Technology and Investment, 2023, 14, 189-219
https://www.scirp.org/journal/ti
ISSN Online: 2150-4067
ISSN Print: 2150-4059

Factors Influencing Change of Smallholder Organic Horticultural Farmer Organisations under Nongovernmental Organisations in Two Selected Regions in Tanzania

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How to cite this paper: Mmari, U. W., Mahonge, C. P., & Malisa, E. T. (2023). Factors Influencing Change of Smallholder Organic Horticultural Farmer Organisations under Nongovernmental Organisations in Two Selected Regions in Tanzania. *Technology and Investment, 14,* 189-219.
https://doi.org/10.4236/ti.2023.144012

Received: July 6, 2023
Accepted: September 2, 2023
Published: September 5, 2023

Abstract

There has been the persistent failure of organic horticultural production to meet its full potential in various aspects including productivity, technological and marketing areas in various Sub Saharan countries in Africa including Tanzania. Thus, this study intended to determine whether a change of Smallholder Organic Horticultural Farmer Organisations (SOHFOs) under the local umbrella Non-governmental Organisations (NGOs)with the mandate to work within the country in coordinating SOHFOs is influenced by relational factors (their networks with other Organic Horticultural Value Chain Actors (OHVCAs)) or non-relational (other) factors. The study was conducted in Morogoro and Kilimanjaro regions in Tanzania. A study included a total of one hundred fifty nine organizations (159) that were represented with three hundred fifty one (351) respondents. From one hundred and forty nine (149) SOHFOs under local umbrella NGOs selected by simple random sampling technique and further proportionate random sampling, quantitative data were collected from two hundred and eighty nine (289) respondents and qualitative data were collected from forty four (44) SOHFOs participants. Moreover, from ten (10) managing organisations represented by eighteen (18) Key Informants qualitative data were collected. Quantitative data (relational data) were analysed using the social network analysis approach using Ghephi 0.9.2 software. For non-relational data, Statistical Packages for Social Science (SPSS) version 21 was used whereby descriptive statistics such as measures of centralities (that is closeness centralities (CCs) and betweenness centralities (BCs)) and mean scores were used to establish some of the vari-

ables of the study. Binary logistic regression model was used to predict the factors influencing change (which is regarded as use of manure) at SOHFOs under local umbrella NGOs. Qualitative data were analysed using content analysis. Results from binary logistic regression model and content analysis indicate that SOHFOs under local umbrella NGOs are experiencing change in technological area whereby, soil erosion control measures are the most used technological practice as opposed to the use of organic manure. Again, the results on predictor factors for use of manure at SOHFOs under local umbrella NGOs indicate that relational factors; that is capacity of SOHFO to access and disseminate knowledge and information to other SOHFOs and to access and spread organic horticultural products and farm inputs to other OHVCAs are the significant factors over individual organisational attribute of SOHFOs under the local umbrella NGOs in Tanzania. The study recommends policies and systems that put emphasis on relational measures for more effective organic horticultural agriculture via SOHFOs under the local umbrella NGOs in Tanzania.

Keywords

Relational Factors, Non-Relational Factors, Smallholder Organic Horticultural Farmer Organisations, Organisational Change, Non-Governmental Organisations, Networks of SOHFOs

1. Introduction

In the contemporary world, Organisational Change (OC) has become a popular term in the operations of various organisations. OC has continued to be an inevitable component of the survival and progress of various organisations (Haveman, 1992). This study borrows the meaning of OC from Booth (1994); Cross et al. (2007) and Ogochi (2018) who define OC as a process by which an organisation intentionally redirects or reorients its core patterns of actions and any of its key areas to meet a newly defined set of strategies and goals. In this light, in various parts of the world including Least Developing Countries (LDCs), Smallholder Organic Horticultural Farmer Organisations (SOHFOs) have been a widespread phenomenon for initiating and hastening change in the face of emerging organic agriculture (Bliss et al., 2018).

Organic agriculture is an emphasized phenomenon since it promotes sustainability and enhances the health of soil, plants, animals and humans. While accomplishing this, organic agriculture works properly with ecological systems, ensures fairness concerning the common environment and life opportunities and considers current and future generations (FAO, 2014; FAO and Technologies and Practices for Smallholder Farmers (TECA), 2015; IFOAM Organics International, 2020). Farmer Organisations (FOs) including Smallholder Organic Horticultural Farmer Organizations (SOHFOs) are crucial hubs for knowledge and other services that can have a positive impact on farmers' yields, crop productiv-

ity, agricultural systems and marketing access (including technological change) (Wennink et al., 2007; Tolno et al., 2015; Aku et al., 2018; Bliss et al., 2018). One reason for such an impact is the ability of FOs to network with numerous stakeholders for the exchange of various resources (Wennink & Heemskerk, 2006; Aku et al., 2018). Besides, in the African context, FOs are important institutions in dealing with various context-specific challenges facing farmers (Wortmann-Kolundzija, 2019).

According to Literature (Cross et al., 2013; Glover et al., 2019), OC hinges on organisational networks. For this reason, organisational networks, particularly inter-organisational networks are considered to have led to changes experienced by various organisations in various fields (Srpova, 2003; Matous & Todo, 2017). Likewise, organisational networks have led to changes in agri-food organisations (Lema & Kapange, 2006; Kinder, 2007; Barham & Chitemi, 2009; Latynskiy & Berger 2015). For instance, the history of organic agriculture, movements of organic agriculture in terms of associations started in the 1940s in the United States of America (USA), the United Kingdom (UK) and New Zealand (Kristiansen & Merfield, 2006). Furthermore, in 1972, the global network of International Federation of Organic Agriculture Movement (IFOAM) was launched. In Africa, IFOAM Africa was launched in 2005 and later reformed into African Organic Network (AFRONET) in 2012 (Wagala, 2005; Arbenz, 2018; Gama, 2018). In the 1980s various countries worldwide including Africa witnessed a remarkable and rapid growth of organic agriculture (Kristiansen & Merfield, 2006; Stolze & Lampkin, 2009). These networks are aimed at leading, strengthening and supporting collaborations of various stakeholders in the organic sector at regional, national and local levels to uphold the organic sector including SOHFOs (Wagala, 2005; Schwindenhammer, 2017; Gama, 2018; Rehber et al., 2018). In the same spirit, the networks worked on improving productivity, profitability, and organic trade development amongst organic farmers via various projects including Organic Trade Development in East Africa (OTEA) in 2017 (Anobah, 2000; Gama, 2018). In the same vein, in the 1980s various countries worldwide including Africa witnessed a remarkable and rapid growth of organic agriculture (Kristiansen & Merfield, 2006; Stolze & Lampkin, 2009).

In Tanzania, Organic Agriculture can be traced back to 1896 with the discovery of the first organic garden at Peramiho in Southern Tanzania (Taylor, 2006). This kind of agriculture was further practised up to the 1950s. However, it was in the 2000s, that the horticulture sub-sector with organic orientation achieved rapid growth averaging 9 - 12 per cent growth per annum (Taylor, 2006; HODECT, 2010; URT & Kingdom of Netherlands, 2017b). While in various countries several governmental and non-governmental actors were on the front line in establishing the organic sector, particularly for smallholder farmers (Adebiyi, 2014), in Tanzania, NGOs as part of non-governmental actors have been recognized as key players in organic based horticulture sub-sector (Taylor, 2006; Mella et al., 2007). The support from governmental and nongovernmental actors to Small-

holder Farmer Organisations (SFOs) in issues related to crop productivity, agricultural systems and marketing access was crucial since smallholder farmers with less than three hectares dominate the agricultural sector in Tanzania by 80 per cent (Mashindano et al., 2013). Similar statistics are expected to apply to even smallholder organic horticultural farmers.

