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Social Network Analysis (Migori)

Global Labor Program – Inclusive
Futures

Supported by: LINC

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List of acronyms

CGA	Cereal Growers Association
GESI	Gender Equality and Social Inclusion
GLP-IF	Global Labor Program – Inclusive Futures
KALRO	Kenya Agriculture and Livestock Research Organization
NGO	Non-Governmental Organization
OPD	Organization of Persons with Disabilities
SACCO	Savings and Credit Cooperative Organization
SNA	Social Network Analysis
SFEA	Syngenta Foundation East Africa
UDPK	United Disabled Persons of Kenya
USAID	United States Agency for International Development

Executive summary

Introduction

Social Network Analysis (SNA) is a systems thinking process which investigates social structures by using networks and graph theory. It characterizes networked structures as nodes (individuals, groups of people or firms within the network) and the ties, edges, or links (relationships or interactions) that connect them. The approach was used to understand the Global Labor Program – Inclusive Futures (GLP-IF)'s intervention in Migori County, as part of a larger context where different stakeholders, driving factors and processes interact to shape outcomes, and evolve over time. This followed the completion of an initial SNA conducted in Homa Bay County in Year 1 of the program. As implementation in Migori County commenced in Year 2, this particular phase of the SNA focused on understanding the networks of farmers in this new implementation area. It further explored their relationships with additional stakeholders, specifically agricultural extension workers, cooperatives and Organizations of Persons with Disabilities (OPDs). The inclusion of these actors was based on lessons learned from the first phase of SNA in Homa Bay, which informed the need to explore relationships with these actors.

Purpose

The SNA aimed to understand how farmers in Migori relate with other actors in the sorghum value chain network, specifically hub owners, input suppliers, financial services providers, aggregators, agricultural extension workers, cooperatives and OPDs. The approach focused on probing relationships between farmers and other actors to understand the relational attributes between farmers and these connections, in the context of their larger relational systems. The objective was to understand the network structure and links that exist among the selected farmers. This would help identify areas of the network where program interventions might have the greatest effect, and how the program may strengthen relationships among sorghum value chain actors in Migori county.

Methodology

The SNA targeted sorghum farmers in Migori county as the primary focal actors in GLP-IF's sorghum value chain. Specifically, it looked at the Farmer's Hub model, as implemented by the Syngenta Foundation East Africa. The design focused on exploring the relationships within the existing structure of the hub model, specifically seeking to understand how farmers related with other actors in the hub model. This included hub owners, input suppliers, buyers, aggregators, agricultural extension workers, cooperatives and OPDs. Our approach focused on probing relationships between farmers and these respective actors, to understand the relational attributes between farmers and these connections, in the context of their larger relational systems.

The SNA's activities were purposive, targeting male and female farmers with disabilities who were already engaged in the EABL value chain. Farmers were selected from GLP-IF's list of program participants and sampled based on specific attributes. These considered gender and disability. LINC recruited Q Data Mapping and Services (QDATAMS), a local survey firm, to collect the data. A structured questionnaire which was developed in English with Kiswahili translation, was used to collect the data. It was scripted into Kobo Collect to facilitate electronic data collection.

Using a snowball approach, each of the interviewed farmers were asked to nominate up to 5 connections who were subsequently interviewed. These connections included input suppliers or financial services providers. In total, 45 farmers and 54 other actors were interviewed via a quantitative survey tool. Data was analyzed using Microsoft Excel and Kumu software with key outputs being frequency tables, graphs, and visual maps of the relevant network attributes.

Findings

Out of the 99 interviews completed, 298 actors or nodes were generated, representing both individuals and organizations. A total of 485 connections were identified. These are established relationships between the 298 actors in the network.

Overall, the whole network is quite sparse. However, there are several distinct clusters of organizations that are densely connected to each other. Distinct clusters of densely connected actors formed around Syngenta Foundation East Africa (SFEA), Cereal Growers Association (CGA), One Acre Fund and Nyakadera Agrovet. These clusters included a wide range of value chain actors and represent the strongest relationships within the value chain.

The SFEA cluster had the largest number of actors and network ties while smaller clusters formed around CGA, One Acre Fund, Nyabon Enterprises, and several influential inputs suppliers and hub owners. Overall, input suppliers were among the most well-connected actors in the network.

The network analysis revealed weak ties among hub owners. According to the SFEA hub model, hub owners work in distinct geographies and typically work independently of other hub owners. Only two hub owners, the most well-connected in the network, appeared to relate and exchange information with one another. While inputs suppliers were well-connected to each other, the network analysis did not identify strong communities among any other groups of value chain actors including OPDs, hub owners, cooperatives or financial service providers.

Farmers were most likely to be in the periphery of the network. Farmers generally did not indicate that they solicited sorghum-related knowledge from other farmers, suggesting that farmers may not value other farmers as influential knowledge sources when it comes to their agricultural practices. Instead, farmers had much stronger connections with hub owners, NGOs, inputs suppliers, buyers, aggregators and government actors. Farmers' ties to financial services, agricultural services providers (e.g. crop protection) and agricultural associations (e.g. cooperatives, farmer groups) were relatively weaker.

Recommendations

The analysis proposed the following recommendations for how GLP-IF could strategically engage network members for enhanced outcomes and more sustainable impact:

Focus on network cohesion while addressing Network Density.

The program may wish to take steps to strategically enhance Network Density. This is likely to contribute to a more useful and cohesive network for farmers. Information and services are likely to travel more easily and effectively across the network, and ultimately reach more farmers. This requires identifying and focusing on the right clusters and the right relationships.

Develop a strategy to prioritize and engage the most influential actors in the network according to the program's needs.

The most influential actors in the network included SFEA, CGA and One Acre Fund. The program should identify the best ways to engage these actors and use them to create bonds and bridges between GLP-IF's core implementers and farmers. These actors can also play a role in disseminating knowledge in the network, and creating clearer pathways between farmers, input suppliers and aggregators.

Develop a strategy to link the hub with the Cereal Growers Association.

The most prominent clusters in the network were SFEA and CGA. The program needs to develop a strategy on how to make links with CGA. The program should rethink how the

hub connects to the CGA because CGA can be part of what is referred to as the 'root of a scale'¹ in the hub model.

Develop a strategy to prioritize and engage the most influential groups of value chain actor groups in the network according to the program's needs.

Besides CGA and SFEA, two central NGOs in the network, the most influential actor groups were agricultural associations, buyers/aggregators, and hub owners. The program should identify the best ways to engage these actor groups to increase cohesion and knowledge transfer across the network.

Strengthen ties between farmers and other value chain actors, particularly financial service providers, OPDs, and cooperatives.

The program should consider strengthening relationships between farmers and actors including financial service providers, OPDs and cooperatives. While farmers are less likely to rely on one another for information about sorghum farming, the program should pursue opportunities to create more cohesion and knowledge exchange among farmers. The program should also explore opportunities for engaging highly influential farmers in disseminating knowledge to farmers.

Strengthen ties between farmers.

Farmers did not indicate that they solicited sorghum-related knowledge from fellow farmers. This suggested that farmers may not value other farmers as influential knowledge sources when it comes to their agricultural practices. It is expected that the program should achieve strong connections between farmers. The program should therefore develop strategies of strengthening ties between the farmers for exchange of knowledge and best agricultural practices.

Introduction

Social Network Analysis (SNA) is a systems thinking approach aimed at investigating social structures by using networks and graph theory. It characterizes networked structures in terms of nodes (individual actors, people, or firms within the network) and the ties, edges, or links (relationships or interactions) that connect them. The systems thinking approach seeks to understand a social structure as part of a larger context in which different stakeholders, driving factors, and processes interact to shape outcomes and evolve over time. It looks at the relationships among actors in a system to see if and how well they are connected to one another.

This approach focuses on the actors in a system instead of factors. Factors are the forces and flows that shape a system like structures, attitudes, causes, and effects. Actors are generally individuals or formal or informal groups of people. The SNA methodology was selected to provide an understanding of existing relationships in the sorghum value chain managed by East African Breweries (EABL), one of GLP-IF's

¹ The root of a scale is the note on which the scale begins in music.

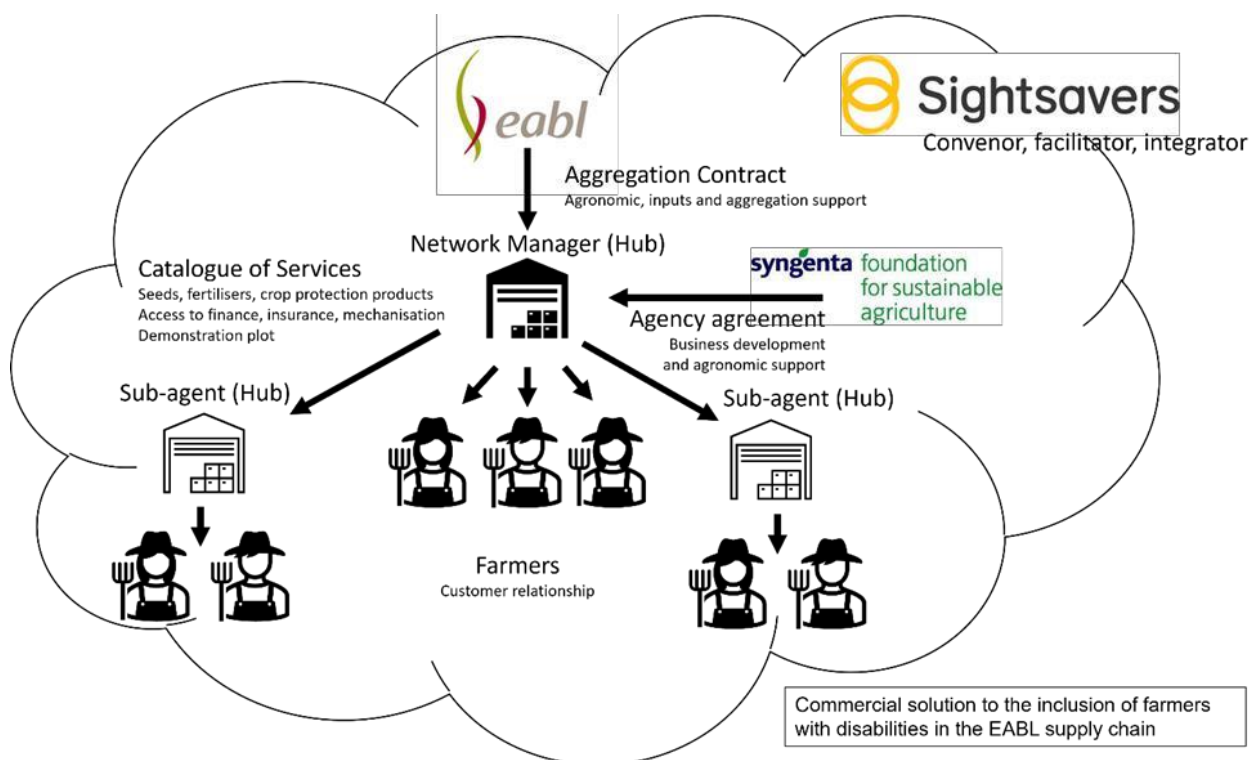
strategic partners. This method was chosen because it provides information that is not available through other sources including routine monitoring data, baseline data, Gender Equality and Social Inclusion (GESI) analyses, action learning and value chain analyses. Ultimately, this SNA sought to identify areas of the network where program interventions might have the greatest effect, and how the program may strengthen relationships among sorghum value chain actors in Migori County.

