations between financial access and trust relations and governance structure among organic producers in Pakistan.

In general, the study draws support from other studies in two main ways. Firstly, it concurs with scholars, notably: Augsburg (2008), Buckley (1997) Morduch (2000) and Swain, Namayengo (2017), and Varghese (2010) who maintains that livelihood improvement requires more than livelihood capitals. Secondly, it is in line with Namayengo (2017) and other scholars who argue that access to credit may not lead to improvement of food security because improvement in productivity and food security may not be a priority for households.

5.0 Conclusion and Recommendation

This study analyses the effects of table banking plus certified organic agriculture on sustainable livelihoods. It compares financial and social capitals, farm incomes, and the number of daily meals among organic and non-organic producers. The study shows that table banking plus certified organic agriculture significantly increases the financial and social capitals of organic producers, especially for female organic producers. It enhances financial capital through the

provision of savings and credit services. Table banking plus certified organic agriculture promotes social capital accumulation by encouraging group formation and trust-building.. However, table banking plus certified organic agriculture reduces farm incomes because of yield reduction following organic conversion and because organic producers certified by participatory guarantee system mainly sell their products through farm-gate channel, which attract a low price premium. Table banking plus certified organic agriculture also reduces the number of daily meals during the lean period. Livelihood capital accumulation occurs sequentially because some livelihood capitals are an essential precursor for gaining access to others.

The study underscores and raises many coordination issues. Firstly, sequential relationships that exist among livelihood capitals points to the need for proper coordination of livelihood intervention activities. In this study, for instance, group formation needed to precede the establishment of table banking because social capital facilitates financial capital accumulation. Secondly, integrated microfinance is a complex intervention, consisting of enterprise development, financial and social intermediation services, which require greater coordination effort to establish synergies and generate desired livelihood outcomes. In this study, for example, limited product market coordination resulted in limited access to premium markets, consequently reducing income. In contrast, non-market coordination through the participatory guarantee system created synergies between table banking and certified organic agriculture and facilitated access to the financial services in the economic environment ridden with market failures. By promoting group formation, trust relations, and continuous knowledge exchange, the participatory guarantee system (PGS) of organic certification facilitated the operations of table banking. The producer groups through their regular meetings provided a platform for

operating table banking and reduced operations costs of table banking that are associated with screening potential borrowers and monitoring credit contracts because group members know one another, come from nearby places, and attend their regular group meetings. Trust relations embedded in PGS processes and group activities also reduce the operational costs of table banking by facilitating the screening of potential borrowers and enforcing credit contracts.

The study has three limitations, which future research interventions need to address. Firstly, the study underestimated the effects of table banking plus certified organic agriculture on income. This is because it never accounted for savings that accrue from the exclusion of synthetic agro-inputs following organic conversion. Therefore, there is a need to assess the economic viability of table banking plus certified organic agriculture using profit because it takes into consideration yield reduction, price premium, and savings accruing from the exclusion of synthetic agro-inputs following organic conversion. Secondly, the study took no consideration for the effect of time on productivity and hence, the income of organic agriculture. Yet, the productivity of organic agriculture tends to increase over time concerning the time after conversion (Shah et al., 2017; Sacco et al., 2015; Te Pas and Rees, 2014; Seufert et al., 2012). Therefore, future studies in this domain need to assess livelihood effects across a range of times after conversion.

There are three policy implications of the study. Firstly, promoting table banking plus certified organic agriculture extends access to financial services to the remotest part of rural areas. Secondly, table banking plus certified organic agriculture requires both market and non-market coordination. Thirdly, the participatory guarantee system of organic certification requires policy support because it is an important institutional infrastructure in the certified organic agriculture-based integrated microfinance.

Acknowledgments

We acknowledge the support of Erasmus Mundus Joint Doctorate Program of Agricultural Transformation by Innovation (AGTRAIN) and the research funding by the Education, Audiovisual, and Culture Executive Agency of the European Commission. We are also thankful to Kenya Organic Agriculture Network (KOAN) and Community Sustainable Agriculture and Healthy Environmental Programme (CSHEP) for their support and our research assistants for their hard work. Finally, we are very grateful to the study respondents for taking the time to respond to our questions.