It should be noted that horticultural production involves production of fruits, vegetables, spices and herbs (URT & Kingdom of Netherlands, 2017a). In Tanzania, the production is dealing more with vegetables and fruits. Even though organic horticultural production is wide-spreading, the production of organic products is not growing as fast as it should. Statistics show that the land coverage for organic horticultural products particularly tropical and sub-tropical fruits and vegetables worldwide has continued to increase from 40,500 ha to 105,253 ha in 2004 and to 374,769 ha and 353,577 ha in 2015. However, comparing Tanzania with other East African countries particularly Kenya, while Kenya in 2015 was among the largest organic fruit producers with 88,516 ha, Tanzania organic fruit production was insignificant (Willer et al., 2017). Similarly, in 2017, Tanzania had low land coverage of 6063 ha for organic tropical and subtropical fruits compared to Kenya which had land coverage of 19,238 ha (Lernoud & Willer, 2019). Subsequently, the unimpressive production of horticultural production (whether organic or inorganic) is associated with poor coordination of various organisations including SOHFOs and other factors in the organic sector in the country (URT, 2006; HODECT, 2010; URT, 2013; Africa Union, 2015; URT & Kingdom of Netherlands, 2017a).

Under such circumstances, there is an ongoing debate on whether individual organisation's attributes are less important compared to the nature of relationships it has with other actors in the sector resulting in reasonable conditions for the SFO to achieve predetermined goals (Wasserman & Faust, 1994; Knoke & Yang, 2008; Giuffre, 2013). Despite the ongoing debate, few studies have looked at the influence of networking on the change of SFOs in Tanzania. For instance, studies done by Kavia (2016) and Brüntrup (2018) on SFOs in organic and inorganic products (i.e. sugar cane, rice and tea) in Tanzania, argued on influence of networking (collaborative efforts) of SFOs to various actors in their performance. The studies are extensively focusing on use of numerous ways in positioning smallholder farmers via SFOs in various collaboration arrangements with processors and manufacturing companies; and their intermediary associations including Nucleus Out growers Schemes (NOSs)arrangements for their enhanced productivity. In the presence of smallholder farmers with limited capacities to meet technological, financial and marketing needs (Ton, 2013; Mayala & Bamanyisa, 2018), studies to SOHFOs under local umbrella NGOs who are more marginalized are paramount.

1.1. Objectives of the Study

The present study was set to find out the determinants on change on SOHFOs

under local umbrella NGOs in two selected regions in Tanzania. Specifically, the objectives of this study are

1) Examining the change found in the SOHFOs under local umbrella NGOs in two selected regions in Tanzania.

2) Determining whether the change observed in SOHFOs results from the networks of SOHFOs under local umbrella NGOs with other OHVCAs or from other factors.

1.2. Rationale of the Study

The study potentially identifies the progress made by SOHFOs under the local umbrella NGOs, the pitfalls and what influence such changes for smooth and informed operations of various stakeholders in the organic horticultural sector in Tanzania. This manuscript is divided into four main parts namely introduction, methodology, results and discussion, and conclusion. The first part introduces the study by clarifying the historical background of the study problem, its intensity, magnitude and the rationale of undertaking such study. Furthermore, via literature review, it introduces the main theories guiding the study and how these theories and other basic concepts constitute the framework of the study. The second part describes the study methodology, that is, how the study was generally undertaken. The third part shows the key results of the study in relation to the problem studied and finally the last part presents, in a nutshell, the key findings and recommends the way forward.

1.3. Theoretical Framework

This study used numerous theories drawn from sociological theories (theoretical triangulation). The study used the social network theory (SNT), complemented by resource dependency theory (RDT) and organisational development theory (ODT). The SNT was founded by Barnes (1954) whose main tenet is that individual actors are not as important as relationships with other actors in the network (Wasserman & Faust, 1994; Giuffre, 2013). Amongst the common areas, the theory used to measure includes the consequences of social relations in terms of structural relations among actors (Wasserman & Faust, 1994; Knoke & Yang, 2008). The theory was used in the current study to understand the consequences of the networking or individual related factors influencing the outcomes on SOHFOs under the local umbrella NGOs in Tanzania. Despite the importance of the theory to the study, the theory has some weaknesses. One of such weakness is its disregard of the contribution of an individual agency in influencing the outcomes amongst SOHFOs. This weakness has recently been addressed by including attributes of an individual in the determining what influences the outcomes of any network.

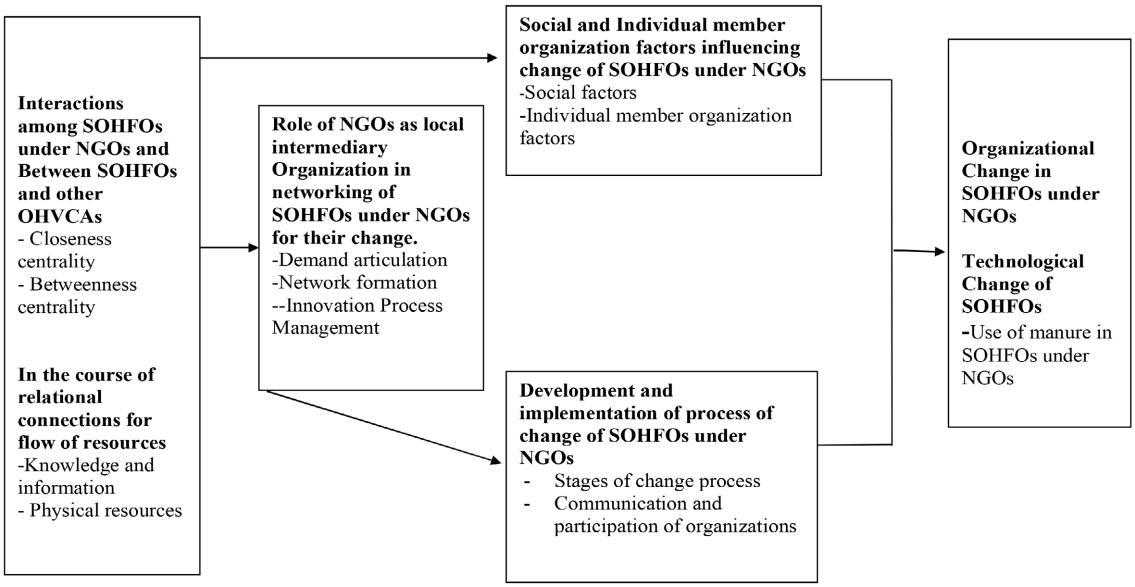
Another theory used in the study (i.e., RDT) is anchored on the hypothesis that no organisation is self-sufficient, therefore all organisations must engage in the exchange which creates interdependence between them (Scott, 1992). This infers

that the context in which an organisation operates reflects its structure and behaviour (Pfeffer & Salancik, 1978). The theory emphasises on the management of demands by the intermediary organisations by creating a supportive institutional environment and resources upon which the interest groups are dependent (Pfeffer & Salancik, 1978). The theory was used to examine the influence of local NGOs as intermediary organisations in controlling and directing resources in the process of change of SOHFOs under local umbrella NGOs for their OC.

Following the observation on social network trajectory, the last theory that complimented the study is Organizational Development Theory (ODT), the theory considers OC as a planned change in an organisation through the application of behavioural science. The theory emphasises on human influence on the change process of an organisation (Rhydderch et al., 2004). The ODT theory focuses on the clarifications of the components of change process (stages in the change process, participation and communication) and the way they can influence change of SOHFOs under local umbrella NGOs. The theory was used to determine the influence of SOHFOs processes on their change.