This phase of SNA followed the completion of an initial SNA conducted in Homa Bay County in Year 1 of the program. As implementation in Migori county commenced in Year 2, this particular phase of the SNA focused on understanding the networks of farmers in this new implementation area.

Methodology

The SNA involved a quantitative survey targeting sorghum producers in Migori as the primary focal actors in the sorghum value chain. Specifically, it looked at the Farmer's Hub model, as implemented by the Syngenta Foundation East Africa. The design focused on exploring the relationships within the existing structure of the hub model, specifically seeking to understand how farmers related with other actors in the hub model. This included hub owners, input suppliers, buyers and aggregators. It further explored their relationships with additional stakeholders, specifically agricultural extension workers, cooperatives and OPDs. The inclusion of these actors was based on lessons learned from the first phase of SNA in Homa Bay, which informed the need to explore relationships with these actors. Our approach focused on probing relationships between farmers and these respective actors, to understand the relational attributes between farmers and these connections, in the context of their larger relational system.

Figure 1: Overview of the hub model



The study took place in Migori County in western Kenya, an area where GLP-IF implementation is ongoing. Data collection was restricted to this intervention county, which was purposefully selected. Farmers from Nyatike, Kuria East, and Kuria West sub-counties were targeted for the study. These sites provide diverse settings where a cross-section of participants from various demographic backgrounds could be enrolled.

Data collection tool

A structured questionnaire was developed in English with Kiswahili translation. It was scripted into Kobo Collect to facilitate electronic data collection. The questionnaire focused on the following areas:

- Basic identifying information about each respondent (e.g. name, gender, disability status).²
- Background information about respondents' businesses (e.g. farm size, annual revenues).
- Information about respondents' social networks and quality of relationships.
- Perceptions of trust, effectiveness, cost and service delivery.

The data collection tool is included in Annex 1.

Recruiting and training enumerators

LINC recruited Q Data Mapping and Services (QDATAMS), a local survey firm, through a competitive procurement process. QDATAMS supplied five enumerators, each with at least two years' experience in data collection in the development sector and a bachelor's degree in social sciences. Enumerators were trained between 2nd August 2023 and 4th August 2023 in Migori.

Training covered:

- Introduction to GLP-IF
- Review of the SNA methodology, data collection tool, sampling, and data collection processes
- Ethical considerations for research with human participants
- Disability and Inclusion Etiquette

LINC sensitized and worked closely with three partners involved in the GLP-IF intervention during the planning, training, and data collection phases of the SNA activity:

- EABL
- Syngenta Foundation East Africa
- UDPK

² Respondents were reassured that all personal information gathered through the survey would be treated confidentially and would not be shared publicly.

These partners helped mobilize and recruit farmers. They provided orientation on the value chain and support on disability awareness and other relevant considerations.

Sampling and identifying respondents

The SNA's activities were purposive, targeting male and female farmers with disabilities who were already engaged in the EABL value chain. Farmers were selected from GLP-IF's list of program participants and sampled based on specific attributes. These considered gender and disability.³

Using a snowball approach, each of the interviewed farmers were asked to nominate up to five connections who subsequently would be interviewed. These connections included input suppliers, hub owners, financial services providers, aggregators, OPD representatives, agricultural extension workers and cooperatives. In total, 45 farmers and 54 other actors were interviewed.

Overall, participants were included in the survey based on their involvement in one of the following areas:

- Growing sorghum to sell either to EABL or an EABL aggregator.
- Providing financial services such as credit and crop insurance to sorghum farmers.
- Supplying EABL with sorghum that is aggregated from a group of farmers.
- Providing inputs such as seeds, fertilizers, and agrochemicals to sorghum farmers.
- Buying sorghum from farmers.
- Providing support to sorghum farmers in collaboration with SFEA. This included providing inputs, promoting market links, and extension and advisory services.
- Providing farmers with extension services, important information, such as seed varieties, crop management practices, marketing, and new technologies, and also improves farmers' knowledge through demonstrations, model plots, and training.
- Farmers' cooperative society or association that either supplies members with seeds, fertilizers, and machinery, or helps farmers with services such as marketing, distribution, sales, and financing related to crop production.

There is a detailed breakdown of the sample in the demographic overview section.

Data collection started on 14th August 2023 and ended on 29th September 2023.

Data analysis

The analysis was completed by exporting the raw survey data from Kobo Collect as a .csv file. This data was coded to reflect network analysis terms (edge list, node list and matrix formats) using Microsoft Excel. The network data was analyzed using Kumu software.⁴ The clean dataset was analyzed using descriptive statistics with frequency tables, graphs, and

³ The key sampling criteria focused on the respondent's role in the value chain (farmer, aggregator, financial services provider, buyer, inputs supplier, agricultural extension worker, OPD representative, and cooperative). Criteria on gender and disability were only applied to the sample of farmers.

⁴ Further information is available at www.kumu.io

visual maps of the relevant network attributes as key outputs. LINC conducted network mapping via Kumu to identify notable patterns, trends, and points of potential interest in the data. These included:

- Deriving network-level metrics for each relationship type. These metrics measure attributes of the entire network rather than any one member.
- Deriving organization-level influence metrics, which measure attributes for each actor within each relationship type.
- Identifying sub-groups of connected organizations within the overall network
- Visualizing the network.

Content analysis was also conducted of qualitative data captured in one open-ended question.

Ethical considerations

The survey targeted respondents aged 18 years or older who were willing and able to provide written informed consent. All potential participants were invited to provide freely given written consent prior to their enrolment in the language of their choice (English, Dholuo, or Kiswahili). During the consent process, participants were fully informed regarding the purposes of the study and the expected duration of the interview. They were provided with information about confidentiality and a description of foreseeable risks or discomforts. Participants were encouraged to ask questions and seek clarification about any queries.

The study team took precautions to ensure that personal information gathered during the study was treated confidentially and that participants were interviewed in a private environment. Participants were made aware that participation in the study was voluntary, free of any coercion or undue influence. All interviews were accompanied by a completed informed consent form. There were no safeguarding concerns or adverse events reported during data collection.

Limitations

While the SNA approach provides valuable information about the nature of relationships in the sorghum value chain, it does not intend to represent all actors in this value chain in Kenya. The analysis presents information about the size and density of the network, but information on farmer affiliations will be most relevant for program implementation purposes. In addition, the network analysis shows how sorghum farmers in the three intervention sub-counties (Nyatike, Kuria East and Kuria West) relate with other actors in the value chain in the entire Migori County. The feedback from the dissemination workshop noted that this was a limitation as the network analysis does not specifically show how the sorghum farmers relate with other actors only in the three intervention sub-counties. The findings should not be generalized to the wider population and this methodology does not allow statistical inference to a specific population such as Kenyan sorghum farmers with disabilities.

Respondent demographics

A total of 99 interviews were conducted across the following sub-counties in Migori: Kuria East, Kuria West, Nyatike, Rongo, Suna East and Uriri. A response rate of 99% was achieved with 99 of the 100 targeted interviews achieved.

Table 1 provides a breakdown of interviews achieved by respondent type. While farmers were identified in the three implementation sub-counties, farmers provided referrals for value chain actors in other sub-counties across Migori.

Table 1: Respondent Demographics

Respondent type	Kuria East	Kuria West	Nyatike	Rongo	Suna East	Uriri	Total
Farmer	15	15	15				45
Inputs supplier	7	1	1	2		1	12
Buyer-aggregator	3	5	2				10
Hub owner	1	5	3				9
Financial services	2	2	1	1			6
Government	1	2	1				4
Community-based organizations	1	1	2				4
Agricultural association			3		1		4
Agricultural service provider	1	1			1		3
Non-governmental organization	1	1					2
Grand total	32	33	28	3	2	1	99

An overview of respondent demographics for the top 5 respondent categories is provided below:

Farmers: grow sorghum and have an agreement to sell it to an EABL aggregator

- Total interviewed: 45
- Disability status: 33.3% persons with disabilities
- Gender: 53.3% male; 46.7% female
- Farm size: Of all farmers interviewed, about 62.2% (n=28) were farming sorghum on 1 acre or less, while 37.8% (n=17) were farming on more than one acre of land
- Length of time farming sorghum: Of all farmers interviewed, about 77.7% (n=358) were farming sorghum less than 5 years, while 22.3% (n=10) were farming more than 5 years
- Annual revenues: 80% made less than KES40,000 last year, while 20% made more than KES40,000

Inputs Supplier: provide inputs such as seeds, fertilizers, and agrochemicals to sorghum farmers

- Total interviewed: 12
- Disability status: No persons with disabilities
- Among the suppliers interviewed were: Kehancha Agrovet, Mkulima Agrovet, Ogutu Agrovet, Rima Agrovet, Nyakadera Agrovet, Kings/Mfalme Agrovet, Juhudi Kilimo Agrovet

Buyer-Aggregator: have direct contract with EABL to supply sorghum based on crop aggregated from a group of farmers OR buy sorghum crop from farmers, but do not have a contract with EABL

- Total interviewed: 10
- Disability status: 30% persons with disabilities
- Gender: 60% female; 40% male
- Among the agents interviewed were: EABL, Nyabon Enterprises, Migori Farmers Center

Hub Owner: provide support to sorghum farmers (inputs, market links, and extension and advisory services) in collaboration with the network manager/SFEA

- Total interviewed: 9
- Disability status: 33.3% persons with disabilities
- Gender: 22.2% female; 71.8% male

Financial Services: provide financial services such as credit and crop insurance to sorghum farmers

- Total interviewed: 6
- Disability status: 33.3% persons with disabilities
- Gender: 83.4% female; 16.6% male
- Among the providers interviewed were: DigiFarm, Kenya Women's Finance Trust, Equity Bank, KCB

Findings: Network analysis

Access results via Kumu

Kumu is user-friendly and allows customizable filtering of all node and edge attributes. This allows even novice users to use the platform for in-depth analysis. A link to the visualization of the network is provided in the respective findings section.

