Smallholder Agriculture and Livelihood Sustainability Potentials among Rural Households: A Case of Sunflower Value Chain in Tanzania

Alban D. Mchopa[*1], John N. Jeckoniah[2] and Japhet M. Mgema[3]
[*1]Moshi Co-operative University, Moshi – Tanzania, Corresponding author: albanmchopa@gmail.com
[2]Sokoine University of Agriculture, Morogoro – Tanzania
[3]Moshi Co-operative University, Moshi – Tanzania

Abstract

Sunflower cultivation has attracted the majority of smallholder farmers who have dominated the production node of the value chain. The chain activities have become the main income stream to households and thus increasing livelihood sustainability potentials. However, in some cases smallholder farmers only end up with minimal benefits since the markets are not stabilized to their advantage. As a result, the market practices continue to leave smallholder farmers exposed to livelihood stresses and shocks which affect their potentials for livelihood sustainability. Therefore, the study aimed to analyze the impact of sunflower value chain activities on livelihood sustainability potentials among households of smallholder farmers. A cross-sectional design was adopted to guide the study along with counterfactual approach to establish the hypothesised impact. A sample size of 368 respondents was used including participant and non-participant smallholder farmers and data was collected using questionnaire, key informant interview and focus group discussion. Quantitative data were analysed by using descriptive statistics and propensity score matching while qualitative data were transcribed and thereafter analysed using constant comparison technique. The findings show that most of the households had lower chances for livelihood sustainability (67.1%) while few households (12.5%) were categorised into high livelihood sustainability. The differences were attributable to one's engagement in sunflower production which had an impact on livelihood sustainability as observed by the differences from propensity scores matching (MD = 1.394; t = 6.98 at p = 0.000). It was concluded that sunflower value chain is potential towards households' livelihood sustainability unlike any other socio-economic activities as it enabled smallholder farmers to withstand livelihood shocks and stresses based on the generated household income.

Keywords: Agriculture, Smallholder Farmers, Livelihood, Sustainability.

JSSBT, Vol. 2 No. 2 (December, 2021), pp. 1 – 10, © 2021 The Co-operative University of Kenya

INTRODUCTION

Smallholder farming alone constitutes approximately 80% of all farms in Sub-Saharan Africa and employs about 175 million people directly (AGRA, 2014) within the rural population. It provides a livelihood for the multitudes of small-scale producers (OECD-FAO, 2016). Thus, developing smallholder agriculture can reduce extreme poverty and starvation among households in Sub-Saharan Africa since they do not have many economic opportunities. Despite of the observed potentials, smallholder farmers continue to face poverty and food insecurity emanating from low production as a result of a number of factors including poor technologies involving the use of poor seeds (World Bank, 2013); climate change and variability (Thompson, Berrang-Ford and Ford, 2010) as well as low commercialization of agricultural products (Delaney, Livingston and Schonberger, 2011).

In Tanzania, agriculture remains the main source of economic livelihood for about 66%

of the population (Kinyondo and Magashi, 2017), particularly the rural smallholder farmers. With 73% of the poor living in rural areas, agriculture is mainly dominated by about 3.7 million smallholder farmers and in 2017 the sector employed about 65% of the population (Deloitte, 2017). Thus, smallholder agriculture provides the main income stream for the majority of rural and peri-urban household and supports nearly all of the household expenditure ranging from medical and foods expenses to school fees. Eventually, through smallholder agriculture, households consume what they grow, trade goods for other necessities, and sell their crops or livestock for income (Rapsomanikis, 2015; NEPAD, 2013).

Among the mostly grown crop by smallholder farmers in the country is sunflower particularly in the semi-arid regions of Singida, Dodoma and Tabora because of weather conditions favorability. Also, among others, the increased demand of oilseeds for edible oil in the domestic and world market has been a push factor attracting smallholder farmers to engage more in sunflower production so as to increase household income. Currently, the production of edible oil is mainly based on sunflower (35%) as the local demand for its cholesterol free oil is increasing which in turn also increases the income potentials for improving smallholder farmers and producers livelihoods. Thus, the crop (sunflower) has increasingly become important for the majority of the smallholder farmers' households where the majority depend on farming as one among the major sources of household livelihood (Salisali, 2012).