1.4. The Conceptual Framework

The conceptual framework (as shown in **Figure 1**) built from the foregoing theories indicates the relationship between OC in SOHFOs as the dependent variable. The OC is influenced directly or indirectly by factors related to networking of SOHFOs, the role of local umbrella NGOs as intermediary organisations, development and implementation of the change process in SOHFOs, social and individual member organisational factors as shown in **Figure 1**. The OC is a comprehensive concept, resulting from a new way of using the prevailing



SOURCE: Researcher through Literature review, 2019.

Figure 1. Conceptual framework for determining factors influencing change of smallholder organic horticultural farmer organisations under non-governmental organisations in two selected regions in Tanzania.

or new knowledge (Bolisani & Bratianu, 2018; Ogochi, 2018). It covers various forms including changes in procedures, rules, regulations, structures, technology, and diversification of products or economic elements (Haveman, 1992; Kanji & Moura, 2003; Lycke, 2003). Despite the various aforementioned forms of change, this study has mainly focused on technological change. This is because this is the form of change that could be captured in the field from the SOHFOs. This study considers innovation synonymous with change (Tereso et al., 2012). A similar observation is made by Haveman (1992) who looks at OC in the savings and loan industry in California focusing on technological change among other things. In the work by Haveman (Ibid), the terms change and innovation are used interchangeably. Technological change in the context of this study (organic farming systems) involves a change in technological processes, products (artefacts and tools) (Tereso et al., 2012; Glover et al., 2019). Yet, this study focuses on technological change in terms of practices of organic agriculture adopted since this is the area mainly implemented by the selected NGOs. Technological change in terms of organic practices can involve restricting activities including the use of synthetic fertilizers and chemical pesticides and emphasizing activities such as the use of organic seeds or locally adapted varieties, the use of measures of improving soil fertility (via crop rotation, organic manure and erosion control) and pest and weed control (via mechanical, biological and thermic measures) (Meemken & Qaim, 2018). Nevertheless, this study focuses on evaluated processes (i.e., the use of organic manure and soil erosion control measures) in both NGOs in 2018.

Similarly, changes in FOs including SOHFOs depend on complex social dynamics including networking among SOHFOs for exchanging knowledge and information; and physical resources so as to apply the introduced technology (Asem-bansah, 2012; Glover et al., 2019). It should be noted that the networks were in terms of normalized closeness centralities (NCCs) and normalized betweenness centralities (NBCs) and degree centralities (DCs). Before using the terms "normalized", it is better to introduce the meaning of betweenness centralities (BCs) and closeness centralities (CCs). BC regards to measurement of the potential of an actor to coordinate resources in the network by bridging them along the shortest path in terms of number of edges (links) in connecting two other nodes (Borgatti et al., 2018). In this study, it implies the capacity of SOHFOs and other OHVCAs to bridge knowledge and information; and physical resources quickly to other actors. For the case of CC, it is a measure on how close an actor is to other actors in the network and how long it will take to transfer any resource from one to other actors (Borgatti et al., 2018), indicating independence and efficiency (Freeman, 1979). In this study, CC imply the capacity of SOHFOs to disseminate and receive knowledge and information; and spread and receive physical resources quickly.

Based on the arguments made by Landherr et al. (2010); Eboli (2019) and Borgatti and Everetti (2020) on the complexity of defining centrality this study has used the dimension which recognize the combination of (flow outcome per-

spective and induced outcome perspective) that is endogenous i.e. flow outcome perspective which involve structural measures of centralities of a node; and exogenous i.e. induced outcome perspective which involves centralities established based on the qualities of the node beyond the network structure Borgatti & Everreti (2020). From such circumstance NBCs, NCCs were used to establish influence of structural properties of SOHFOs under local umbrella NGOs and other OHVCAs in the face of various positions and stages of OHVC.

Again, a broader perspective in terms of the network context of SOHFOs is an intermediate variable in this study. According to scholars (Goni, 1999; Van Der Meer, 2006; Fischer & Qaim, 2011; Melano et al., 2015) numerous factors can influence change in SOHFOs (in terms of enhancing or restraining). The social factors i.e. the availability of social services including access to water and road (Van Der Meer, 2006; Latynskiy & Berger 2015). Individual organisation factors include careful mainstreaming of gender particularly women in SOHFOs (Cook & Burress, 2009; Manchon & Macleod, 2010; Nipplerd, 2012; Wijers, 2019), the duration of SOHFO within local umbrella NGOs and the type of NO that supports SOHFO (Garnevska et al., 2011). Others are the process of change (i.e. communication of intermediary organisation and SOHFOs, participation of SOHFOs and stages in the process of change of SOHFOs) (Goni, 1999; Rhydderch et al., 2004; Nielsen & Randall, 2012). In the context of this study where NGOs are key OHVCAs and therefore play key roles, they influence the change process of SOHFOs. Thus, role of NGOs as intermediary organisations (key OHVCAs) in the change process of SOHFOs under local umbrella NGOs for their OC (i.e. demand articulation, network formation and network management function of NGOs) is another important variable (Garnevska et al., 2011).

Generally, when categorizing the factors influencing change of SOHFOs under local umbrella NGOs, relational factors refers to networking of SOHFOs (with themselves and with other organisations) and role of NGOs as intermediary organisations factors. Other factors that are the process of change, social factors and individual organisational factors are regarded as non-relational factors in a sense that the factors are not primarily interlinking the SOHFOs under local umbrella NGOs with actors for obtaining the resources for their immediate change, rather they act as important attributes (change management aspects) during the implementation of change.

2. Methodology

2.1. Study Area

The study was conducted in Morogoro and Kilimanjaro Regions. The regions were purposively selected because they are among the leading regions in the production of horticultural products (URT & the Kingdom of Netherlands, 2017a; Mayala & Bamanyisa, 2018). In these regions, the two NGOs include NO X in Morogoro and NO Y in Kilimanjaro are working as local umbrella organisations for SOHFOs. The NGOs were amongst the key players in establishing

and strengthening organic agriculture in Tanzania. Among other things, they introduced organic farming technology and boosting organic farmers' economic situation (Taylor, 2006; Mella et al., 2007). Also, NO X and NO Y are actively networking with SOHFOs in their regions and have a strong relationship with TOAM (Singo, S. Personal Communication, 2018). Furthermore, their years of establishment are different (NO X was established in 2011 and NO Y in 2004 years respectively). These consequently can influence the OC of their SOHFOs.

2.2. Materials and Methods

The study employed a mixed design which was informed by social network analysis approach. Social network analysis gives room for quantification of networks and at the same time allows analyses of their impacts (Borgatti et al., 2018). Again, the design allowed the researcher to collect data employing quantitative as well as qualitative data collection methods concurrently (at a single study at the same time). This was done to supplementing data i.e. informing one method by adding data due to failure of the previous administered data collection method to capture the intended matter of inquiry. Furthermore, by one method complementing data i.e. add on the richness and complexity of the matter of the inquiry to the other in terms of data produced (Bryman, 2006; Bryman 2016). In a nutshell this can be known as triangulation of the data (Creswell & Clark, 2017).

It is worth noting that from sampling techniques, probability sampling procedure namely simple random sampling technique was employed to select 167 SOHFOs from local umbrella NGOs that is NGO X and NO Y. The sample for SOHFOs was determined by Yamane formula (1967). The population consisted of 79 SOHFOs from the former and 207 SOHFOs from the latter respectively.

Yamane's formula is

$$n = N/1 + N(e)^2 .$$

where: n is the sample size;

N is the estimated number of SOHFOs in the two selected NGOs;

e = level of estimation $(0.05)^2$.

Therefore $n = N/1 + N(e)^2 = 286/1 + 286(0.05)^2 = 166.764 = 167$ SOHFOs.