Terminology and use of capitalization

To provide more clarity for the reader, this report capitalizes network attributes and metrics when referring to them by name. For example, metrics like Density and Degree are capitalized when referring to the network metric.

Disclosure of individual names

The names of individual respondents associated with the network have been anonymized within this report's analysis. As such, names are excluded where the Network Map has been reproduced in full or in part.

Dissemination and use

LINC will disseminate the findings of this report to Sightsavers and the wider consortium of GLP-IF coalition members, as well as other stakeholders including OPDs, county government representatives, program participants and other value chain actors. The purpose of this is to share knowledge, validate findings and generate additional recommendations that could help guide potential next steps for programming. The SNA findings will inform the program's stakeholder engagement activities specifically for the sorghum value chain. Findings will also provide evidence to help strengthen relationships between value chain actors.

Network metrics overview

Prior to beginning the analysis, the reader should be familiar with the SNA terms and metrics listed in [Table 2](#).

Table 2: Standard metrics used for analysis

Metric	Description
Node, or Actor	An organization included in the network. Node is used synonymously with Actor(s) .
Connection	A representation of a relationship between two actors or nodes, illustrated by a line connecting them.
Network Size (number of nodes)	The number of actors or organizations in a network.

Ties (number of edges)	The number of reported connections among actors. In-degree ties are ties into a given node: out-degree ties are ties out of a given node. These are given as a whole number and can be an average or total.
Density	The proportion of actual ties relative to all possible ties in a network.
Average Distance	The average steps required to get between any two actors in a network.
Average Degree	The average number of ties of actors in the network.
Reciprocity	The extent to which directed relationships are reciprocated.
Degree Centrality	A normalized measure of the number of a given actor's unique ties. This indicates the importance or significance of an actor for the network. This can be separated for directed relationship types into in-degree centrality (for incoming ties) and out-degree (for outgoing ties).
Closeness Centrality	Closeness measures the distance each actor is from all other actors. In general, actors with high closeness can spread information to the rest of the network most easily and usually have high visibility into what is happening across the network.

Interpreting and using network maps

Network maps presented in this report show 'nodes' as circles in the map, which each represent an actor. 'Connections' are represented by lines between nodes. The size of each node depends on its Degree Centrality, so more prominent actors in the network appear larger. The position of nodes in a map may vary and is not intended to reflect distance or

other attributes of the network. Generally, nodes with the highest number of connections are more central while those with the fewest connections appear at the periphery.

Network analysis findings

Out of the 99 interviews completed, 298 actors or nodes were generated, representing both individuals and organizations. A total of 485 connections were identified. These are established relationships between the 298 actors in the network.

This section presents findings from the analysis. It begins with the network structure, and then explores results of key SNA metrics such as Density and Centrality. This section also includes findings from survey responses to questions about communication, trust, engagement, effectiveness, cost and perception of services.

Network Density

Overall, the whole network is quite sparse. However, there are several distinct clusters of organizations that are densely connected to each other.

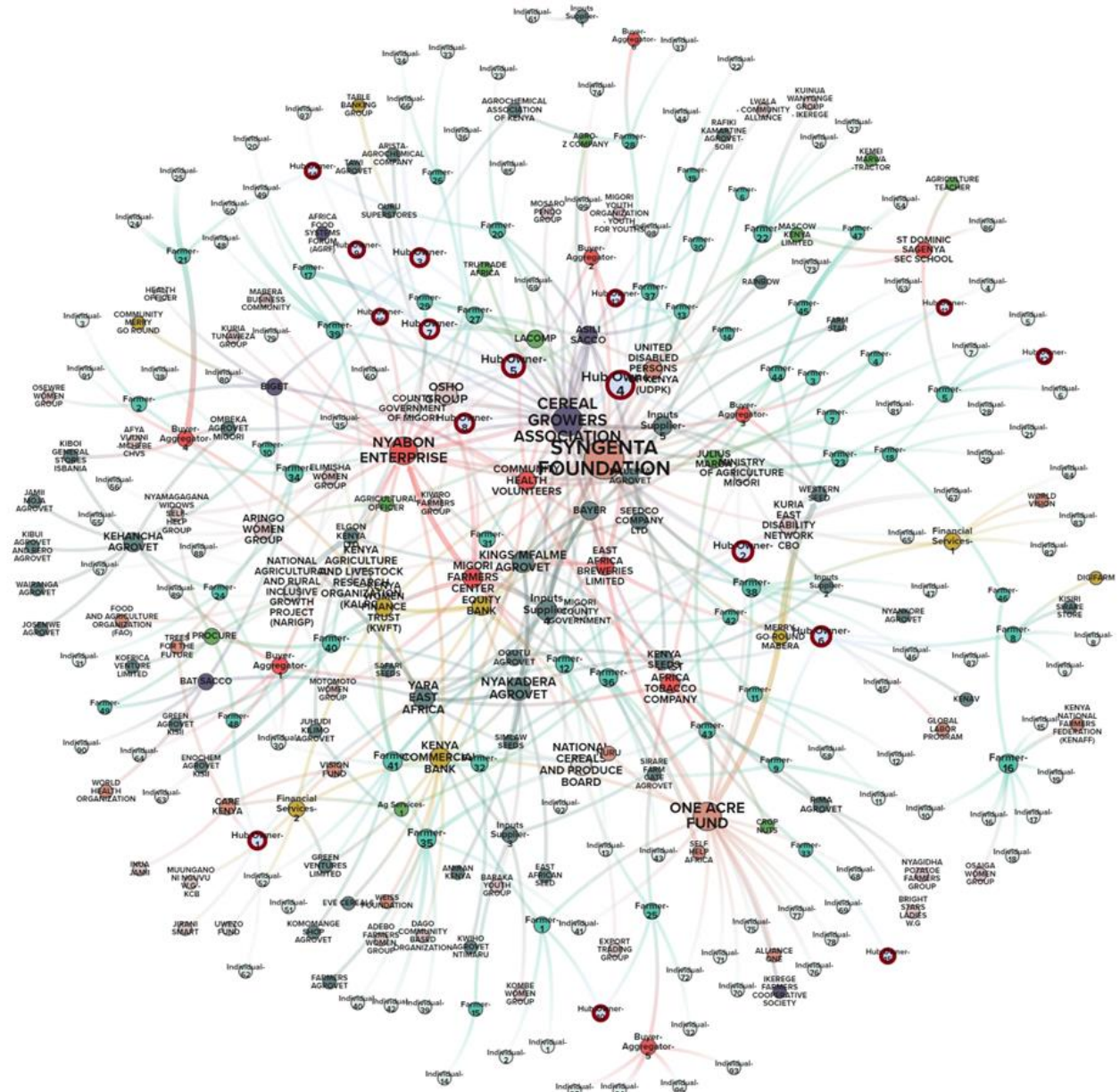
Specifically, there were dense clusters around one of key GLP-IF actors: Syngenta Foundation East Africa (SFEA) and Nyabon Enterprises. Smaller clusters surrounded other influential input suppliers including the Cereal Growers Association (CGA) and One Acre Fund (see Figure 3).

LINC also analyzed the network structure to determine how groups of actors are organized and how well network actors relate to each other. Generally, the network appeared to be structured around Core actors with groups of densely connected nodes, and Periphery actors with more sparsely connected nodes.

Generally, nodes in the Core were not well connected to those in the Periphery. Farmers were most likely to be in the Periphery of the network. Further, the network appeared to be structured around hubs and spokes, with input suppliers being the most central and influential actors. The Kumu link to the visualization⁵ is available at <https://embed.kumu.io/42aa9d9aff2019a3b2e8bd98609b0ac2>.

Figure 1: Overview of the Network

⁵ The complete Network Map can be accessed at <https://embed.kumu.io/42aa9d9aff2019a3b2e8bd98609b0ac2>. This online version can be enlarged for ease of use.



Legend

- Ag Services
- Agricultural Association
- Buyer-Aggregator
- CBO
- Farmer
- Financial Services
- Government
- Hub Owner
- Individuals
- Inputs Supplier
- NGO

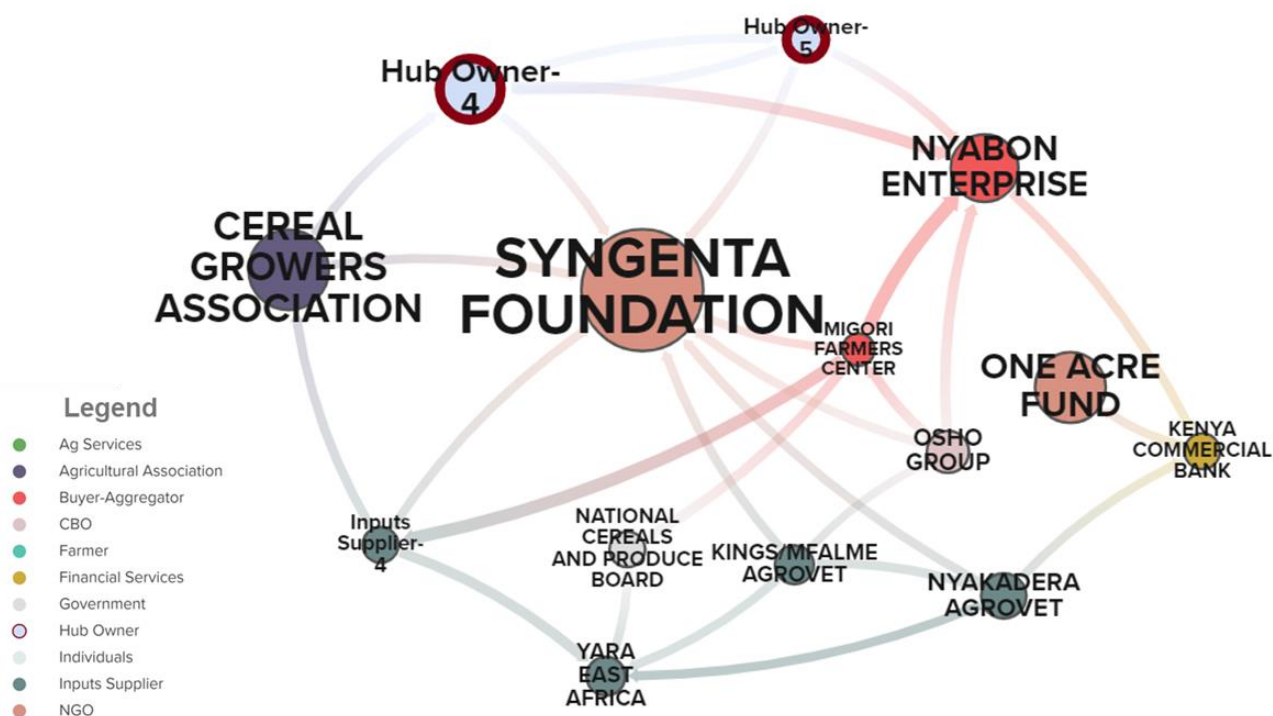
Table 3 shows the top ten core actors that were identified. The clusters around these actors were the most conspicuous in the network structure. This indicates that there is a centralized core structure governing all types of relationships in the network. The SFEA cluster had the largest number of actors and network ties while smaller clusters formed around CGA, One Acre Fund, Nyabon Enterprises, and several influential Inputs Suppliers and Hub Owners. Overall, Input Suppliers were among the most well-connected actors in the network.