Declaration

a) Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

b) Conflict of interest

I declare that there is or I have no conflict of interest

c) Funding

The study is part of a Ph.D. study funded Education, Audiovisual, and Culture Executive Agency of the European Commission.

d) Authors' contributions

VC conducted data collection, data analysis, and manuscript writing. OS guided data collection, data analysis, drafting, and editing of the paper.

References

Abid, A., Jie, S., Aslam, W., Batool, S., & Y. Lili. 2020. "Application of structural equation modelling to develop a conceptual model for smallholder's credit access: The mediation of agility and innovativeness in organic food value chain finance". *PloS one 15*(8): e0235921.

Abu, B. M., Domanban, P. B., & Sekyi, S. (2016). Credit market participation by women-owned small scale enterprises in Wa and Jirapa districts of the Upper West region of Ghana. *Ghanaian Journal of Economics*, *4*(1), 71-97.

Abukutsa-Onyango, M. O., Adipala, E., Tusiime, G., & Majaliwa, J. G. M. (2010, September). Strategic repositioning of African indigenous vegetables in the Horticulture Sector. In *Second RUFORUM biennial regional conference on "Building capacity for food security in Africa", Entebbe, Uganda* (pp. 1413-1419).

Akinwumi A. A. and J. Baidu-Forson. 1993. "Technology characteristics, farmers' perceptions, and adoption decisions: A Tobit model application in Sierra Leone". *Agricultural Economics* 9: 297-311.

De Andrés, P., Gimeno, R., & de Cabo, R. M. (2020). The gender gap in bank credit access. *Journal of Corporate Finance*, 101782.

Annan, J., Bundervoet, T., Seban, J. and J. Costigan. 2013. "A Randomized Impact Evaluation of Village Savings and Loans Associations and Family-Based Interventions in Burundi. [online] New York: International Rescue Committee". Available at: http://www.rescue.org/sites/default/files/resourcefile/New_Generation_Final_Report_0531 2013.pdf [Accessed 22 Dec. 2020].

Arora, S., & Meenu. 2012. "The banking sector intervention in the microfinance world: a study of bankers' perception and outreach to rural microfinance in India with special reference to

the state of Punjab". *Development in Practice 22*(7): 991-1005.

Armendáriz de Aghion, B. and J. Morduch. 2010. "The economics of microfinance", The MIT Press: Massachusetts.

Asfaw, S., Mithöfer, D. and H. Waibel. 2010. "What impact are EU supermarket standards having on developing countries' export of high-value horticultural products? Evidence from Kenya". *Journal of International Food & Agribusiness Marketing* 22: 252-276.

Atieno, R. 2001. "Formal and informal institutions' lending policies and access to credit by small-scale enterprises in Kenya: An empirical assessment (Vol. 111)". Nairobi: African Economic Research Consortium.

Augsburg, B. 2008. "Microfinance Plus–Impact of the 'plus' on customers' income in rural India". *Maastricht Graduate School of Governance, University Maastricht, the Netherlands*.

Ayuya, O. I., Gido, E. O., Bett, H. K., Lagat, J. K., Kahi, A. K., & S. Bauer. 2015. "Effect of certified organic production systems on poverty among smallholder farmers: Empirical evidence from Kenya". *World Development 67*: 27-37.

Bakliwal, S. and M . Umoh. 2011. " Sustainable access to financial services for investment (SAFI) project: learning document on financial linkages". Theme number 1.

Balkenhol, B., & M. Hudon. 2011. "Efficiency". *World Scientific Book Chapters*, 383-396.

Banerjee, A.V. and E. Duflo. 2011. "Poor Economics". Penguin Books: New York, USA.