Proportionate random sampling was used to ensure the proportionality of the sample (Hansen et al., 1953). This is because while NGO Y operations in terms of offices are scattered in four various districts; NGO X operations in terms of offices are all managed in Morogoro Urban only. The formula is as follows: $a = n/N^* b$ where: a is the sample size for each point in the NGOs (as shown in **Table 1**), n is the number of SOHFOs found in a single point of NGOs, N is the number of SOHFOs found in five points in NGOs and b is the target (sampled) SOHFOs in all points in the two selected NGOs.

Based on the formula used, the required sample of SOHFOs under local umbrella NGOs was 167. Besides, this study selected only 149 SOHFOs since change observations were taken from all 46 SOHFOs at organization X and only 103

Table 1. Sample of selected smallholder organic horticultural farmer organizations s at each point in two nongovernmental organizations.

NO	Total SOHFOs (N)	Sampled SOHFOs	% of the total sample
NO X	79	79/286 * 167 = 46	27.6
NO Y Point A	82	82/286 * 167 = 48	28.7
NO Y Point B	82	82/286 * 167 = 48	28.7
NO Y Point C	21	21/286 * 167 = 12	7.2
NO Y Point D	22	22/286 * 167 = 13	7.8
Total	**286**	**167**	**100**

Source: Researcher contemplation, 2019.

SOHFOs at organization Y that were included in the evaluation season of 2018. These 149 SOHFOs were represented by 289 respondents from whom data were collected using structured interview method. Other methods used for data collection in this study are documentary review, semi structured interviews (whereby key informants were interviewed) and focus group discussions (FGDs). These data collection methods were triangulated (Bryman, 2004; Bryman, 2006; Bryman, 2012) to generate comprehensive data that are credible. Furthermore, in the efforts of increasing the validity of the data obtained, data were coded, cleaned and edited. The criteria for selection of respondents included in the structured interview were experience and leadership in SOHFOs. These representatives provided information on quantitative primary data particularly on a change and various factors influencing it in SOHFOs.

FGDs and KIIs were used to collect qualitative data. In FGDs, a total of 44 knowledgeable representatives in SOHFOs matters were used in about 6 FGDs (each with participants ranging from six to eight). Similarly, 18 key informants (KIs) from 10 managing (key organisations with mandatory in facilitating the organic farming in SOHFOs). The organisations were purposely selected due to their role in managing SOHFOs endeavours were purposely selected. These are TOAM, NO X, NO Y and 7 various District Councils in Morogoro and Kilimanjaro. This makes a total of 159 organisations that were represented by 351 respondents.

The qualitative data were collected using a checklist of questions. The quantitative primary data were collected using a structured questionnaire with both open and closed-ended questions. To facilitate provision of relevant data from questionnaires, phone interview was used whereby the respondents were allowed to communicate with other SOHFOs' members during the interview. More so, communication between researcher and respondents continued even after the scheduled time of interview in the initiatives of obtaining relevant data (this was done almost for three months after first nterview day). This way the missing cases were addressed. The collected quantitative non-relational primary data were analysed using the statistical package for social science (SPSS) version 21,

whereas quantitative relational data were analysed using Gephi 0.92 software. Measures mainly determined were closeness centralities and betweenness centralities of SOHFOs studied. Others are means, standard deviations, maximums and t-tests of use of organic practices used mainly soil erosion control measures and use of manure. **Appendices 1** and **2** show only the main variable of the study.

In determining the factors influencing change of SOHFOs in Morogoro and Kilimanjaro regions, the inferential statistics i.e. the binary logistic regression model was chosen to predict the likelihood of SOHFOs using organic manure. This was done since use of manure can also act as a way of reducing and mitigating soil erosion. In the model, the use of manure at SOHFOs was associated with some attributes of the SOHFOs. The model was chosen because it accepts a mixture of continuous and categorical independent variables; and for the current study, the dependent variable was categorical (0 = non-users of organic manure and 1 = users of organic manure).

The prediction was led by the following binary logistic model:

$$Lg\left(P/1-P\right)=\beta_0+\beta_1x_1+\beta_2x_2+\beta_3\ x_3+\cdots\beta_nx_n+\varepsilon_i \quad (1)$$

where P = SOHFOs use of organic manure (1 = use of organic manure 0 = does not use organic manure) 1 – P = SOHFOs use of organic manure; x_1-x_9 = Explanatory relational (the role of local umbrella NGOs as intermediary organisations, the networking among SOHFOs and between SOHFOs and other actors in the OHVC) and non-relational (individual organisation, social and change process in SOHFOs) predictor variables as shown in **Table 2**.

Network data used in the binary logistic regression model were both from flow outcome perspective and induced outcome perspective (Borgatti & Everetti, 2020). In other words, they both dealt with the position of SOHFO under local umbrella NO and other OHVCAs in the network based on edges (links) they had and their other attributes beyond their position in the social networks. The data used on the model were expressed in terms of closeness and betweenness centralities as shown in **Table 2**.

Data on the role of intermediary organisation to SOHFOs under local umbrella NGOs and change process of SOHFOs under NGOs for their OC were analysed using summated index score; whereby overall mean scores from statements were used in the model. Data on individual organisation factors i.e. duration of SOHFO within local umbrella NO, type of sex of apex leaders of SOHFOs total number of members in the SOHFOs and NO that deals with SOHFOs were also entered in the model.

Again, content analysis through development of themes was used (Vaismoradi et al., 2016). In theme development; data were transcribed, coded (putting texts and phrases into relevant categories) and examined to find meaningful textual strings (relating themes) to established knowledge (Bryman, 2016; Vaismoradi et al., 2016). Content analysis was used with the aim of complementing (use data to increase richness and complexity of the matter of the inquiry) (Bryman, 2006; Bryman, 2016).

Table 2. Operationalization of relational, individual and social variables for use of organic manure.

SN	Explanatory variable	Measurement	Expected Sign	Description	Comment
1	Duration of SOHFO within local umbrella NO	Continuous	+	The highest years of experience SOHFO has within local umbrella NO	The more the experience the more the ability to sell organic horticultural products
2	Type of sex of apex leaders of SOHFOs	Dummy	-	1; if Male 0; if Female	Female involvement the more the chance of a change at SOHFOs
3	Total number of members in the SOHFOs	Continuous	+	Total number of members in SOHFOs	The greater the number the more chance of a change at SOHFOs
4	Closeness centrality of SOHFOs in knowledge and information flow	Continuous	+	The capacity of SOHFO to access and disseminate knowledge and information	Great capacity increases the chances of change at SOHFOs
5	Betweenness centrality of SOHFOs in Knowledge and Information flow	Continuous	+	The capacity of SOHFO to bridge knowledge and information	Great capacity increases the chances of change at SOHFOs
6	Closeness centrality of SOHFOs in physical resources flow	Continuous	+	The capacity of SOHFOs to access and spread organic horticultural products and farm inputs	Great capacity increases the chances of change at SOHFOs
7	Change process of SOHFOs	Continuous	+	Highest capacity of NGOs to facilitate change to SOHFOS	Great capacity increases the chances of change at SOHFOs
8	The intermediary role of NGOs to SOHFOs	Continuous	+	The capacity of NGOs to intermediate SOHFOs	Great capacity increases the chances of change at SOHFOs
9	NO that deals with SOHFOs	Dummy	-	1 = if NO Y 0 = if NO X	NGOs with more years increases the chance to change of their SOHFOs

Source: Researcher Contemplation, 2019.

2.3. Ethical Considerations

To ensure anonymity of the respondents of this study, alphabetical names were assigned to original names. This was done particularly for NGOs involved in this study and the points at which one NO has introduced its offices.

3. Results and Discussion

3.1. Attributes of Smallholder Organic Horticultural Farmer Organisations' Respondents

As aforementioned, this research was focused on 149 SOHFOs under NGOs, which were represented by 289 respondents that were included in structured interview for provision of quantitative data as shown in Table 3.