Table 3:Core Network Actors

Actor	Actor Type	Connections
Syngenta Foundation	NGO	38
Cereal Growers Association	Agricultural Association	25
One Acre Fund	NGO	22
Nyabon Enterprise	Buyer-Aggregator	21
Hub Owner-4	Hub Owner	19
Nyakadera Agrovet	Inputs Supplier	14
Osho Group	CBO	13
Hub Owner-5	Hub Owner	12
Kings/Mfalme Agrovet	Inputs Supplier	12
Yara East Africa	Inputs Supplier	12

Figure 2 visually depicts the most highly connected actors in the network. These include a variety of Inputs Suppliers (i.e. Yara East Africa, Nyakadera Agrovet, Kings/Mfalme Agrovet), as well as CGA, Nyabon Enterprises and One Acre Fund. It also includes SFEA, the National Cereal and Produce Board, as well as influential Hub Owners, one Community Based Organization (Osho Group) and one financial institution (KCB). This suggests that a variety of well-connected actors are working together to support the sorghum supply chain in Migori, with SFEA being a dominant actor that is either directly or indirectly connected with each of these value chain players.

Figure 2: Core Network Actors



Key Clusters

Within the network, distinct clusters of densely connected actors formed around SFEA, CGA, One Acre Fund and Nyakadera Agrovet. These clusters include a wide range of value chain actors and represent the strongest relationships within the value chain.

Several key clusters also emerged in the network, the most prominent one being the SFEA and CGA cluster (Figure 3). SFEA was the most connected actor overall with 39 direct connections (approximately 13% of the network) and 157 indirect connections (52% of the network). SFEA also demonstrated strong ties to a range of other well-connected actors including farmers, CGA, influential hub owners and Inputs Suppliers, and the Kenya Agricultural Livestock and Research Organization (KALRO). SFEA also appeared to have direct ties with financial service providers including Kenya Women’s Finance Trust and Asili SACCO, a SACCO established in Migori County. However, according to the network analysis, SFEA did not appear to have any direct connections with Nyabon Enterprises, the main aggregator in Migori County.

CGA, a national member-based farmer organization, was the second most-connected actor in the network with a total of 25 direct connections. In addition, CGA was indirectly connected to 109 other actors (36% of the network). CGA’s connections include a wide range of value chain actors including farmers, EABL, SFEA, Hub Owners, Input Suppliers (e.g. SeedCo Limited), Agricultural Service Providers (e.g. TruTrade Africa) and the County

Government of Migori. This suggests that CGA is well-positioned to share information and resources across the network.

Importantly, SFEA and CGA are connected by several influential farmers, hub owners and inputs suppliers who play a bridging role across the two clusters. These actors play an intermediary role between two of the most prominent sorghum value chain actors, one that is directly involved in the implementation of GLP-IF (i.e. SFEA) and one that is not (i.e. CGA). Without these bridging actors, these clusters and their respective connections might not interact with each other at all. While some of these bridging actors are not directly involved in implementing the program (e.g. Asili SACCO), they play an important role in the value chain and have active relationships with other network actors.

The combined networks of SFEA and CGA include some of the most highly connected actors. The clusters formed around each of these actors are bridged by input suppliers and hub owners. In total, the indirect connections of both actors cover more than half the network. SFEA and CGA therefore represent the two most important actors in the network, meaning that they are the best placed to influence changes in the sorghum value chain.

Figure 3: SFEA and CGA Clusters

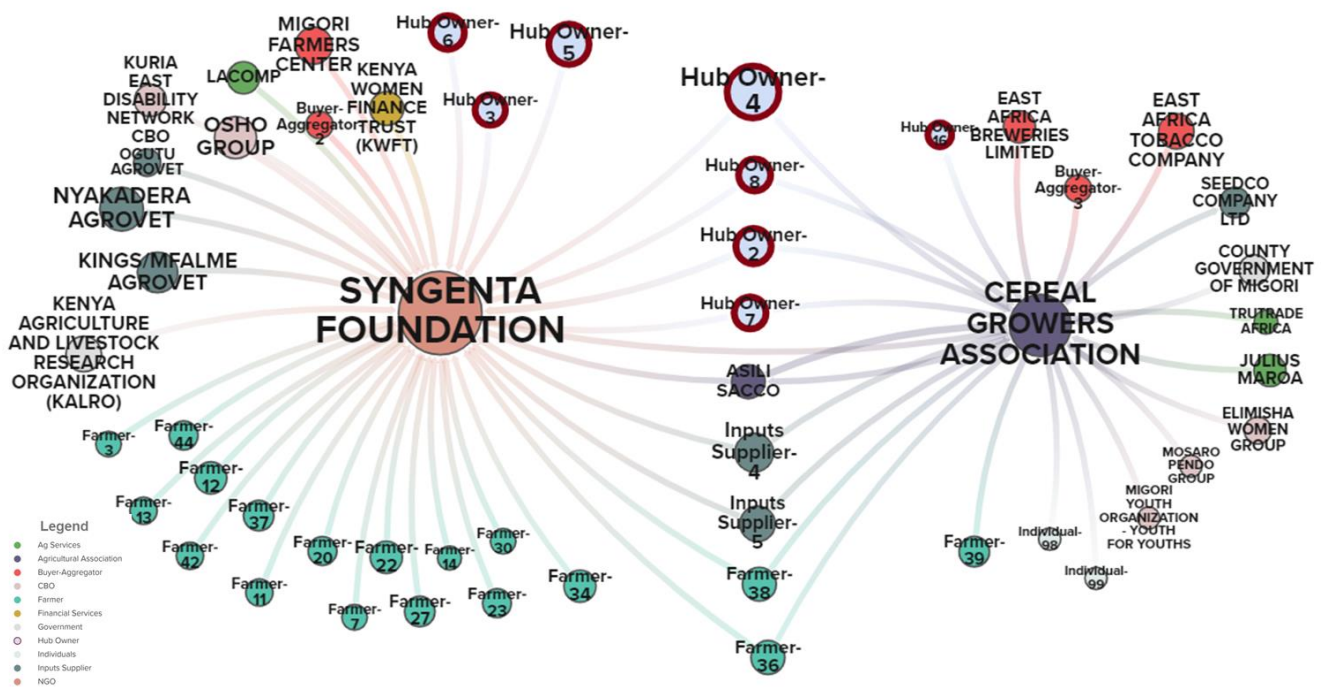
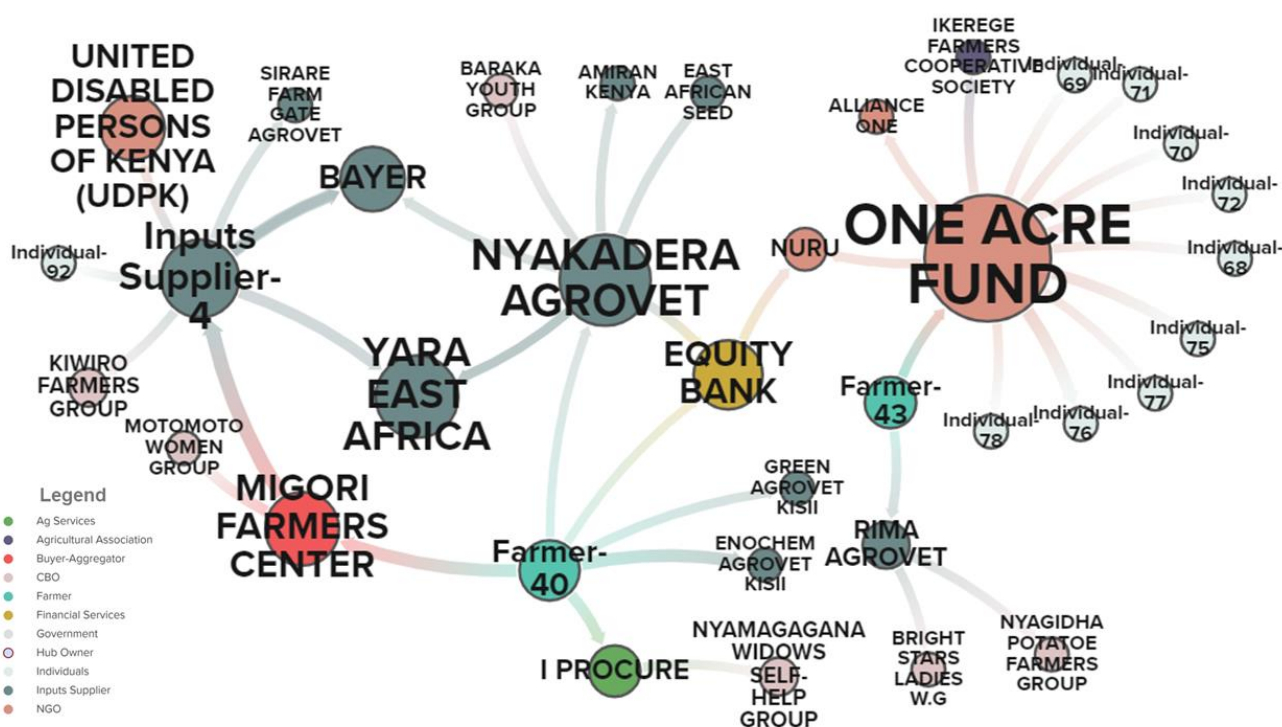