Barslund, M. & F.Tarp. 2008. "Formal and Informal Rural Credit in Four Provinces of Vietnam". *The Journal of Development Studies* 44: 485-503.

Bateman, M. and H. Chang. 2012. "Microfinance and the Illusion of Development: From Hubris to Nemesis in Thirty Years". *World Economic Review* 1: 13-36.

Biosca, O., Lenton, P. and P. Mosely. 2014. "Where is the 'Plus' in 'Credit-Plus'. The Case of Chiapas, Mexico". *The Journal of Development Studies* 50(12): 1700-1716.

Brett, J.A. (2006). "We sacrifice and eat less": the structural complexities of microfinance participation. Human Organization, 65(1), 8-19.

Briggeman, B.C. "The Importance of Off-farm Income to Servicing Farm Debt." Economic Review-Federal Reserve Bank of Kansas City 96(2011):63–82.

Brunie, A., Fumagalli, L., Martin, T., Field, S. and D.Rutherford. 2014. "Can village savings and loan groups be a potential tool in the malnutrition fight? Mixed method findings from Mozambique". *Children and Youth Services Review* 47: 113–120.

Buckley, G. (1997). Microfinance in Africa: Is it either the problem or the solution? *World Development*, 25(7), 1081-1093.

Burlando, A., Canidio, A. and R. Selby. 2016. "The Economics of Savings Groups".

Butler, L. M., Bhandari, S., Otieno, P., Weiser, S. D., Cohen, C. R., & E. A. Frongillo. 2020. "Agricultural and finance intervention increased dietary intake and weight of children living in HIV-affected households in western Kenya". *Current developments in nutrition 4*(2): nzaa003.

Bwana, K. M. & J. Mwakujonga. 2013. "Issues in SACCO development in Kenya and Tanzania: The historical and development perspectives". *The International Institute for Science, Technology and Education Journal 3*: 114-120.

Caliendo, M. and S. Kopeinig. 2008. "Some Practical Guidance for the Implementation of Propensity Score Matching". *Journal of Economic Surveys*: 22, 31-72.

Canwat, V., Oelofse, M., Onakuse, S., & A. de Neergaard. 2021. "Agroecological intensification: Can organic conversion improve the production efficiency? A perspective

from smallholder kale production systems Kenya". *Cleaner Environmental Systems*, 100048.

Crépon, B., Devoto, F., Duflo, E., & Pariente, W. (2015). Estimating the impact of microcredit on those who take it up: Evidence from a randomized experiment in Morocco. American Economic Journal: Applied Economics, 7(1), 123-150.

De Klerk, T. 2008. "The rural finance landscape: A practitioner's guide". Agrodok-series No.49, Agromisa Foundation and CTA: Wageningen.

Dittrich, P. 2012. "Organic Agriculture: Information Note", European Commission: Brussel.

Doocy, S., Teferra, S., Norell, D., & Burnham, G. (2005). Credit program outcomes: coping capacity and nutritional status in the food insecure context of Ethiopia. Social Science & Medicine, 60(10), 2371-2382.

Duncombe, R., & Boateng, R. (2009). Mobile Phones and Financial Services in Developing Countries: a review of concepts, methods, issues, evidence and future research directions. *Third World Quarterly*, *30*(7), 1237-1258.

Van Eijkel, R., Hermes, N., & Lensink, R. (2011). Group lending and the role of the group leader. *Small business economics*, *36*(3), 299-321.

Farnworth, C. and J. Hutchings. 2009. "Organic Agriculture and Women's' Empowerment", IFOAM: Bonn, Germany.

Faturoti B O, G N Emah, B I Isife, A Tenkouano1 and J Lemchi (2006), "Prospects and determinants of adoption of IITA plantain and banana based technologies in three Niger Delta States of Nigeria." African Journal of Biotechnology Vol. 5 (14), Pp. 1319-1323

Fernandez-Cornego, J., Daberkow, S. and W.D. McBride. 2001. "Decomposing the size effect on the adoption of innovations: agrobiotechnology and precision farming". Selected

Paper for American Agricultural Economics Association 2001 Annual meeting August 5-8, Chicago, IL.