Results from Table 3 indicate that amongst respondents, the highest amount 52.9% of the respondents were females. This relatively high number of female respondents shows more commitment of women particularly in organic horticultural production as well as their more participation in farmers' organizations.

Table 3. Characteristics of respondents.

Characteristic of the Respondents	Number of Respondents
Sex of the Respondents	
Males	136 (47.1%)
Females	153 (52.9%)
Total	**289 (100%)**
Title of Respondents	
Chairperson of the SOHFO	66 (22.8%)
Assistant chairperson of the SOHFO	07 (02.4%)
Secretary of the SOHFO	57 (19.7%)
Assistant secretary of the SOHFO	06 (02.1%)
Treasurer of the SOHFO	49 (17.0%)
Discipline leader of SOHFO	10 (03.5%)
Knowledgeable members of the SOHFOs	85 (29.4%)
Facilitator of the SOHFOs	04 (01.3%)
Project leader of the SOHFOs	02 (0.7%)
Chairperson marketing committee	02 (0.7%)
Secretary marketing committee	01 (0.3%)
Total	**289 (99.9) = 100**
Affiliation of the Respondents	
Organization X	112 (38.8%)
Organisation Y	177 (61.2%)
Total	**289 (100%)**

Source: Research findings, 2019.

Furthermore, the findings in Table 3 portray that knowledgeable members of SOHFOs were the highest proportion of participants interviewed. The argument to justify this finding is use of telephone interview (whereby respondents as representatives of their SOHFOs were able to share rich information). However, in the circumstance of inadequate information, they were permitted to ask their counterparts in their SOHFOs via phone interview. Similar experience was done in circumstance where answers were not timely obtained. In this situation the researcher communicated with the respondents to obtain relevant data. Table 3 also indicates more respondents in study from organization Y than in organization X. This implies that while both organizations have active participation in membership within national umbrella organization TOAM, organization Y has more SOHFOs dealing with organic horticultural production particularly vegetables and fruits production.

3.2. Change of Smallholder Organic Horticultural Farmer Organizations under X and Y Non-Governmental Organizations

The meaning of organisation in the context of this study (study of SOHFOs) was borrowed from Greenberg and Baron (1995) who considers an organisation as comprising a structured social system that involves individuals who work together to meet specified goals. These social systems can also be regarded as relational entities with flow of goods and information (Poudel et al., 2015). Since, organisational change involves alteration of certain patterns of the organisation. The study explored the changes found in SOHFOs under local umbrella NGOs. The results indicate that overall change in SOHFOs under local umbrella NGOs was in technological area. Technological change refers to use of organic agriculture practices.

Technological Change of Smallholder Organic Horticultural Farmer Organizations under X and Y Non-Governmental Organizations

As aforementioned, in this part, technological change was captured by officers of NGOs after being asked about the percentage of farmers in each SOHFO that adopted particular organic practices based on their internal evaluations for the year 2018. The study results were obtained for only two practices for both NGOs. Furthermore, the data were obtained from all 46 SOHFOs at NGO X and only 103 at NOG Y due to the graduation of some of the groups in training from NGO Y and the inclusion of new groups in the study which were not reached during the evaluation season in 2018. The results in Table 4 reveal that the overall mean score of farmers in SOHFOs who practice soil erosion control measures under NGO X and NO Y is 77.2 and 81.1 per cent respectively.

In terms of the use of organic manure, SOHFOs practices by 75.0 and 60.7 per cent under NO X and Y respectively. In comparing the means, in terms of the use of organic manure has a significant difference at NO X and NO Y with the t statistic of 3.489 (p = 0.001). The findings suggest SOHFOs under the local umbrella NGOs have experienced change in their use of agricultural practices.

Table 4. Used Organic Practices in Smallholder Organic Horticultural Farmer Organizations under Local Umbrella Non-governmental Organizations in 2018.

Organic Practices	Organic Practices of SOHFOs under NO X		Organic Practices of SOHFOs under NO Y		p-value of t-statistic	
	Mean	SD	Mean	SD	t-statistic	p-value
Soil erosion control	77.28	16.37	81.18	28.38	−1.055	0.293**
Organic manure	75.02	16.04	60.66	34.18	3.489	0.001*
Observations	46		103			

* and ** indicate levels of significance at 5%; 0.05 and above are significant and below 0.05 are slightly significant. Source: Research findings, 2019.

Amongst agricultural practices, soil erosion control measures including double digging and the use of contours and terraces were preferred by SOHFOs under the local umbrella NGOs compared to the use of organic manure.

Despite that double digging can include the use of manure, the NGOs evaluate the practices separately. Furthermore, though the use of the aforementioned practices by farmers in SOHFOs under local umbrella NGOs was observed, there were some farmers who did not use these practices properly as the evaluation results of NGOs indicate. Contrary to Meemken and Qaim (2018), although SOHFOs in NGOs seem to use more practices of organic agriculture (including the use of organic seeds or locally adapted varieties), measures to improve soil fertility (via crop rotation, organic manure and erosion control) and pest and weed control (via mechanical, biological and thermic measures), their emphasis is on the two soil fertility improving practices in **Table 4** which were evaluated in both NGOs in the time of the study. This is also evidenced by the FGD results, *(FGD, October 2019)* the FGD members said:

> "One cause that influences the level of the use of organic agriculture practices in our SOHFOs is incoming and outcoming members in the SOHFO".

3.3. Factors Influencing Change of Smallholder Organic Horticultural Farmer Organizations under Nongovernmental Organizations X and Y

In this work, technological change particularly use of manure was used as proxy of change in SOHFOs under local umbrella NGOs. This is because; one of key attributes of organic production is the focus on the health of the soil. The soil health is enhanced by use of organic matter that increases the ability of the soil to absorb water and various important nutrients. In cementing the fact, according to Food and Agriculture Organisation (FAO), the organic manure is mainly act as revolving nutrients fund and agent for conserving soil structure and therefore minimize soil erosion, increase soil humic substance, increase resilience to climate change and reduce emission of greenhouse gas (Bot & Benites, 2005; Gerke, 2022). This section focuses on establishing whether the change in the use of organic manure as overall change in SOHFOs under local umbrella NGOs is related to relational or non-relational factors. The previous section has shown changes that occur in SOHFOs. Despite the fact that there are numerous determinants that are related to the use of manure at SOHFOs, this study focuses on the relationship to some factors at SOHFO's level. The observations used here was for 149 SOHFOs. As earlier said, these are all 46 SOHFOs at NO X and only 103 at NO Y included in the evaluation season of 2018.

Binary logistic regression was used to model the explanatory variables for the use of manure in SOHFOs under the local umbrella NGOs as presented in **Table 5**.

The results show that, among the nine (9) variables, three variables namely, closeness centrality in information and knowledge flow, closeness centrality in

Table 5. Binary Logistic Regression Estimates for Use of Manure by SOHFOs at NO X and NO Y. (n = 46 for NO X and n = 103 for NO Y).