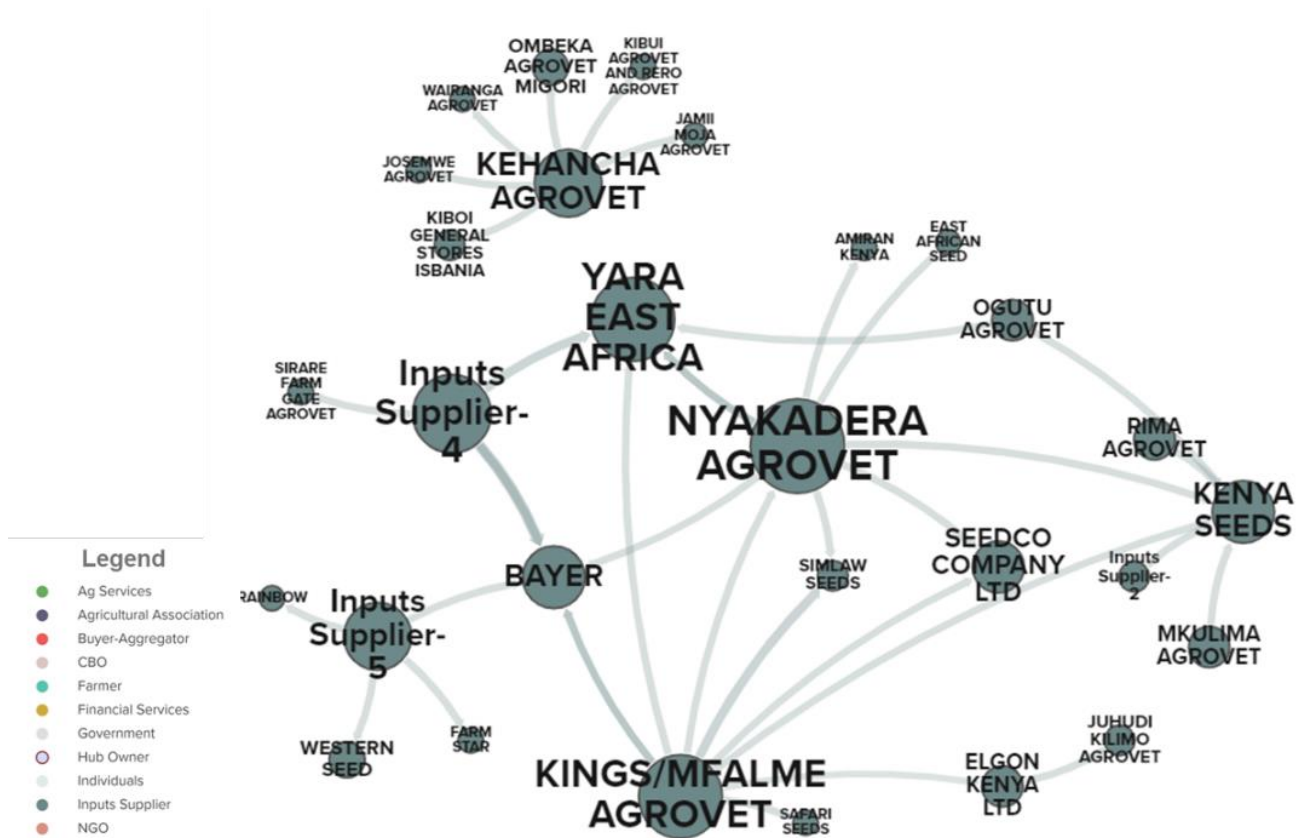
Figure 4: One Acre Fund and Nyakadera Agrovet Clusters



The second most prominent clusters featured One Acre Fund and Nyakadera Agrovet (Figure 4). One Acre Fund, an organization that supplies smallholder farmers with finance, agricultural inputs and training, demonstrated strong connections to farmers, buyers, cooperatives and other individuals in the network. Nyakadera Agrovet, a local inputs supplier based in Sare Awendo, demonstrated direct ties with a range of actors including Equity Bank, Bayer, an international agrochemicals company, Yara East Africa, a regional organization crop nutrition company, Amiran Kenya and East Africa Seed Company, both regional inputs suppliers. In addition to have indirect ties with other inputs suppliers, Nyakadera was also indirectly connected to other important players including Migori Farmers Center, a sorghum buyer, and iProcure, an agricultural supply chain platform. While the two clusters formed by One Acre Fund and Nyakadera Agrovet are loosely tied to one another, Equity Bank is a potential key connector across the two groups.

The network analysis identified a strong community of inputs suppliers (Figure 5), indicating that this group was particularly well connected to each other. This suggests that inputs suppliers, both large and small, regularly communicate with other input suppliers in the network, exchanging information, knowledge, services and expertise.

Figure 5: Community of Inputs Suppliers



While inputs suppliers were well-connected to each other, the network analysis did not identify strong communities among any other groups of value chain actors including OPDs, hub owners, cooperatives or financial service providers. Only one OPD, the Kuria East Disability Network, was identified within the network (Figure 6), indicating weak ties between OPDs and other value chain actors. While there were several financial service providers identified (KCB, Equity Bank, Kenya Women’s Finance Trust), they did not appear to be well-connected or influential.

Figure 6: Kuria East Disability Network

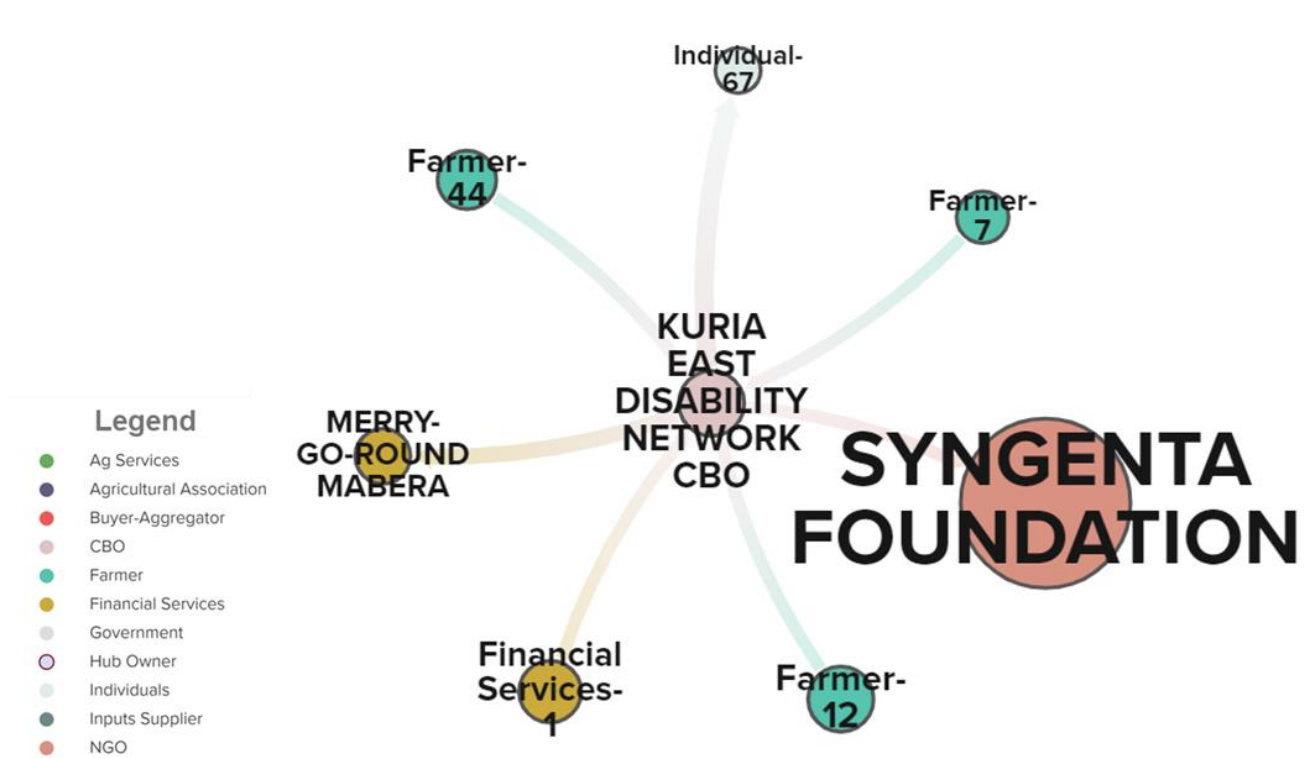
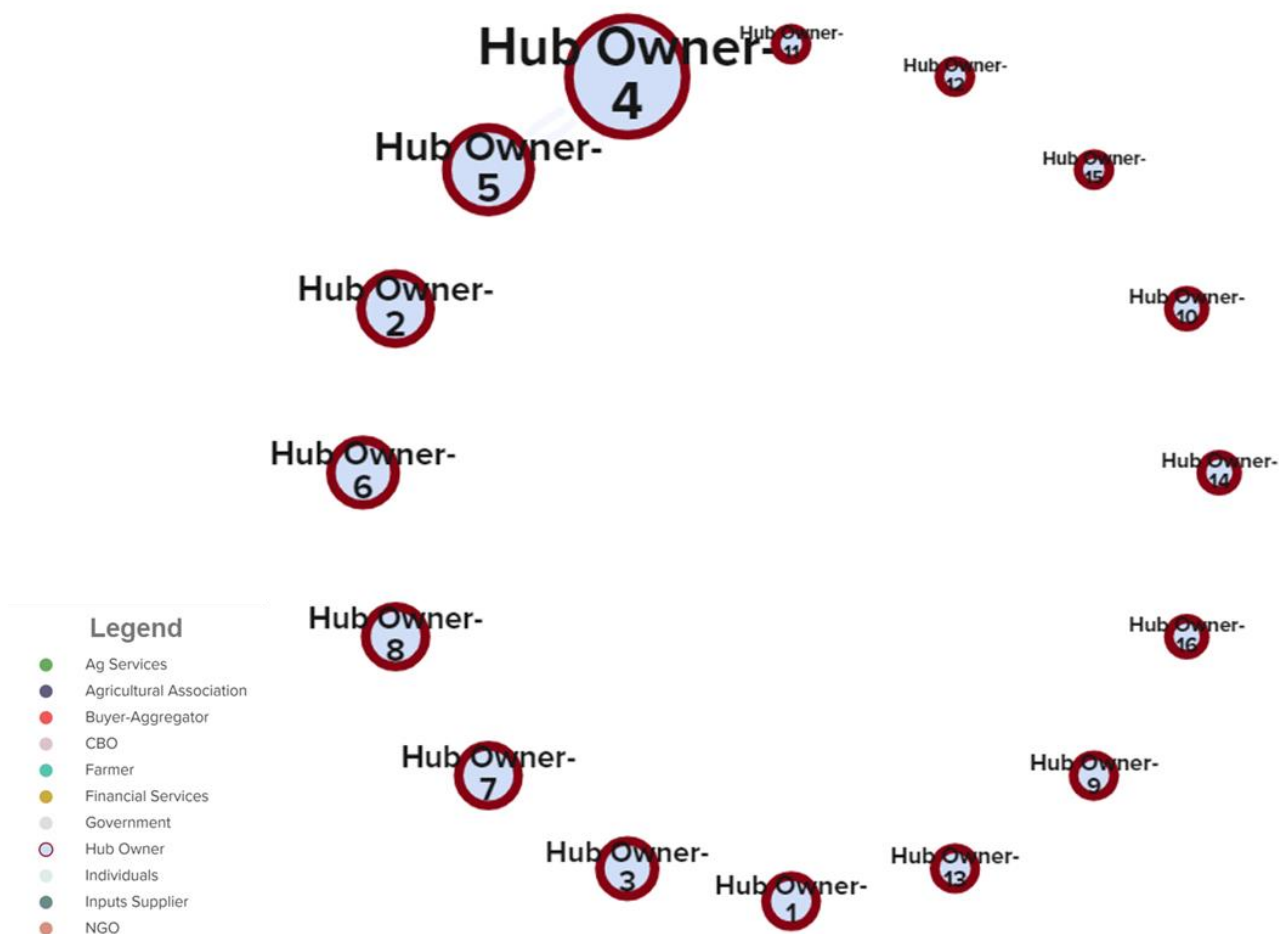


Figure 7: Hub Owners Community



The network analysis revealed weak ties among hub owners (Figure 7). According to the SFEA hub model, hub owners work in distinct geographies and typically work independently of other hub owners. Only two hub owners, the most well-connected in the network, appeared to relate and exchange information with one another. A strategic approach to building a more connected hub network may be useful for the program.