Flores, I., & P. Serres. 2009. "Microfinance and non-financial services: An impossible marriage". *Private Sector and Developpment Proparcos Magazine* (3).

Gamba, P. and I. Komo. 2014. "Evolution, growth and decline of the cooperative sector". A paper prepared for the Centre for Governance and Development.

Gido, E. O., Ayuya, O. I., Owuor, G., & Bokelmann, W. (2017). Consumption intensity of leafy African indigenous vegetables: towards enhancing nutritional security in rural and urban dwellers in Kenya. *Agricultural and Food Economics*, *5*(1), 1-16.

Government of Kenya. 2009. "Agricultural Sector Development Strategy": 2009 – 2020.

Gulli, H. 1998. "Microfinance and poverty: questioning the conventional wisdom". Inter-American Development Bank: Washington D.C.

Gupta, A., Ponticelli, J., & Tesei, A. (2019). *Technology Adoption and Access to Credit via Mobile Phones* (No. 13956). CEPR Discussion Papers.

Hamad, R., & Fernald, L.C.H. (2015). Microcredit participation and women's health: Results from a cross-sectional study in Peru. International Journal for Equity in Health, 14.

Herath, H. M. W. A., Guneratne, L. H. P., & N. Sanderatne. 2015. "Impact of microfinance on women's empowerment: a case study on two microfinance institutions in Sri Lanka". *Sri Lanka Journal of Social Sciences 38*(1): 51-61.

Imai, K.S., & Azam, M.D.S. (2012). Does microfinance reduce poverty in Bangladesh? New evidence from household panel data. *The Journal of Development Studies*, 48(5), 633- 653.

Kamau, J. W., Stellmacher, T., Biber-Freudenberger, L., & C. Borgemeister. 2018. "Organic and conventional agriculture in Kenya: A typology of smallholder farms in Kajiado and

Murang'a counties". *Journal of rural studies 57*: 171-185.

Kariuki, C. M. and P. K. Ngugi. 2014. "The effect of table banking on the performance of micro and small enterprises in Nairobi County". *International Journal of Current Business and Social Sciences* 1: 339-360.

Key, N. (2020). Off-farm Income, Credit Constraints, and Farm Investment. *Journal of Agricultural and Applied Economics*, *52*(4), 642-663.

Khanna, S. A., & L. Tripathee. 2018. "Organic certification: a case study of organic valley, Nepal". *International Journal of Applied Agricultural Sciences 4*(1): 14.

Kibaara, B., and J. Nyoro. 2007. "Expanding the agricultural finance frontier: a Kenyan case". In: *AAAE Ghana Conference, 20–22 August, Institute of Agricultural Policy and Development, Nairobi.* Page: 287-290.

Krenz, K., Gilbert, D. J., & G. Mandayam. 2014. "Exploring women's empowerment through "credit-plus" microfinance in India". *Affilia 29*(3): 310-325.

Ksoll, C., Lilleør, H. B., Lønborg, J. H., and O. D. Rasmussen. 2016. "Impact of Village Savings and Loan Associations: Evidence from a cluster randomized trial". *Journal of Development Economics* 120: 70–85.

Ledgerwood, J. 1999. "Microfinance Handbook, an Institutional and Financial Perspective". The World Bank, Washington DC.

Lensink, R., Mersland, R., Vu, H.T.H. and S. Zamore. 2018. "Do microfinance institutions benefit from integrating financial and nonfinancial services?". *Applied Economics* 50 (21): 2386-2401, DOI: 10.1080/00036846.2017.1397852

Littlefield, E, Murdoch, J. and S. Hashemi. 2003. "Is microfinance an effective strategy to reach the millennium development goals?" Focus Note, No. 24

Lorenzetti, L. M., Leatherman, S., & V. L. Flax. 2017. “Evaluating the effect of integrated microfinance and health interventions: an updated review of the evidence”. *Health policy and planning 32*(5): 732-756.