Variables	B	S.E	Waldo	Sig	Exp (B)
Duration of SOHFOs within local umbrella NO	0.065	0.084	0.595	0.440	1.067
Male leaders in SOHFOs	−0.044	0.050	0.792	0.373	0.956
Total members in SOHFOs	−0.029	0.041	0.486	0.486	0.972
Closeness centrality of knowledge and information flow	7.672	3.686	4.332	**0.037***	2147.911
Betweenness centrality of knowledge and information flow	36.488	36.463	1.001	0.317	7,023,575,571,715,698.000
Closeness centrality of physical resources flow	−0.889	0.447	30.964	**0.046***	0.411
Change process	0.323	0.493	0.430	0.512	1.381
Intermediary role	−0.524	0.592	0.784	0.376	0.592
NGOs	−2.694	0.922	8.544	**0.003***	0.068
Constant	1.270	3.090	0.169	0.681	3.562
P	0.000				

Omnibus Tests of Model Coefficients (Chi-square = 32.658; sig. = 0.000); Cox and Snell R Square = 0.197, Hosmer and Lemeshow Test (Chi-square= 3.433; sig. = 0.904); Percentage of Correct prediction 71%; Nagelkerke R Square = 0.281; * and ** indicate levels of significance at 5%; 0.05 and below is significant and abovw 0.05 is slightly significant. Source: Research Findings, 2019.

physical resources flow and the NGO involvement were found to be important predictors of the use of manure in SOHFOs ($p < 0.05$). The findings in Table 5 indicate further that the Hosmer and Lemeshow test predicted well the outcome of the overall model with a significant Chi-square statistic of 3.433, and p-value close to 1 ($p = 0.904$) (Field, 2013). Even though Negelkerke pseudo R^2 statistics which represents the adjusted Cox and Snell Pseudo R^2 statistics was (Cox and Snell R Square = 0.197), denoting that 19.7 per cent of the variance in the use of manure in SOHFOs under the local umbrella NGOs was explained by the independent variables that were entered in the model and the rest (80.3%) could not be explained by variables in the equation, the Omnibus Chi-square was significant ($p = 0.000$). Thus, overall, the model predicted the outcome well with percentage of correct prediction 71% (Gujalati & Porter, 2009). Based on the results, Waldo coefficients are associated with individual independent variables. In Table 5, NGOs involvement is the variable with the maximum wald statistic of 8.544 and statistically significant with p of 0.003 indicating higher contribution of the variable compared to other counterpart variables.

The binary logistic regression results (Table 5) show that closeness centrality in information and knowledge flow significantly influenced SOHFOs chances of using organic manure ($p < 0.05$). The findings reveal further that in a circumstance where SOHFOs have to use organic manure, the odds ratio has to be 7.672. This implies that the SOHFO with great access and dissemination of knowledge and information had 7.672 times the chances of using organic manure. The findings suggest that independent SOHFOs with the capacity of getting knowl-

edge and information on the use of manure are more likely to use it. The findings reflect the prior expectation since the more the SOHFO has the right knowledge and information the more it is able to put knowledge and information into action. The findings are in line with Crawford et al. (2015) who argued on communication between peer groups and facilitation of uptodate organic education to extension students in universities as the ways of enhancing communication and organic agriculture in general.

The findings are also corresponding to FGD results whereby the SOHFOs leaders argues on importance of intermediary organisations' role in provision of knowledge and information on organic practices for horticultural production. They recognized the benefits of trainings, guests, demonstrations, facilitations, field visits and meetings on getting acquainted about various organic agriculture practices including use of manure as one of the key factors for their development. Based on FGD results, *(FGD, October 2019).* The FGD members said:

> "The responsibilities made by intermediary organisation have enabled the formation of the SOHFOs, acquisition of knowledge on organic horticultural agriculture from facilitators, arranged visits to exhibitions and guests from some organisations".

This indicates that the capacity of NGOs to intermediate SOHFOs increases their capacity in using organic practices in their horticultural production. Similar results are reported by Garnevska et al. (2011) and Rwelamila (2015) who reported the significance of non-profit organisations in supporting the development of FOs. This is plausible to be found in SOHFOs under local umbrella NGOs that are mainly covered by this study.

Besides, despite the efforts made by intermediary organisations, challenges encountered by them imply challenges again to SOHFOs. This is supported by the KI interview findings at NO Y where most of SOHFOs are not using the local certification (Participatory Guarantee System) that can capacitate their ability to use organic manure. In an interview with KI from NO Y;

> "It is a fact that most of our SOHFOs have not been certified by local certification (Participatory Guarantee system). The main reason that contributes to this is cost for the process (KII, December 2019)."

The findings reveal again the importance of access to all resources required so as to facilitate the provision of knowledge and information to SOHFOs under local umbrella NGOs. This can imply provision of more accessible organic horticultural production technological information, and affordable certification process so as to increase the potential of SOHFOs under local umbrella NGOs to use organic manure.

The NO involvement (**Table 5**) is another explanatory variable that is significantly associated with SOHFOs likelihood of using organic manure ($p < 0.05$). The findings show that the odd ratio for NGOs involvement was −2.694, implying that SOHFOs at NO X are 2.694 times more likely to use organic manure.

Probably this is because while NO Y was founded earlier, more of its SOHFOs which were studied are in areas with limited water, this led to fewer possibilities of getting sufficient materials for organic manure preparation. This can result in an inefficient use of organic manure.

The findings concur to the FGD results whereby it was argued that social attributes of areas where the SOHFOs are present is another factor that affects organic horticultural agriculture. Based on FGD results *(FGD, October, 2019)* FGD members said:

> "SOHFOs in areas with water availability … are in better chance to increase their horticultural production".

Another FGD results confirmed the same *(FGD, October, 2019)* whereby FGD members said:

> "We…experience difficulty in organic horticultural production due to lack of water in our area… We carry water buckets by our heads for our plants while we are not using synthetic materials".

Apart from water as part of social service, reliable roads are also important factor for SOHFOs under local umbrella NGOs that are found in remote areas. This is in line with the the FGD results *(FGD, December 2019)*, whereby the following was said;

> "SOHFOs are faced with unreliable transport to their products (there are cases of farmers find better to sell their horticultural products at local markets with low price rather than in the far place with high price".

Generally, this indicates that; the SOHFO that were in position to access resources that can perpetuate the use of organic practices and organic agriculture production (including more water availability and reliable roads) could produce more horticultural products. The study findings are is in line with the findings in a study by Van Der Meer (2006) and Latynskiy and Berger (2015) who reported that FOs that are accessing social services including water and roads are in a better position to increase their activities and hence their productivity.

The binary logistic results (**Table 5**) show that closeness centrality in physical resource flows significantly influenced SOHFOs chances of using organic manure ($p < 0.05$). The findings indicate further that the odds ratio for closeness centrality in physical resources flow was −0.889. This indicates that SOHFOs with the capacity to access and spread organic horticultural products and farm inputs were 0.889 less likely to use organic manure. The results are in contrast with the expectation, whereby it was expected that as the capacity of SOHFOs to access and spread organic horticultural products and farm inputs increases, the use of manure could increase. This might suggest that the majority of SOHFOs which have the capacity to access more actors that demand their horticultural products, or obtain various farm inputs they require are scantly use manure (this is the situation mainly found in NGO Y). As earlier said, probably this is accel-

erated by the fact that some of SOHFOs are in areas with scanty water. The findings suggest the significance of presence of key resources in implementation of the projects/programmes.

In indicating the importance of flow of physical resources, FGD results indicate the importance of other resources in general practice of organic horticultural production. Based on FGD results *(FGD, December 2019)* FGD members said that:

> "SOHFOs are scantly provided/lacking some of the physical resources. The physical resources that are scantly provided/lacking are prepared local seeds resources for production of organic pesticides, prepared infrastructures and facilities for packaging and storing horticultural products. This affects production of horticultural products".

The findings again indicate that in SOHFOs, capacity to accessing some other important physical resources is paramount in organic horticultural production and use of manure as one of the significant aspects in organic practices.