Notwithstanding the aforementioned potentials to households' livelihood, sunflower value chain is still distorted to the disadvantage of the smallholder farmers who have little bargaining power over buyers (Sebyiga, 2020). The markets are not stabilised to their advantage (Salisali, 2012) due to collusive price setting (Lubungu, Burke and Sitko, 2014) and relentless price variations determined by rural collectors and middle men (UNCTAD, 2015; Beerlandt, Uronu and Phlix, 2013). Sosina, Espen and Kinyondo (2018) observed that smallholder farmers receive prices lower than the product deserves because of the weaker bargaining position, lack of proper pricing information and uncoordinated timing of their supply in the markets. Experience shows that there is a very high supply immediately after harvest and normally few buyers intentionally show up for the sake of influencing prices to their advantage. Likewise, smallholder farmers have limited access to quality and reliable extension services as well as financial resources that would enable them to upgrade their production assets including higher-yielding seeds, tilling machines as well as storage and processing facilities (Sebyiga, 2020). The aforementioned disrupts their household incomes and affects smallholder farmers' opportunities for achieving the desired livelihood outcomes and increase their potentials for livelihood sustenance.

As a result, a number of government and development agencies initiatives have been in place to support efforts for organizing sunflower actors using the value chain approaches aiming at improving livelihood outcomes (TEOSA, 2012). The interventions, among others, include the introduction of quality declared seeds by Rural Livelihood Development Program (RLDP) and Netherland Development Organisation (SNV). However, there is still a need for more coordinated interventions focusing on smallholder farmers and geared toward upgrading the value chain especially on production parameters, post-harvest losses and semi-processing (Nerman, 2015; TEOSA, 2012).

Consequently, absence of coordinated initiatives has left smallholder farmers exposed and vulnerable to livelihood stresses and shocks which affect chances of livelihood sustainability due to imperfections along the value chain (Mchopa and Jeckoniah, 2018). Thus, it is important that there should be coordinated initiatives by the governments for the purpose of understanding how households are

influenced at the micro level by various crops value chain upgrading strategies (Mgeni, Muller and Sieber, 2019). This would enable the government to provide support for specific crop value chains in terms of increasing productivity (Arndt, Pauw, and Thurlow, 2012) and market linkages (McArthur and McCord, 2017) which can ultimately contribute to improvement of households' livelihood. Improving smallholder crop production in a decentralized farming system and increasing market access opportunities directly impact the economic growth and livelihood improvement of the rural population (Herrmann, Nkonya and Faße, 2018; Kissoly, Faße and Grote, 2017).

Nonetheless, Mgeni *et al.* (2019) observed that there is a paucity of empirical evidence about the extent of how gains in agricultural value chain activities (productivity and market linkages) among smallholder farmers in rural areas help improve the economy at the household level. Contrasting empirical orientations seem to bring conflicting discussions and conclusions which subject the matter for more research undertakings. Thus, there is little consensus about how value chain interventions contribute to poverty alleviation among different gender groups despite the claimed potentials of value chains in creating livelihood opportunities based on how they are designed and implemented (Mvurungu *et al.,* 2014). Accordingly, there is a need for analysing the impact of sunflower value chain activities on livelihood outcomes sustainability among households of smallholder farmers in order to contextualise where the intersections occur.

The analysis of the intersections based on broader theoretical and methodological perspectives will provide more empirical findings that qualify the avenues for more wealth accumulation and control over resources based on participation in value chain activities (Jeckoniah, Mdoe and Nombo, 2013) and the opportunities for households' livelihood sustenance. Therefore, guided by the sustainable livelihood framework (DFID, 2001), the study aimed to analyse the impact of sunflower value chain activities on livelihood outcomes sustainability among households of smallholder farmers.