When prompted, farmers generally did not indicate that they solicited sorghum-related knowledge from other farmers, suggesting that farmers may not value other farmers as influential knowledge sources when it comes to their agricultural practices. Instead, farmers had much stronger connections with hub owners, NGOs, inputs suppliers, buyers, aggregators and government actors (e.g. extension service providers) as illustrated in Figure 8. Farmers’ ties to financial services, agricultural services providers (e.g. crop protection) and agricultural associations (e.g. cooperatives, farmer groups) were relatively weaker.

Figure 8: Overview of Farmer Connections

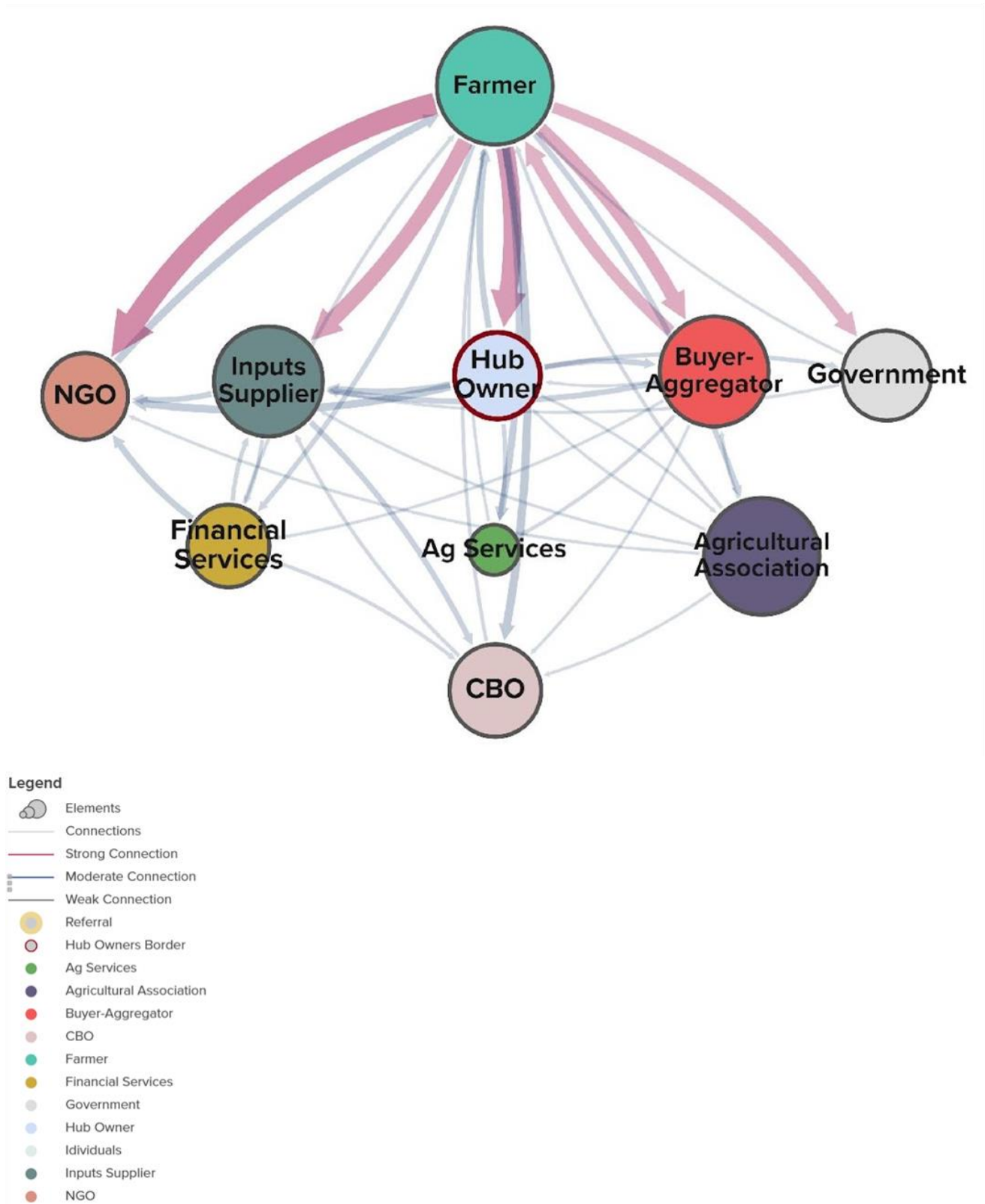


Figure 9: Migori County government connections

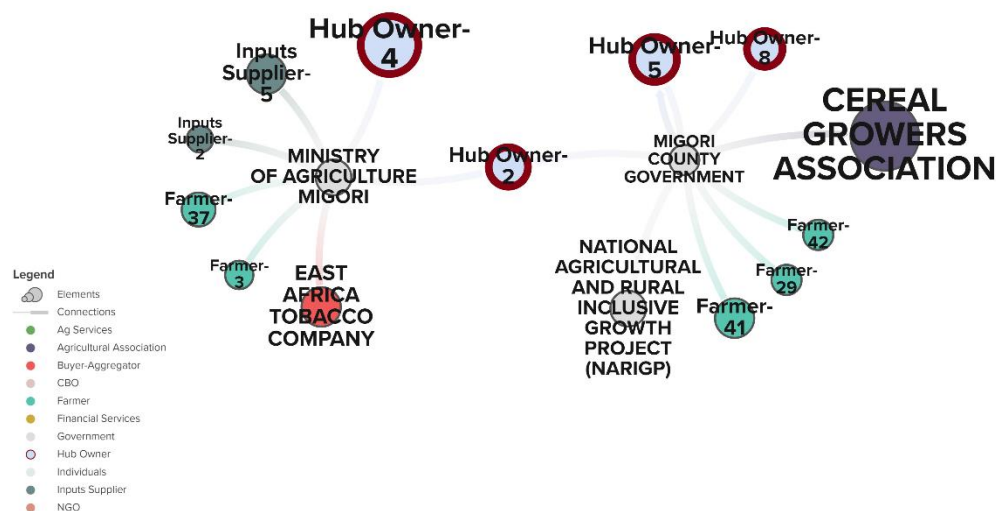


Figure 9 shows the direct connections that were mentioned for Migori County Government and Migori County Ministry of Agriculture, which was the only Migori county government department mentioned in the findings. The only 'bridging' connection they share is hub owner 2. Only three hub owners and three farmers mentioned direct connections to the Migori County Government. The other direct connections to the Migori County Government were the Cereal Growers Association and National Agricultural and Rural Inclusive Growth Project (NARIGP), which is a Government of Kenya project implemented through the Ministry of Agriculture, Livestock Fisheries and Cooperatives, state department for crop development and agricultural research, with funding support from the World Bank.

In addition, only two hub owners and two farmers mentioned direct connections to the Migori County Ministry of Agriculture. The other direct connections were two inputs suppliers and East Africa Tobacco Company. This suggests that farmers and hub owners' ties to Migori County Government was weak, and the program needs to engage more and link the farmers and hub owners with the Department of Agriculture and other relevant departments in the county government, at various levels, for expertise and information around sorghum farming, access to various government funds, and sustained sorghum production in the county.

Key Network Metrics by Actor

Table 4: Key Network Metrics by Actor⁶

In-Degree Centrality		Out-Degree Centrality		Closeness Centrality	
SFEA	16	One Acre Fund	14	Male Farmer-40	0.11
Nyabon Enterprise	14	Nyakadera Agrovet	12	Female Farmer-36	0.10
Cereal Growers Association	11	Kings/Mfalme Agrovet	12	Kings/Mfalme Agrovet	0.10
Yara East Africa	8	Cereal Growers Association	11	Male Inputs Supplier-5	0.10
Kenya Seeds	8	Male Hub Owner-4	11	Male Farmer-35	0.09
Bayer	8	Male Farmer-16	9	Female Farmer-41	0.09
Hub Owner-4	7	Male Farmer-41	9	Female Farmer-38	0.09
One Acre Fund	7	Male Farmer-35	9	Male Hub Owner-8	0.09
EABL	6	Female Inputs Supplier-4	9	Male Farmer-10	0.09
Ministry of Agriculture Migori	6	Male Inputs Supplier-5	9	Male Farmer-12	0.09
National Cereals and Produce Board	6	Female Farmer-38	8	Female Farmer-37	0.09
Seedco Company Ltd	6	Female Farmer-36	8	Female Farmer-39	0.09

The In-Degree Centrality metric measures an actor’s number of in-coming connections. In general, actors with high In-Degree Centrality are perceived as network leaders and are frequently looked to by others as a source of advice, expertise, or information. These are the actors who also enjoy the highest degree of popularity in the network. The organizations with the highest In-Degree scores include SFEA, Nyabon Enterprises, CGA, Kenya Seed Company, Bayer and One Acre Fund (Table 4). One hub owner was also identified among the top ten actors for this metric.

Out-Degree Centrality measures the number of outgoing connections for an actor. In general, actors with high Out-Degree Centrality can reach a high number of actors and

⁶ F=Farmer, HO=Hub Owner, IS=Inputs Supplier. Names shaded in green represent Persons with Disabilities.

spark the flow of information across a network. Most of the network's actors operating as effective connectors or helping information to flow were smaller players, including individuals such as farmers, hub owners and small-scale input suppliers (Table 4). Specifically, these individuals and smaller players were most likely to spark information flows between core network actors and more peripheral actors.

One Acre Fund was the only actor to feature among the top ten for both In-degree and Out-degree metrics. This organization appeared to have a strong degree of influence and popularity and could connect quickly with the wider network.