Generally, in this study, SNT theory overrides two other theories; that is Organisational Development Theory (ODT) and Resource Dependency Theory (RDT). This is because overall change of smallholder organic horticultural farmer organisations (SOHFOs) under non-governmental organisations (NGOs) in Tanzania which is mainly regarded as use of manure in is basically influenced by (networking factors) their capacity to receive and provide resources (technological knowledge and information, organic horticultural products and farm inputs) to other organic horticultural value chain actors (OHVCAs). Organisational Development Theory (ODT) aspects of human processes in the change process, that is stages of change, communication, participation and clear stages of the model adopted for change seem not to impact the change. This is also the case for and Resource Dependency Theory (RDT) that mainly for management of demands of smallholder organic horticultural farmer organisations (SOHFOs) by non-governmental organisations (NGOs) by scanning, filtering, orchestrating relevant partners for change and managing collaborative efforts in change process. Again, results from content analysis indicate that composition of the total number of members in the smallholder organic horticultural farmer organisations (SOHFOs) under non-governmental organisations (NGOs) affects their change; Despite the results, the findings from binary logistic model indicate that composition of the total number of members in the smallholder organic horticultural farmer organisations (SOHFOs) under non-governmental organisations (NGOs) that vary from almost 15 to 30 seems not to affect their overall change which is mainly regarded as use of manure.

4. Conclusion

The study findings indicate that smallholder organic horticultural farmer organisations (SOHFOs) under the umbrella non-governmental organisations (NGOs) are experiencing remarkable technological changes in terms of using various organic agriculture practices beyond soil erosion control measures and organic

manure as discussed earlier in this work. Based on the findings, soil erosion control measures including double digging, the use of contours and terraces were preferred over the use of organic manure (Double digging include the use of manure. However, in these NGOs they are evaluated differently). Besides, with the change experienced by substantial number of SOHFOs, there is small number of farmers who do not use the practices.

Again, in this study overall change is regarded as technological change that is use of manure. This is due to the fact that organic manure increase soil humic substances, minimizes soil erosion and leads to lower greenhouse gases (Bot & Benites, 2005; Gerke, 2022). Our findings reveal that technological change of SOHFOs under the local umbrella NGOs is influenced by social network theory (SNT). This is because the use of manure in SOHFOs under local umbrella NGOs in Tanzania is mainly influenced by their capacity to receive and provide resources (technological knowledge and information, organic horticultural products and farm inputs) to other OHVCAs. On the other hand, individual SOHFO factors; that include gendered aspect (i.e. whether the leader was a male or female) and total number of members in the SOHFOs (that vary from almost 15 to 30) seem not to affect the change of use of manure. One of the key interests of the study was also to discover if the duration of an NGO since establishment affects the change of their SOHFOs. Referring to this, the findings don't show any significant observation.

Generally, in promoting organic horticultural production the study recommends for the deliberate establishment of strategic networks amongst smallholder organic horticultural farmer organisations (SOHFOs) under nongovernmental organisations (NGOs) and other potential OHVCAs by the responsible ministries. Non-governmental organisations (NGOs) as champions of change and any other responsible change agents require all support from the government in their efforts to mobilise and manage smallholder organic horticultural farmer organisations (SOHFOs) which mostly encompass the marginalized and reside in the most remote areas of the country. When one looks for areas for further studies, this study has dealt with factors influencing change in smallholder organic horticultural farmer organisations (SOHFOs); whereby their networks were accounted for their change. The in-depth analysis of causes for their prevailing networks is not part of the study. More so, in the Social network trajectory, while one of the strength of this study was the use of Social Network Analysis to quantify relationships, whereby Ghephi was the software used, use of R Software in the same analysis (Borgatti et al., 2022) is among the new arenas for contemporary researchers. This study is applicable to all who participate in change management in complex environment (particularly in semiformal organizations) which include multidimensional actors.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Appendix 1: Organization X Normalized Network Values

1D/LABEL	CC in KIR flow at ORGANISATION X	BC in KIR flow at ORGANISATION X	CC in PR flow at ORGANISATION X
UPENDO-KISALAWE	0.421053	0.000300	0.450382
JIUNGENI-KIZIWA	0.522876	0.004894	0.472000
TWAWEZA-TAWA	0.425532	0.027719	0.000000
TUPENDANE-KIFINDIKE	0.425532	0.000328	0.000000
TUSHIKAMANE-KIFULU	0.529801	0.039248	0.000000
JITAHIDI-KILOKA	0.526316	0.018721	0.457364
MWONGOZO-KIMBWALA	0.432432	0.017213	0.000000
MAPAMBANO-LUVENGE	0.421053	0.000247	0.000000
HAPA KAZI-VIANZI	0.423280	0.000247	0.450382
TUSHIKAMANE-KICHANGANI	0.421053	0.000247	0.000000
VIJANA AMKENI-MFUBWE	0.437158	0.023853	0.000000
TUANZENI-MSONGOZI	0.421053	0.000000	0.000000
USAMBITE-MTAMBA	0.427807	0.009511	0.000000
MKOMBOZI-VIANZI	0.423280	0.010076	0.000000
TUSHIKAMANE MENGE-VIANZI	0.432432	0.000000	0.000000
TULAMKE-MTOMBOZI	0.425532	0.000000	0.000000
TWIYAME-MTOMBOZI	0.425532	0.000000	0.000000
NUMBINI VANILA-LUGENI	0.421053	0.000000	0.000000
KIMAMBILA AGRICULTURE-KIMAMBILA	0.439560	0.003683	0.000000
TUMAINI MENGE-VIANZI	0.540541	0.016490	0.000000
MASIMBU STATION-KIMAMBILA	0.446927	0.035269	0.000000
TWENDE PAMOJA-KIMAMBILA	0.547945	0.068200	0.000000
GWAMIKE-DIOVUVA	0.529801	0.015301	0.457364
TWIKINDE-DIOVUVA	0.449438	0.012436	0.000000
UPATACHO-LANGALI	0.547945	0.046895	0.457364
MAENDELEO-RUVUMA	0.444444	0.024986	0.000000
TUTOGOLE-KILOKA	0.432432	0.011164	1.000000
KIVUMA A-KIVUMA	0.519481	0.005442	0.457364
KIVUMA B-KIVUMA	0.423280	0.000000	0.457364
LAMKA MANGALA-LUDEWA	0.529801	0.026096	0.457364
MUUNGANO-KIBUKO	0.516129	0.002457	1.000000
UMOJA NI NGUVU ZAWA-MKUYUNI	0.516129	0.000042	0.457364
VIJANA TUSHIKAMANE-KIBUKO	0.516129	0.000042	0.000000

Continued

UMOJA MAFUMBA-MKUYUNI	0.516129	0.000042	1.000000
UPENDO AMINI-KINOLE	0.516129	0.003383	0.000000
KAZUNDWA KALOLENI-KINOLE	0.512821	0.000030	0.000000
MUUNGANO-MADAMU	0.516129	0.002444	0.000000
TWIYAME-MKUYUNI	0.357143	0.034230	0.457364
JITEGEMEE-LUHOLOLE	0.421053	0.000334	0.000000
TUJIKOMBOE-MFUMBWE	0.459770	0.018503	0.457364
TUGHETSE-LANGALI	0.516129	0.001816	0.450382
TWAWEZA-MINGO	0.516129	0.002002	0.450382
VIJANA BOMBA-KUNGWE	0.516129	0.000042	0.479675
NGUVU KAZI-LUKONDE	0.516129	0.002310	1.000000
MKOMBOZI-BAMBA IMSOWELO	0.519481	0.008345	0.457364
NGUVU KAZI-TULO	0.522876	0.037704	0.457364