METHODOLOGY

The study was a quasi-experimental guided by a cross-sectional research design where data for multiple variables was collected over a single point in time from a representative sample with varied characteristics. Based on counterfactual approaches for quasi-experiments, data was collected from participants (control group) and non-participants (treated group) to detect variables patterns of association based on cross sectional data (Bryman and Bell, 2011). The study was purposely conducted in Iramba District (Singida Region) as the area had a high number of households participating in sunflower production and provided the ground for more empirical evidence. The sample size was estimated at 384 respondents using Daniel (2009) formula. The formula provided room for selecting respondents with and without particular characteristics since the study applied counterfactual techniques by focusing on participants (p) and non-participant (1-p) smallholder farmers.

$$\text{Sample Size (n)} = \frac{z^2 \text{x (p) x (q)}}{d^2} \quad \text{..... (1)}$$

Where:

z = degree of confidence (95% which yields 1.96); p = percentage of target population estimated to have particular characteristics (50%); q = 1.0-p (population estimated to have a particular characteristics-50%); and d = margin of error set at 0.05. Therefore;

$$n = \frac{(1.96)^2 \times [0.5(1-0.5)]}{(0.05)^2} \qquad \text{n = 384}$$

The response rate was equivalent to 95.8% (358 respondents) which is reasonable as recommended by Babbie (2010) that a response rate of 70% and above is very good. A systematic sampling technique was used to sample respondents based on the register obtained from the village executive officers and

extension officers. The sampling interval (k^{th} element) was determined and thereafter the first observation was randomly chosen then, the sample was systematically picked from the register based on the sample interval.

Quantitative data were collected by using a questionnaire administered at a household level while five (5) key informant interviews and five (5) focus group discussions were used for collecting qualitative data. Qualitative data were analysed by using a constant comparison technique in terms of comparing incidents applicable to each category and delimiting data to the theory as proposed by Kolb (2012). A livelihood sustainability index was constructed by customizing Rahman and Akter (2010) index basing on the indicators from the sustainable livelihoods framework (DFID, 2001). The index was solely constructed in order to measure the livelihood sustainability potentials among households of smallholder farmers. Propensity score matching was used to establish the impact since it reduces dimensionality problem (dimensions of covariates) to a scalar (propensity score) and can balance the observables between compared groups (Stuart, 2010). Through Nearest Neighbour Matching (NNM) the propensity score matching was defined as:

$P(X_i) = Prob(H_i = 1| X_i)$ $(0< P(X) < 1)$ .....(1) (Ravallion, 2003)

Where:

Xi = vector of pre-intervention control variables; Hi = 1 for household i that participate; Hi = 0 for household i that did not participate.

Based on propensity scores, Average Treatment on the Treated (ATT) was established to capture the average effect of treatment on the treated. Thereafter, matching of propensity scores among the compared groups was performed using difference in difference to establish the impact. The ATT was defined as: ATT (T = 1): $E(Y_i1 – Y_i0 | T_i = 1) = E(Y_i1| T_i = 1) – E(Y_i0| T_i = 1)$..... (2) (Imbens and Wooldridge, 2009)

Where:

T = an indicator for the treatment status which has a value of 1 for units in the treatment group, and a value of 0 for units in the control group; Y_i1= the outcome for each case (*i)* in the treated group given that it has been treated; and Y_i0 = the counterfactual outcome for each case (*i)* in the treated group had it not been treated.

FINDINGS AND DISCUSSION

Algorithms estimations and control of experiments

For the purpose of having quality matching of propensity scores, it was important that $0< p(X) < 1$ to ensure common support where the matched groups share commons characteristic in the outcome variable (livelihood sustainability). This restriction ensured comparisons were made only to observations whose propensity scores belongs to the intersection of support of the propensity score for treated and control (Becker and Ichino, 2002). Thus, if *p(X) = 1* such household was dropped and the ATT was estimated only for households where *p(X) < 1*. Therefore, the algorithm to estimate the propensity scores was run as a preliminary test for checking the covariates balance between the two groups that is $P(D = 0|X) = 1- P(D = 1|X)$. A total of 5 blocks as optimal number were identified for ensuring that the mean propensity scores were not different per blocks with a mean propensity score of 57.8% as shown in Plate 1 as an extract from the analysis.