Lowicki-Zucca, M., Walugembe, P., Ogaba, I. and S. Langol. 2014. “Savings groups as a socio-economic strategy to improve protection of moderately and critically children in Uganda”. *Children and Youth Services Review* 47: 176-181.

Mathenge, L. (1995). Nutritional value and utilization of indigenous vegetables in Kenya. In: Proceedings of The International Workshop on Genetic Resources of Traditional Vegetables in Africa, Nairobi, kenya

Matin, I., Hulme, D. and S. Rutherford. 2002. “Finance for the poor: from microcredit to microfinancial services”. *Journal of International Development* 14: 273–294.

Mersland, R. and Ø. Eggen. 2008. “You cannot save alone: financial and social mobilization in savings and credit groups”. Norad Report 8/2008 Discussion.

Migliore, G., Cembalo, L., Caracciolo, F. and G. Schifani. 2012. “Organic consumption and consumer participation in food community networks”. *New Medit Mediterranean journal of economics, agriculture and environment*, Special Issue (4)

MkNelly, B., and C. Dunford. 1998. “Impact of Credit with Education on Mothers and Their Young Children's Nutrition: Lower Pra Rural Bank Credit with Education in Ghana”. Freedom from Hunger Research Paper No. 4. Davis: Calif.: Freedom from Hunger. 1998.

— . “Impact of Credit with Education on Mothers and Their Young Children's Nutrition: CRECER Credit with Education Program in Bolivia”. Freedom from Hunger Research Paper No. 5. Davis, Calif.: Freedom from Hunger. 1999.

Miyata, S., N. Minot, and D. Hu. 2009. “ Impact of Contract Farming on Income: Linking

Small Farmers, Packers, and Supermarkets in China". *World Development* 37: 1781–1790.

Mohamed, K. S., & Temu, A. E. (2008). Access to credit and its effect on the adoption of agricultural technologies: the case of Zanzibar. *African Review of Money Finance and Banking*, 45-89.

Monteiro, S. (2020). *The impact of the formal employment contract on credit access in Africa* (No. hal-02493388).

Morsy, H., El-Shal, A., & Woldemichael, A. (2019). Women self-selection out of the credit market in Africa.

Moseson, H., Hamad, R., & Fernald, L. (2014). Microcredit participation and child health: results from a cross-sectional study in Peru. *Journal of Epidemiology and Community Health*, 68(12), 1175-1181.

Morduch, J. (2000). The microfinance schism. World Development, 28(4), 617-629.

Namayengo, M. M. F. (2017). *Microcredit to women and its contribution to production and household food security* (Doctoral dissertation, Wageningen University).

Ndungu, S. K., Macharia, I. N., Kahuthia, R. G., & R.G. Wahome. 2013. "Impact of Organic Vegetable Production System in Kiambu and Kajiado Counties of Kenya". *Journal of Environmental Science and Engineering 2*(4): 256-266.

Ngare, P., Kweyu, M., & C. Huka. 2015. "Modelling Risk of Financing Agribusiness in Kenya". Kenya Bankers Association Working Paper Series, Centre for Research on Financial Markets and Policy: Nairobi.

Nguyen, H. L. Q. (2019). Are credit markets still local? Evidence from bank branch closings. *American Economic Journal: Applied Economics*, *11*(1), 1-32.

Nishi, N. Y., Islam, M. M., & Ahmed, M. B. (2019). Participation of rural women in organic farming. *Asian Journal of Agricultural Extension, Economics & Sociology*, 1-14

Obaidullah, M. 2015. "Enhancing food security with Islamic microfinance: insights from some recent experiments". *Agricultural Finance Review*.

Oelofse, M., Høgh-Jensen, H., Abreu, L. S., Almeida, G. F., Hui, Q. Y., Sultan, T., & A. De Neergaard. 2010. "Certified organic agriculture in China and Brazil: Market accessibility and outcomes following adoption". *Ecological Economics 69*(9): 1785-1793.