Appendix 2: Organization Y Normalized Network Values

1D/ LABEL	CC in KIR flow at ORGANISATION Y	BC in KIR flow at ORGANISATION Y	CC in PR flow at ORGANISATION Y
,OMBENI-KIRUWENI	0.464744	0.000000	0.000000
KIRIMENI-MRIMBO UUWO	0.463259	0.000000	0.800000
KISHINGONI B-MRIMBO UUWO	0.463259	0.000000	0.000000
UUWO KATI-MRIMBO UUWO	0.463259	0.000000	0.000000
SIANGICHA-MRIMBO UUWO	0.464744	0.000000	1.000000
CHINIYO-MRIMBO UUWO	0.463259	0.000000	0.000000
KARANGO B-MAWANJENI	0.463259	0.000000	0.000000
KARANGO A-MAWANJENI	0.463259	0.000000	0.000000
AGAPE-KIMANGARO	0.463259	0.000528	0.666667
NURU-KOKRIE	0.463259	0.007399	1.000000
MSHIKAMANO-LYASONGORO	0.466238	0.019651	0.000000
TUMAINI B-KOKRIE	0.464744	0.000000	1.000000
SAMARIA-KOMAKUNDI	0.466238	0.010030	1.000000
PLANET-LYASONGORO	0.464744	0.000000	1.000000
M.T.G-ARISI	0.466238	0.010030	0.750000
BARAKA-KYALLA	0.463259	0.004602	10.000000
MAWAZI WAMBAA-MBAHE	0.466238	0.010062	0.000000
MESIA-KIRUWENI	0.463259	0.000000	0.000000

Continued

TAWATI-KYALLA	0.463259	0.000000	1.000000
KIRUA-MATALA	0.463259	0.000000	1.000000
TUMUSIFU-MAKUYUNI	0.463259	0.000000	0.000000
JITIHADA-MATALA	0.466238	0.000016	0.750000
MATAMBA-MAWANJENI	0.463259	0.000000	0.000000
SOLIDALE-MATALA	0.464744	0.000000	0.000000
ZAWADI-MATALA	0.464744	0.000000	0.750000
GALILAYA-KISIMANI	0.467742	0.010030	0.000000
KISIMANI A-MASAINI KISIMANI	0.463259	0.000000	00.000000
MATALA-MATALA	0.464744	0.000016	00.000000
KINDOKICHA-MASAINI KISIMANI	0.464744	0.000000	1.000000
UPENDO A-RIATA	0.467742	0.010030	0.666667
KAUNI-MENGENI KITASHI	0.463259	0.000000	1.000000
BAANDE A-MA40MSERA KATI	0.464744	0.000000	0.000000
THUNDANE-MAMSERA KATI	0.463259	00.000000	0.000000
MATUMAINI-MAHIDA NGUDUNI	0.463259	0.004602	0.000000
IRUNDA-MENGENI KITASHA	0.463259	0.002269	0.000000
DUHEKANE-MACHAME ALENI	0.463259	0.004602	0.000000
YERUSALEM-MASHUA	0.464744	0.004602	1.000000
USOFA HAI-MUNGUSHI	0.463259	0.004602	0.000000
MANSO-MASHUA	0.467742	0.004698	1.000000
GREEN-KYUU	0.463259	0.000000	1.000000
JEHOVA-NKWESIRA	0.463259	0.000000	1.000000
MAARIFA-LUKANI	0.464744	0.000000	0.750000
MAHIDA-NGUDUNI	0.466238	0.010030	1.000000
ANGAZA-MUNGUSHI	0.463259	0.000000	1.000000
BAANDE B-MAMSERA KATI	0.464744	0.004602	0.000000
ROYA FLORESTA-MENGENI KITASHA	0.466238	0.007729	0.000000
NURU-NRAO	0.464744	0.000000	0.000000
UMOJA NASAI-NRAO KISANGARA	0.466238	0.010030	1.000000
IKUDA-NGIRINY	0.463259	0.000000	0.000000
IMARA-KISHISHA	0.463259	0.000000	1.000000
ENJOM-NGARITATI	0.463259	0.000000	1.000000
IRIKENY MAE-MAE JUU	0.463259	0.000000	0.000000
SAFINA-MAE JUU	0.466238	0.01003	0.000000

Continued

DONYO-DONYO MURWA	0.463259	0.000000	0.000000
KOBOKO-KOBOKO KASKAZINI	0.463259	0.000000	1.000000
AMANA-KOBOKO	0.463259	0.000000	0.000000
LAURA-MAE JUU	0.463259	0.000000	0.000000
NRAO JITEGEMEE-NRAO KISANGARA	0.463259	0.000000	0.000000
UFUNUO-MAKWIRU	0.475410	0.039738	0.000000
SAMARIA-TINDIGANI	0.463259	0.000000	0.000000
MANYATA-DONYOMURWA	0.463259	0.000000	0.000000
KUSARE-KOBOKO KASKAZINI	0.466238	0.010030	1.000000
ALFA-KOBOKO KASKAZINI	0.472313	0.029899	1.000000
AGANO-MLANGONI	0.463259	0.000000	0.000000
UBORA-WIRI	0.463259	0.000000	1.000000
SHALMU-MLANGONI	0.463259	0.000626	1.000000
ZIWANI-MAGADINI	0.466238	0.010656	1.000000
JORDANI-MLANGONI	0.463259	0.000626	1.000000
EWOTU-MAGADINI	0.463259	0.000626	0.000000
NARCO-MAGADINI	0.463259	0.000000	1.000000
AMAU-MAGADINI	0.463259	0.000000	1.000000
WIRI-MAGADINI	0.463259	0.000626	0.000000
HUUMA-FUKA	0.466238	0.01460	0.000000
VABAU-KOBOKO KASKAZINI	0.464744	0.000000	0.000000
TUDUMISHE-MAE JUU	0.463259	0.000000	0.000000
UHAI-KIRISHA	0.463259	0.000000	1.000000
KESHENI-MAE JUU	0.463259	0.000000	1.000000
EFATHA-MANIO	0.463259	0.000000	1.000000
ENYORATA-ASHENGAI	0.463259	0.000000	0.000000
MALIASILI-MLANGONI	0.463259	0.000000	1.000000
OLOSHAIK ZAHANATI-MAGADINI	0.463259	0.002285	1.000000
ANGAZA-MAGADINI	0.463259	0.002285	1.000000
BETHELI-MAGADINI	0.463259	0.000000	1.000000
AMANA-NRAO	0.463259	0.001524	1.000000
ITUEDE-FUKA	0.463259	0.000000	0.000000
KUSARE-KOBOKO	0.464744	0.000000	0.000000
KOBOKO IVAENY-KOBOKO KASKAZINI	0.466877	0.011608	1.000000
PARADISO-NSHEREHEHE	0.464744	0.000657	0.000000

Continued

WITO-FUKA	0.463259	0.000000	1.000000
MBURIASH-NGUMBARU	0.463259	0.002285	0.000000
EBENEZA-LAWATE	0.463259	0.006888	1.000000
KISUBE-KIRISHA	0.463259	0.000000	0.000000
IFUMU NRAO-NRAO KISANGARA	0.463259	0.001524	1.000000
BIRIRI-NGUMBARU	0.463259	0.004602	0.000000
TINDIGANI MAZINGIRA-MKOMBOZI	0.463259	0.000000	0.000000
HAPA KAZI-KWARE	0.463259	0.000000	0.000000
ALFA-LEMIRA KATI	0.463259	0.000000	0.000000
MANSO-NSONGORO	0.463259	0.000000	0.000000
GALILAYA A-KISIMANI	0.463259	0.000000	0.000000
TAUSI-MAHANGO	0.463259	0.000000	0.000000
HOSIANA-MAHANGO	0.463259	0.000000	0.000000
TUMSIFU-MAWANJENI	0.466238	0.000000	0.000000
UPENDO-RIATA B	0.466238	0.000000	0.000000

NB: For Appendices A and B, KIR is Knowledge and Information Resources, PR is the Physical Resources. Note that the actors in centrality measures (networking actors) were more than those mentioned here. The analysis of interest was only for targeted actors.