Thereafter, the balancing property as a control of experiments was satisfied and common support option was selected whereby there was a considerable overlap of propensity scores between the treated and control households. By restricting the succeeding analysis to the region of common support rules out the perfect predictability of treatment status based upon the covariates. As shown in Plate 2, there was a considerable overlap of propensity scores between the treated and control households, which implies that the match was good and balanced. A larger proportion of overlap implies a good match of treated and control

cases (Dehejia and Wahba, 2002). Thus, in each class of the propensity score there was a number of treated and untreated households.

Estimated propensity score

	Percentiles	Smallest		
1%	.2695837	.195409		
5%	.3593395	.195409		
10%	.3593395	.2695837	Obs	368
25%	.4601526	.2695837	Sum of Wgt.	368
50%	.5643352		Mean	.5788043
		Largest	Std. Dev.	.1710663
75%	.6631311	.913037		
90%	.8196955	.913037	Variance	.0292637
95%	.913037	.913037	Skewness	.3433922
99%	.913037	.913037	Kurtosis	2.356804

Plate 1: Extract of the estimated propensity score on livelihood sustainability scores

The balancing property is satisfied

This table shows the inferior bound, the number of treated and the number of controls for each block

Inferior of block of pscore	r 0	1	Total
.195409	0	2	2
.2	29	22	51
.4	103	76	179
.6	18	63	81
.8	5	50	55
Total	155	213	368

Note: the common support option has been selected

Plate 2: Extract of the test of balancing of the propensity scores (control of experiments)

Livelihood sustainability levels among households

Understanding the status of household livelihood outcomes sustainability is important since households are endowed differently in terms of livelihood capabilities and wealth levels. The same has implications towards livelihood sustenance as they may view livelihood vulnerabilities and risks differently. The study established the status of the levels of livelihood sustainability among households of smallholder farmers in terms of poor, low, moderate and high. Findings in Table 1 show that the majority of smallholder famers' households (85.2% of non-participants and 54% of participants) fall

under low livelihood sustainability status. This implies that smallholders' household with lower level of livelihood sustainability did not generate enough abilities (such as household income) to withstand future livelihood shock and stresses basing on vulnerability context.

Most of smallholder farmers earned low incomes as observed by Rapsomanikis (2015) and Kawamala (2012) which may not be sustainable since they use the incomes immediately to cover for household requirements and very little is saved to cover for future needs. Thus, they have low propensity to save as pointed out by Girabi and Mwikaje (2013) since what they earn from agriculture largely ends up covering subsistence needs at the household.

Among the households that were categorised into high level of livelihood sustainability, the participants into sunflower production accounted for 16.9% unlike their counterparts who had 6.5%. This implies that some households with high level of livelihood sustainability had chances to withstand livelihood shocks as it was observed during focus group discussions whereby the members pointed out that some households were able to use the incomes earned from sunflower production to diversify income generating activities by involving themselves with small businesses such as motorcycle (*bodaboda)* and retail shops. Thus, with diversification of household income generating activities they stood better chances for livelihood sustainability.

Table 1: Levels of livelihood sustainability between smallholder farmers' households

Levels - Livelihood Sustainability	Pooled Data (n=368)		Non-Participant (n=155)		Participant (n=213)	
	Freq.	Percent	Freq.	Percent	Freq.	Percent
Poor Sustainability	42	19.7	00	00	42	19.7
Low Sustainability	247	67.1	132	85.2	115	54
Moderate Sustainability	33	8.97	13	8.4	20	9.4
High Sustainability	46	12.5	10	6.5	36	16.9

The observed disparities in the levels of livelihood sustainability were highlighted during an interview with the District Agriculture and Livestock Development Officer (DALDO) as a key informant confirmed that sunflower smallholder farmers were more favoured with weather conditions of Iramba District since sunflower is drought resistant, hence they had better chances of productivity and higher incomes even with drought weather conditions compared to other crops' farmers who highly depends on less resistant crops in some parts of Iramba District. Thus, basing on DALDO's observations, households of participants into sunflower production had higher chances of livelihood sustainability unlike their counterparts who are less favoured with the weather conditions.