Closeness measures the distance each actor is from all other actors. In general, the actors with high Closeness can spread information to the rest of the network most easily and usually have high visibility of what is happening across the network. The organizations with the highest Closeness metrics were Kings/Mfalme Agrovets and Nyakadera Agrovets (Table 4). The list also includes a range of farmers and hub owners in each of the three target sub-counties. Notably, the top ten most influential farmers in the network based on the three measures of Centrality were female. If there is a need to disseminate information through the network, it takes these actors only a few steps to reach all other members and so it can happen relatively quickly. In contrast, other actors in the network may require many more steps.

Network Metrics by Actor Type

The network analysis also explored average network metrics by actor type in order to understand the most influential types of actors in the network more generally. The most influential actor groups in the network were agricultural associations, buyers/aggregators, NGOs, and hub owners (Table 5).

A total of six agricultural associations were named, mainly farmers' cooperative societies and organizations including CGA and Africa Food Systems Forum, a regional forum for African agriculture and sustainable food production. Agricultural associations had the highest average Degree metric (7.7), indicating that this group of actors had the highest number of connections in the network. On average, agricultural associations had one of the highest In-Degree metrics, indicating that they were the most popular and most influential actors in the network. They also had the highest Out-Degree metric, meaning that they were the most effective connectors in the network. In addition, these associations also had the highest metrics for trust, effectiveness, cost and services.

Table 5: Network Metrics by Actor Type

Actor Type	Average Degree	In-Degree	Out-Degree	Communication	Trust	Effectiveness	Cost	Service
Agricultural Association	7.67	3.50	4.17	53.8	31.3	32.3	30.3	31.0
Buyer-Aggregator	7.17	3.42	3.75	104.4	30.9	30.8	29.1	30.3
NGO	5.93	4.73	1.20	47.3	23.5	24.0	22.5	23.1
Hub Owner	5.50	2.25	3.25	62.8	23.3	23.1	22.3	23.3
Financial Services	5.22	2.22	3.00	63.3	23.1	23.4	23.6	23.7
Government	5.75	3.88	1.88	51.6	24.4	24.3	23.9	25.1
Farmer	4.51	0.22	4.29	48.1	18.8	18.9	17.8	18.8
Inputs Supplier	3.26	1.91	1.34	32.0	14.2	14.3	14.0	14.3
Agricultural Services	2.91	2.09	0.82	35.4	11.2	11.3	11.0	11.4
CBO	2.19	1.38	0.81	30.1	9.3	9.3	9.2	9.5

A total of 12 sorghum buyers/aggregators were identified in the network. This included Nyabon Enterprises, EABL as well as other individual buyers. Buyers/aggregators had a similarly high Degree metric (7.2), indicating that this group were among the most highly connected actors in the network. Buyers/aggregators had the highest metrics for effective communication in the network and were highly rated for their ability to disseminate information in the network. They also scored highly for trust, effectiveness, cost and services.

NGOs in the network (n=15) included SFEA, UDPK and One Acre Fund, as well as other international organizations implementing sustainable agriculture programs such as World Vision, Self-Help Africa and Nuru International. NGOs had one of the highest Degree metrics (5.93), and had relatively high scores for trust, effectiveness, cost and service.

Hub owners (n=16) were considered relatively well-connected based on their high Degree score (5.5) and scored relatively high on the communication metric. They were more likely to be considered effective communicators than experts. Farmers (n=45) were the most effective connectors in the network (4.29) although they had the lowest In-Degree score, suggesting that they were considered the least influential actors in the network.

Financial service providers (n=9) included banks, table banking groups, and government affirmative action funds), while government agencies (n=8) included county agricultural ministries, county extension service providers and national agricultural organizations and initiatives including KALRO and the National Agricultural and Rural Inclusive Growth Project (NARIGP). Both actor groups had moderate scores in terms of trust, effectiveness, cost and service. However, government actors had the second highest In-Degree score (3.88), meaning that they were considered one of the most influential actors in the network for expertise and information around sorghum farming, second only to NGOs. Community Based Organizations (e.g. farmers associations, OPDs, youth and women groups), inputs suppliers and agricultural service providers (e.g. crop protection, mechanization, storage) had the lowest average ratings for all metrics.

Conclusions and recommendations

Conclusions and recommendations from the network analysis are presented below. These include recommendations for how GLP-IF could strategically engage network members for enhanced outcomes and more sustainable impact.

Focus on network cohesion while addressing Network Density

While Network Density (the total number of connections in the network) is important, it is not the only - or best - metric affecting network health. It may be difficult to manage the flow and quality of information if a network is too dense, while a sparse network may leave many actors isolated from core activities.

However, the program may wish to take steps to strategically enhance Network Density. This is likely to contribute to a more useful and cohesive network for farmers. Information and services are likely to travel more easily and effectively across the network, and ultimately reach more farmers. This requires identifying and focusing on the right clusters and the right relationships. While SFEA is a very influential actor, increasing connections to SFEA does not seem to be critical. Instead, enhancing links among other disconnected actors is likely to have a greater impact.

Develop a strategy to prioritize and engage the most influential actors in the network according to the program's needs

The most influential actors in the network included SFEA, CGA and One Acre Fund. The program should identify the best ways to engage these actors and use them to create bonds and bridges between GLP-IF's core implementers and farmers. These actors can also play a role in disseminating knowledge in the network, and creating clearer pathways between farmers, input suppliers and aggregators. The program should decide which key network actors should be engaged in its different phases, and if there are opportunities to leverage existing relationships or resources. Table 6 and Table 7 provide a summary of key attributes for the network's most influential organizations and individuals. Additionally, they detail potential leverage points and recommended actions for working with each individual and organization.

Develop a strategy to link the hub with the Cereal Growers Association

The most prominent clusters in the network were SFEA and CGA. The program needs to develop a strategy on how to make links with CGA. The program should rethink how the hub connects to the CGA because CGA can be part of what is referred to as the 'root of a scale'⁷ in the hub model.

Develop a strategy to prioritize and engage the most influential groups of value chain actor groups in the network according to the program's needs

Besides CGA and SFEA, two central NGOs in the network, the most influential actor groups were agricultural associations, buyers/aggregators, and hub owners. The program should identify the best ways to engage these actor groups to increase cohesion and knowledge transfer across the network.

Agricultural associations: The program should develop a strategy to engage organizations such as CGA, Africa Food Systems Forum and farmers cooperative societies in Migori county. These types of organizations enjoy a high level of trust and influence in the network and are key to disseminating information within the value chain.

Aggregators/Buyers: Nyabon Enterprises is a highly influential aggregator in the county. The program should continue to engage and capitalize on Nyabon's influence in the network.

Hub owners: Several hub owners emerged as highly influential actors in the network. The program should develop a strategy to engage these individuals in connecting network actors and delivering information and services to farmers. While hub owners are mostly working independently, the program should decide if creating more cohesion and knowledge exchange among hub owners is useful.

Strengthen ties between farmers and other value chain actors, particularly financial service providers, OPDs, and cooperatives

The program should consider strengthening relationships between farmers and actors including financial service providers, OPDs and cooperatives. The analysis revealed that farmers did not have strong ties to these types of actors, and only one OPD was represented in the network. While farmers are less likely to rely on one another for information about sorghum farming, the program should pursue opportunities to create more cohesion and knowledge exchange among farmers. This would be best achieved by promoting farmers' enrollment in farmers associations and cooperative societies, which provide additional benefits such as access to agricultural inputs and services as well as financial support. The most influential farmers in the network were all female. The program should also explore opportunities for engaging highly influential farmers in disseminating knowledge to farmers.

⁷ The root of a scale is the note on which the scale begins in music.

Strengthen ties between farmers

Farmers did not indicate that they solicited sorghum-related knowledge from fellow farmers. This suggested that farmers may not value other farmers as influential knowledge sources when it comes to their agricultural practices. It is expected that the program should achieve strong connections between farmers. The program should therefore develop strategies of strengthening ties between the farmers for exchange of knowledge and best agricultural practices.

Table 6: Summary of key organizations in the network and potential leverage points

Actor	Key network attributes	Leverage points: opportunities to engage or work with this organization
<p>Cereal Growers Association (CGA) is a national non-profit member-based farmer organization, which was incorporated in August 1996. It brings together commercial cereal farmers to promote collective action for sustained improvement in their farming enterprises. and address industry challenges in Kenya.</p> <p>CGA works with industry stakeholders to provide services to its members. These stakeholders include government bodies, agricultural input suppliers, financial institutions, insurance companies, output buyers, development partners and NGOs.</p> <p>CGA offers cereal farmers a functional platform. This provides structure and links to business support services to grow their farming businesses and improve their livelihoods.</p> <p>More information is available at https://cga.co.ke</p>	<ul style="list-style-type: none"> - Strong Centrality: has many connections in the sorghum value chain; is an influential source of information and expertise. - High degree of popularity and closeness; despite its size, CGA can spread information within the network easily; it has excellent visibility of activities across the network. 	<ul style="list-style-type: none"> - Enrolling GLP-IF farmers in CGA farmer groups would offer: <ul style="list-style-type: none"> a. Access to credit through the Cereal Growers SACCO Society Ltd b. Increased bargaining power c. Access to information through various publications and bulk SMS platforms d. Access to extension and advisory services e. Sustainable support to farmers after the exit of GLP-IF - Engage GLP-IF farmers in activities such as CGA’s farmer field days. - Enhance lobbying and advocacy for GLP-IF’s farmers with disabilities by working through CGA’s platform and collective action mission. - Draw on CGA’s experience implementing sorghum commercialization projects in partnership with USAID, AgriFund and other development partners. - Identify opportunities to connect network managers and hub owners with CGA distributors and agro-dealers, and/or enhance existing relationships. - Leverage CGA’s extensive knowledge, relationships, and visibility in the sorghum value chain, and seek out connections with other valuable resources that can complement GLP- IF’s initiatives in the sector.

Actor	Key network attributes	Leverage points: opportunities to engage or work with this organization
<p>One Acre Fund supplies smallholder farmers with finance and training to grow more food and earn more money. The organization offers a full-service program in Eastern and Southern Africa. They work directly with farmers to provide:</p> <ul style="list-style-type: none"> • Quality farm products on credit, which farmers repay over the full growing season • Training for farmers on new agricultural practices and how to sell harvest surplus • Crop insurance and credit. <p>One Acre Fund also works with governments and private sector partners to expand access to quality agricultural services to all farmers.</p>	<ul style="list-style-type: none"> - Strong Centrality: has many connections in the sorghum value chain; is an influential source of information and expertise. - High degree of popularity and closeness; can spread information within the network easily; it has excellent visibility of activities across the network. 	<ul style="list-style-type: none"> - Leverage One Acre Fund’s relationships with public and private sector actors in the sorghum value chain, and seek links with other valuable connections to complement GLP-IF’s initiatives in the sector. - Identify opportunities to learn from One Acre Fund’s full-service model, which is similar to Syngenta Foundation East Africa’s hub model. - Identify opportunities to learn from One Acre Fund’s service model which provides farmers with credit and crop insurance. This could help address GLP-IF farmers’ most pressing constraints. - Determine how GLP-IF’s and One Acre Fund’s initiatives could complement each other by identifying areas of mutual interest based on existing activities in the sorghum value chain.