OSEA and IFOAM. 2013. "Impacts associated with the uptake of organic agriculture in East Africa".

Pitt, M.M. and S. R. Khandker. 1999. "The impact of Group-Based Credit Programs on Poor Households in Bangladesh: Does the Gender of Participants Matter?". *Journal of Political Economy* 106: 958-996.

Population council. 2016. "Evaluating the impact of integrated microfinance and reproductive (MF/RH) services on household wellbeing and reproductive health behaviors of women in Nigeria". Project Brief. Washington, DC.

Pretty, J. N., Morison, J.I.L and R. E. Hine. 2003. "Reducing food poverty by increasing agricultural sustainability in developing countries". *Agriculture, Ecosystems and Environment* 95: 217–234.

Qiao, Y., Halberg, N., Vaheesan, S., & S. Scott. 2016. "Assessing the social and economic benefits of organic and fair trade tea production for small-scale farmers in Asia: a comparative case study of China and Sri Lanka". *Renewable Agriculture and Food Systems*: *31*(3): 246-257.

Ranganathan, M., Knight, L., Abramsky, T., Muvhango, L., Polzer Ngwato, T., Mbobelatsi, M., ... & H. Stöckl. 2019. "Associations between women's economic and social empowerment and intimate partner violence: Findings from a microfinance plus program in rural North West Province, South Africa". *Journal of interpersonal violence*, 0886260519836952.

Reardon, T., C. Barrett, J. Berdegue and J. Swinnen. 2009. "Agrifood Industry Transformation and Small Farmers in Developing Countries". *World Development* 37: 1717-1727.

Reed LR 2011. "State of the microfinance summit campaign report 2011". *Microfinance Summit Campaign*.

Richardson, P., Howarth, R., & Finnegan, G. (2004). The challenges of growing small businesses: Insights from women entrepreneurs in Africa. Geneva: International Labour Office.

Rosina Bara, C., Jarquin Gálvez, R., Reyes Hernández, H., & J. Fortanelli Martínez. 2018. "Adaptation of a participatory organic certification system to the organic products law in six local markets in Mexico". *Agroecology and Sustainable Food Systems 42*(1): 48-76.

Rutherford, S. 2000. "The poor and their money". 1st edition. Oxford University Press: New Delhi, India.

Scoones, I. 1998. "Sustainable rural livelihoods: a framework for analysis".

Seibert, S. E., Kraimer, M. L., & R. C. Liden. 2001. "A social capital theory of career success". *Academy of management journal 44*(2): 219-237.

Sekyi, S., Abu, B. M., & Nkegbe, P. K. (2020). Effects of farm credit access on agricultural commercialization in Ghana: Empirical evidence from the northern Savannah ecological zone. *African Development Review*, *32*(2), 150-162.

Sekyi, S., Nkegbe, P. K., & Kuunibe, N. (2014). Participation in the credit market by small scale enterprises in Ghana: Evidence from Wa Municipality.

Seng, K. (2017). Considering the effects of mobile phones on financial inclusion in Cambodia (MPRA Paper No. 82225). Munich Personal RePEc Archive.

Serrat, O. 2017. "The sustainable livelihoods approach". In *Knowledge solutions* (pp. 21-26). Springer, Singapore.

Severson, R. 2012. "Linking savings and loan associations to external financing: A guide for practitioners". Available at: http://www.microfinancegateway.org/sites/default/files/mfg-en-toolkit-linking-savings-and-loan-associations-to-external-financing-a-guide-for-practitioners-nov-2012.pdf (accessed: 5/7/2016).

Shah, A., Askegaard, M., Rasmussen, I. A., Jimenez, E. M. C., & J. E. Olesen. 2017. "Productivity of organic and conventional arable cropping systems in long-term experiments in Denmark". *European Journal of Agronomy 90*: 12-22.