Sunflower value chain and livelihood sustainability among households

The study also established the impact of sunflower value chain activities on livelihood sustainability potentials between treated households (sunflower smallholder farmers) and control households (non-sunflower smallholder farmers). The propensity score matching scaled the contribution of the selected covariate against other covariates when establishing the impact on a pre-determined outcome basing on the propensity scores. Based on propensity scores, the ATT was established to capture the average effect of treatment on the treated and control group basing on difference in difference analysis.

The nearest neighbour matching allowed for better causal inference as comparisons made were only between households with similar observed characteristics that resembled each other on unobserved

variables. The findings show that there was a significant contribution of sunflower production on the livelihood sustainability of smallholder farmers. The results presented in Table 2 indicate that there were considerable differences between the treated and control depicted by the average effect of treatment on the treated depicted by the mean differences (MD = 1.394; t = 10.03; p= 0.000). The extent of the mean scores for household of sunflower smallholder farmers (M = 4.910) versus non-sunflower smallholder farmers (M = 3.516) indicates that sunflower had a great contribution on livelihood sustainability among participants households. This was qualified in terms of their ability to sustain household dietary requirements, increase the number of household assets, maintain and increase land owned, cover medical expenses and school fees as the livelihood sustainability requirements.

Table 2: Impact on household livelihood sustainability using propensities

Variable	Sample	Treated	Control	Difference	S.E	T-Stat
Livelihood Sustainability	Unmatched	4.910	3.892	1.018	0.758	1.34
	ATT	4.910	3.516	1.394	0.199	6.98

Summary for pstest LSS: t=6.15; p=0.000; V(C)/V(T)=4.72 if variance ratio outside (0.76; 1.31)

$$\text{Eta Squared} = \frac{t^2}{t^2 + (n1 + n2 - 2)} \quad \text{..... (3) (Cohen, 1988)}$$

Where:

t = t test score; n1= sample size of participant; and n2 = sample size of non-participant

$$\textit{eta squared} = \frac{(6.15)^2}{(6.15)^2 + (155 + 213 - 2)} \qquad \text{0.09 effect size (moderate)}$$

Nonetheless, the magnitude of the differences in the means (mean difference = 1.394) was found to be moderate between treated and control households basing on the eta squared statistics (0.09[1]). Although there was a moderate magnitude of the differences in compared groups, significant difference exists in the diversity of livelihood sustainability status as shown earlier in Table 2 where more households of sunflower smallholder farmers had higher levels of livelihood sustainability compared to their counterparts. Through an interview, a Village Executive Officer (VEO) pointed out that:

> *"...sunflower farmers have better chances for livelihood sustainability compared to their counterparts...unlike others they have bought improved farming equipments which increases their productivity but also they have more small businesses such as selling sunflower oil, selling sunflower seed cake and retails shops for household products which enables them to have diversified sources of income for sustainable livelihoods..."*

CONCLUSION AND RECOMMENDATIONS

Based on counterfactual approach, the comparison of control and treated groups shows that sunflower value chain activities play an important role towards higher chances of livelihood sustainability. The treated group (sunflower smallholder farmers) attained higher levels of livelihood sustainability compared to their counterparts (control group). Sunflower value chain activities were considered to be among the highest income generating unlike other crops value chain activities due to the high demand.

[1] The interpretations of eta squared value based on the guidelines proposed by Cohen (1988) that 0.01 = small effect; 0.06 = moderate effect; 0.14 = large effect.