Actor	Key network attributes	Leverage points: opportunities to engage or work with this organization
<p>Yara East Africa is Kenya and Uganda’s leading crop nutrition company. It provides farmers with knowledge about effective practices to sustainably improve crop yields and quality, and so increase farmers’ profits. Yara EA Ltd is a subsidiary of Yara International SA.</p> <p>Yara East Africa has developed crop specific fertilizers and foliar micronutrient crop programs to supply complete balanced crop nutrition for a wide range of arable, horticultural, grassland, fruit, and forage crops. Yara has developed a broad fertilizer portfolio to increase the productivity of the main crop nutrition solutions. This translates to higher farmer and household incomes. Yara also offers capacity building programs to farmers. More information is available at https://www.yara.co.ke</p>	<ul style="list-style-type: none"> - Strong Centrality: many connections in the sorghum value chain; influential sources of information and expertise. - Is a moderately influential source of information and expertise in the network. 	<ul style="list-style-type: none"> - Leverage Yara’s vast experience training smallholder farmers on agronomic practices, fertilizer use and crop nutrition network managers and hub owners with Yara EA Ltd’s distributors, and/or enhance existing relationships. - Identify opportunities to connect GLP-IF network managers and hub owners with Yara EA Ltd’s distributors, and/or enhance existing relationships. - Leverage Yara’s extensive experience of agro-chemicals including training hub owners on crop nutrition and safe use of fertilizers.

Actor	Key network attributes	Leverage points: opportunities to engage or work with this organization
<p>Equity Bank is a regional financial services provider offering integrated financial services that socially and economically empower consumers, businesses, enterprises and communities.</p>	<ul style="list-style-type: none"> - Key bridging actor between two influential actors (One Acre Fund and Nyakadera Agrovet). 	<ul style="list-style-type: none"> - Identify opportunities to connect farmers with Equity’s short and medium term credit facilities designed to finance youth to establish Food and Agriculture related businesses.

Asili Sacco Asili Sacco Society Limited was established in 1972 and registered under the Cooperative Society Act. Initially, the society members formed the Ministry of Natural Resources but now, it has opened its common bond to accommodate all. Currently, the membership of the Sacco is 11,000 members, with 7 board members, 3 Supervisory members, and 31 staff members.

The Sacco has opened one branch in Muhurubay, Migori County.

- **Key bridging actor between two influential actors (One Acre Fund and Nyakadera Agrovet).**

- Identify opportunities to connect farmers with Asili’s short and medium term credit facilities to support sorghum production.

Table 7: Summary of key inputs suppliers in the network and potential leverage points

Actor	Key network attributes	Leverage points
<p>Local Agrovet</p> <ul style="list-style-type: none"> - Nyakadera Agrovet (Rongo) - Kings/Mfalme Agrovet (Rongo) - Kehancha Agrovet (Kuria East) 	<ul style="list-style-type: none"> - High degree of Closeness: can spread information within the network easily and have high visibility of activities across the network. - Strong Centrality: many connections in the sorghum value chain; influential sources of information and expertise. 	<ul style="list-style-type: none"> - Identify opportunities to engage these input suppliers in training and supporting farmers.

Annex: Data collection tool

Social Network Analysis

Global Labor Program – Inclusive Futures

Please read to respondent before starting the survey:

My name is [NAME]. I am working with Q-Data and Mapping Services, a local research company. I am conducting a survey of people who are involved in the sorghum value chain in Migori county. The study is intended to understand your relationship with various people and organizations that are involved in the sorghum industry. You were suggested to us by representatives of the Global Labor Program implemented by Sightsavers Kenya and its partners. This survey usually takes less than 30 minutes to complete, and we would appreciate your participation. Your participation in this survey is entirely voluntary. The analysis based on this survey will be used for learning purposes. Because the analysis will be looking at relationships between organizations, there will be parts of the analysis which include looking at specific organizations, and therefore your responses should not be considered as fully anonymous. We appreciate your openness and honesty.

Section 1: Respondent and firm/organization information

Read: First, I will ask some basic identifying information about you/your organization. These questions are meant to provide some background information about your business. Personal information is private and will not be shared publicly.

Respondent information	
1. Respondent first name:	
2. Respondent last name:	
3. Respondent's telephone:	
4. County:	
5. Sub-county:	
6. Gender:	

7. What category best describes your role in the sorghum value chain? (Select only one. Please read all responses before finalizing selection.)
- a. _____ Farmer [I grow less than 10 acres of sorghum on my farm, and I have an agreement to sell it to an EABL aggregator]
 - b. _____ Financial services provider [I provide financial services such as credit and crop insurance to sorghum farmers]
 - c. _____ Network manager [I have a direct contract with EABL to supply sorghum that I aggregate from a group of farmers]
 - d. _____ Inputs supplier [I provide inputs such as seeds, fertilizers, and agrochemicals to sorghum farmers]
 - e. _____ Buyer [I buy sorghum crop from farmers, but I do not have a contract with EABL]
 - f. _____ Hub owner [I provide support to sorghum farmers (inputs, market linkages and extension and advisory services) in collaboration with Syngenta Foundation]

- g. ____ Agricultural cooperative [I represent a farmers' association that either supplies members with seeds, fertilizers, and machinery, or helps farmers with services such as marketing, distribution, sales, and financing related to crop production].
- h. ____ Organizations for Persons with Disabilities (OPDs) [I represent a network or association of persons with disabilities who advocate for their own rights to equal opportunities and social inclusion].
- i. ____ Agricultural extension workers [I am a government employee who provides farmers with important information, such as seed varieties, crop management practices, marketing, and new technologies, and also improves farmers' knowledge through demonstrations, model plots, and training].
- j. Other [specify]

8. Do you have any form of disability? (Single response)

- a. ____ Yes
- b. ____ No

9. If yes, which type of disability? (Multiple responses)

- a. ____ Visual impairment (blind or low vision)
- b. ____ Hearing impairment (deaf or hard of hearing)
- c. ____ Deafblindness
- d. ____ Intellectual impairment
- e. ____ Psychosocial impairment
- f. ____ Multiple impairments
- g. ____ Other (please specify): _____

10. Do you have any full-time employees?

- a. Yes
- b. No (Skip to Q15)

11. If yes, how many: _____
12. Do you employ anyone with any form of disability? (Single response; for respondents with at least one full-time employee.)
- a. _____ Yes
 - b. _____ No
13. If yes, please specify the type(s) of disability. (Multiple responses. Please read all responses before finalizing selection.)
- a. _____ Visual impairment (blind or low vision)
 - b. _____ Hearing impairment (deaf or hard of hearing)
 - c. _____ Deafblindness
 - d. _____ Intellectual impairment
 - e. _____ Psychosocial impairment
 - f. _____ Multiple impairments
 - g. _____ Other (please specify): _____

Section 1a: Farmers only

14. Approximately how many years have you been farming sorghum?

15. On what size of land are you currently farming sorghum?
- a. _____ 1/8 acre or less
 - b. _____ About a 1/4 acre
 - c. _____ About a 1/2 acre
 - d. _____ About a full acre
 - e. _____ About 1 to 5 acres
 - f. About 6 to 9 acres
 - g. About 10 or more acres
16. Approximately how much revenue did you generate from selling your sorghum

crop last year?

- a. _____ KES 0 - 20,000
- b. _____ KES 20,001 - 40,000
- c. _____ KES 40,001 - 60,000
- d. _____ KES 60,001 - 80,000
- e. _____ KES 80,001 - 100,000
- f. _____ More than KES 100,000

17. Do you normally employ seasonal workers?

- a. _____ Yes
- b. _____ No

18. If yes, how many per season? _____

Section 2: Respondent and firm/organization information

Read: Now I will ask you some questions about how you/your firm interact/s with other groups of actors in the sorghum value chain. We understand that you may not know all of the interactions that members of your firm have with other actors, but please answer to the best of your knowledge. If you feel unable to answer a question on behalf of your firm, please let me know and I will note this.

19. Please think about all the organizations and individuals you normally interact with in the course of either producing, marketing, financing, or buying sorghum crop in Migori county. Please name up to 10 of the most important individuals or organizations that you have a relationship with in this line of business.

(Interviewer, probe for organizations/individuals including financial service providers, network managers, hub owners, inputs suppliers, buyers, agricultural cooperatives, OPDs and agricultural extension workers)

- i. _____
- ii. _____

- iii. _____
- iv. _____
- v. _____
- vi. _____
- vii. _____
- viii. _____
- ix. _____
- x. _____

20. How many years/months have you had this relationship? _____ years _____ months

21. Do you buy sorghum from this individual/organization?

- a. _____ Yes
- b. _____ No

22. Do you sell sorghum to this individual/organization?

- a. _____ Yes
- b. _____ No

23. Do you get information about sorghum farming from this individual/organization?

- a. _____ Yes
- b. _____ No

24. Do you receive financial services (e.g. credit, crop insurance) for your sorghum farming from this individual/organization?

- a. _____ Yes
- b. _____ No

25. Do you purchase agricultural inputs (e.g. sorghum seeds, fertilizers, or agrochemicals) for your sorghum crop from this individual/organization?

a. _____ Yes

b. _____ No

26. In the past six months, how many times have you communicated with this individual/organization in a month? _____ times

27. Using the following scale, please score how reliable/trustworthy this individual/organization is. **(Interviewer, please read all responses before finalizing selection.)**

1. _____ Very untrustworthy

2. _____ Somewhat untrustworthy

3. _____ Neutral

4. _____ Somewhat trustworthy

5. _____ Very trustworthy

28. Using the following scale, please score how effective the information and communication with this individual/organization is. **(Interviewer, please read all responses before finalizing selection.)**

1. _____ Very ineffective

2. _____ Somewhat ineffective

3. _____ Neutral

4. _____ Somewhat effective

5. _____ Very effective

29. Using the following scale, please score your level of satisfaction with the costs offered by this individual/organization **(Interviewer, please read all responses before finalizing selection.)**

1. _____ Very dissatisfied

2. _____ Somewhat dissatisfied

3. _____ Neutral

4. _____ Somewhat satisfied

5. _____Very satisfied

30. Using the following scale, please score your level of satisfaction with the quality of services from this individual/organization. (**Interviewer, please read all responses before finalizing selection.**)

1. _____Very dissatisfied

2. _____Somewhat dissatisfied

3. _____Neutral

4. _____Somewhat satisfied

5. _____Very satisfied

31. Please provide a contact number for this individual/organisation:

Thank and close