Soltani, S., Azadi, H., Mahmoudi, H., & Witlox, F. (2014). Organic agriculture in Iran: Farmers' barriers to and factors influencing adoption. *Renewable Agriculture and Food Systems*, *29*(2), 126-134.

Sumner, J. & S. Llewelyn. 2011. "Organic Solutions? Gender and Organic Farming in the Age of Industrial Agriculture". *Capitalism Nature Socialism* 22: 100-118.

Swain, R. B., & A. Varghese. 2010. "Being patient with microfinance: The impact of training on Indian self-help groups". Working paper No. 2010: 22.

Swarts, B, Bukuluki, P., Mwangi, G., & J. Wanyama. 2010. "Evaluation of Economic Strengthening for OVC: Using the WORTH Model in Uganda". [online] Alexandria, VA: Salvation Army World Service Office.

Te Pas, C. M., & R. M. Rees. 2014. “Analysis of differences in productivity, profitability and soil fertility between organic and conventional cropping systems in the tropics and sub-tropics”. *Journal of Integrative Agriculture 13*(10): 2299-2310.

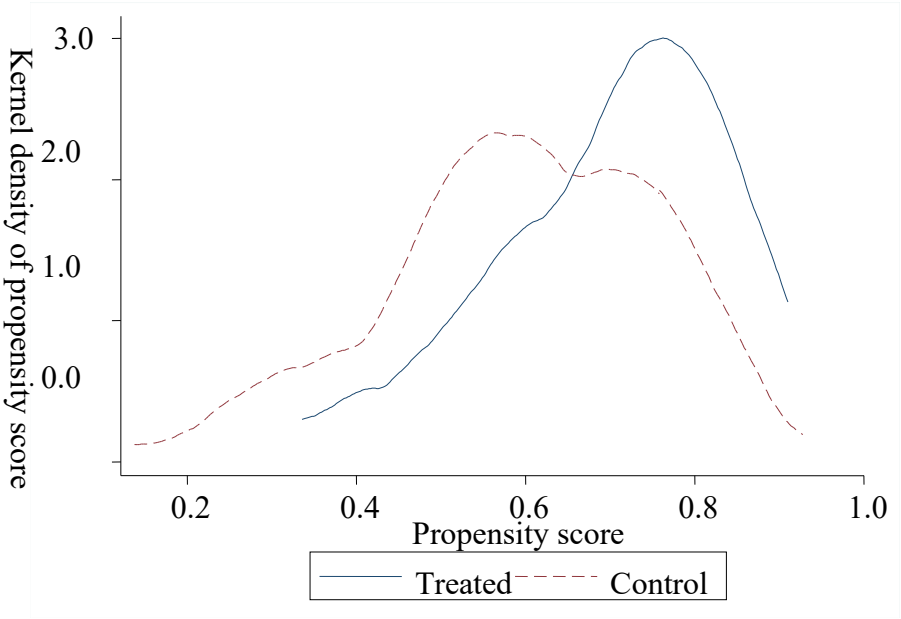
Trauger, A. 2004. “Because they can do the work’: women farmers in sustainable agriculture in Pennsylvania, USA”. *Gender, Place and Culture* 11: 289-307.

Wanyama, F. O. 2009. “Surviving liberalization: the cooperative movement in Kenya”. Geneva: International Labour Organisation.

Wanyama, F. O. 2007. “The impact of liberalization on the co-operative movement in Kenya. School of Development and Strategic Studies”. Maseno University.

Yuan, Y., & Gao, P. (2012). Farmers' financial choices and informal credit markets in China. *China Agricultural Economic Review*.

Zhang, F., Huang, C.L., Lin, B. and J.E. Epperson. 2008. “Modeling Fresh Organic Produce Consumption with Scanner Data: A Generalized Double Hurdle Model Approach”. *Agribusiness* 24: 510–522.



Appendix 1: An overlap plot of density functions of propensity scores of organic (treated) and non-organic (control) units