In turn, this enables households engaged in sunflower value chain activities to increase their livelihood sustainability potentials and hedge against livelihood shocks unlike their counterparts. Therefore, it is concluded that sunflower production and the subsequent value chain activities are vital to livelihood and livelihood sustainability potentials among households of smallholder farmers. Provided that there are many households with lower levels of livelihood sustainability, it suggests that these households were not able to withstand livelihood shocks and stresses.

Thus, it is recommended to smallholder farmers that they should consider upgrading the value chain activities through processing sunflower at local level. This can be done collectively (using farmer groups) through accessing small credits from microfinance institutions and acquire the small milling machines to process sunflower for oil and seed cakes at a preliminary level. This would enable households to earn more incomes and increases their potential towards sustaining the achieved livelihood status and increase the livelihood assets for sustenance.

REFERENCES

AGRA (2014), *Africa Agriculture Status Report 2014: Climate Change and Smallholder Agriculture in Sub Saharan Africa*. Nairobi: Alliance for a Green Revolution in Africa.

Arndt, C., Pauw, K. and Thurlow, J. (2012). Biofuels and Economic Development: A Computable General Equilibrium Analysis for Tanzania. *Energy Economics*, 34(6), 1922–1930.

Babbie, E. (2010). *The Practice of Social Research*, Belmont-California: Wadsworth. 577pp.

Beerlandt, H., Uronu, A. and Phlix, G. (2013). *In-depth study of the support to the edible oil value chains in Tanzania*. Mid-term Evaluation SNV programme 2007–2015 Report.

Bryman, A. and Bell E. (2011). *Business Research Methods*. New York: Oxford University Press.

Cohen, J. (1988). *Statistical Power Analysis for the Behavioural Sciences*. Hillsdale: Lawrence Erlbaum Associates.

Delaney, S., Livingston, G. and Schonberger, S. (2011). Right place, right time: Increasing the effectiveness of agricultural development support in Sub-Saharan Africa. *South African Journal of International Affairs*, 18(3), 341-365.

Dehejia, R. and Wahba, S. (2002). Propensity score matching methods for non-experimental causal studies. *The Review of Economics and Statistics*, 84(1), 151–161.

Deloitte (2017). *Tanzania Economic Outlook*. Deloitte and Touche: Dar es Salaam.

DFID (2001). *Sustainable Livelihoods Guidance Sheets*. [http://www.ennonline.net/dfidsustainableliving] site visited on 03/10/2020

Girabi, F. and Mwikaje, A. (2013). Impact of microfinance on smallholder farm productivity in Tanzania: The Case of Iramba District. *Asian Economic and Financial Review*, 3(2), 227-242

Herrmann, R. Nkonya, E. and Faße, A. (2018). Food Value Chain Linkages and Household Food Security in Tanzania. *Food Security*, 10 (4), 827–839.

Imbens, W. and Wooldridge. J. (2009). Recent Developments in the Econometrics of Program Evaluation. *Journal of Economic Literature*, 47 (1), 5-86.

Jeckoniah, J. Mdoe, N.S.Y. and Nombo, C.I. (2013). Mapping Gender Roles and Relations along Onion Value Chain in Tanzania. *International Journal of Asian Social Science* 3(2), 2013: 523-541.

Kawamala, P. (2012). *Twelve Districts Sunflower Value Chain Mini-Survey Report.* Agricultural Seed Agency & Rural Livelihood Development Company.

Kinyondo, A. and Magashi, J. (2017). Enhancing rural livelihoods in Tanzania: A small-holder farmers' perspective.

International Journal of Accounting and Economics Studies, 5 (2), 68-79.

Kissoly, L., Faße, A. and Grote, U. (2017). The Integration of Smallholders in Agricultural Value Chain Activities and Food Security: Evidence from Rural Tanzania. *Food Security*, 9 (4), 1219–1235.

Kolb, S. (2012). Grounded Theory and the Constant Comparative Method: Valid Research Strategies for Educators. *Journal of Emerging Trends in Educational Research and Policy Studies*, 3 (1), 83-86.

Lubungu, M., Burke, W., and Sitko, N. (2014). *Analysis of the Sunflower ValueChain in Zambia's Eastern Province*, Working Paper 85. IAPRI, Lusaka.

McArthur, J.W. and McCord, G.C. (2017). Fertilizing Growth: Agricultural Inputs and their Effects on Economic Development. *Journal of Developmental Economics*, 127, 133–152.

Mchopa, A. D., and Jeckoniah, J. N. (2018). Socio-economic Factors influencing Livelihood Outcomes Sustainability among Households of Sunflower Smallholder Farmers in Iramba District Tanzania. *Journal of Co-operative and Business Studies*, 3(2), 40-55.

Mgeni, C., Müller, K. and Sieber, S. (2019). Sunflower Value Chain Enhancements for the Rural Economy in Tanzania: A Village Computable General Equilibrium-CGE Approach, *Sustainability* 11(75), 1-22.

Mvurungu, E., Nombo, C., Mvena, Z., Ngetti, M., Kilima, F., Coles, C. and Akyoo, A. (2014). Milk Value Chain, Gender Equity and Poverty Alleviation in Tanzania, *Journal of Continuing Education and Extension*, 5(2), 476-491.

NEPAD (2013). *African agriculture, transformation and outlook*. Johannesburg: New Partnership for African Development.

Nerman, M. (2015), Households' Income-generating Activities and Marginal Returns to Labour in Rural Tanzania. *Journal of African Economies*, 24 (3), 367–389.

OECD/FAO (2016). *Agriculture in Sub-Saharan Africa: Prospects and challenges for the next decade*. OECD-FAO Agricultural Outlook 2016-2025, Paris: OECD Publishing.

Rahman, S. and Akter, S. (2010). Determinants of Household Livelihood Security in Poor Urban Settlements in Bangladesh. Natural Resource, Agricultural Resources and Food Security. *International Working Paper Series 10(1).*

Rapsomanikis, G. (2015). *The economic lives of smallholder farmers: An analysis based on household data from nine countries.* Roma: Food and Agriculture Organisation.

Ravallion, M. (2003). *Assessing the poverty impact of an assigned Program.* The Impact of economic policy on poverty and income distribution: Evaluation techniques and tools edited by Pereira da Silva, L. and Bourguignon, T. World Bank: Washington D.C. Chapter 5: 1-17pp.

Salisali, B. (2012). *Sunflower Sector Project Implementation Brief 2006-2012*. Rural Livelihood Development Programme, Dodoma.

Sebyiga, B. (2020). Sunflower Production and its Potential for Improving Income of Smallholder Producers in the Tanzania. *Local Administration Journal*, 13(3), 223 – 234.

Sosina, B., Espen, V. and Kinyondo, A. (2018). *Can Smallholders Benefit from the New Market Opportunities from the Extractive Industry in Tanzania*? CMI Report Number 8, May 2018. Bergen-Norway: Chr. Michelsen Institute.

Stuart, E. A. (2010). Matching Methods for Causal Inference: A Review and a Look Forward. *Statistical Science*, 25(1), 1–21.

TEOSA (2012). *Assessment of the Potential of Edible Oilseeds Produced in Tanzania: The Case of Sunflower and Sesame.* TEOSA, Dodoma.

Thompson, H., Berrang-Ford, L., and Ford, J. (2010). Climate change and Food Security in Sub-Saharan Africa: A Systematic Literature Review. *Sustainability, 2*(8), 2719-2733.

UNCTAD (2015). *The role of smallholder farmers in sustainable commodities production and trade*. Geneva: United Nations Conference on Trade and Development.

URT (2016). *Iramba District Profile – Agricultural Sector*. Kiomboi: District Secretariat.

World Bank (2013). *Growing Africa: Unlocking the Potential of Agribusiness*. Washington: The World Bank Group.