

# Social Network Analysis: Evaluation of the CGIAR Genebank Platform

*Shweta Anand, Sarah Humphrey, Stefania Sellitti, David Coombs,  
Hugh W. Pritchard, Jean-Louis Pham*

**Correct citation:** IAES (CGIAR Independent Advisory and Evaluation Service). (2023). Evaluation of the CGIAR Genebank Platform: Social Network Analysis. Rome: IAES Evaluation Function.  
<https://iaes.cgiar.org/evaluation>

# **Social Network Analysis: Evaluation of the CGIAR Genebank Platform**

*Authors: Shweta Anand, Sarah Humphrey,  
Stefania Sellitti, David Coombs, Hugh W.  
Pritchard, Jean-Louis Pham*

December 2023

## Acknowledgements

The Genebank Platform Evaluation Team is extremely grateful to IAES for facilitating the uptake of social network analysis (SNA). The team would like to acknowledge all those who guided and supported them throughout the process of evaluation data collection, as well as all those who responded quickly to enquiries and the online questionnaire. The team would like to acknowledge the constant feedback and support provided by Bia Carneiro throughout the process of conducting SNA in the evaluation of the Genebank platform and related knowledge management.

# Contents

<b>Acknowledgements</b> .....	<b>4</b>
<b>Figures</b> .....	<b>5</b>
<b>Boxes</b> .....	<b>5</b>
<b>Acronyms</b> .....	<b>6</b>
<b>Executive Summary</b> .....	<b>7</b>
<b>1 Introduction</b> .....	<b>10</b>
<b>2 Methodology</b> .....	<b>11</b>
<b>3 Discussion of SNA Findings</b> .....	<b>12</b>
3.1 Genebank Platform Professional Network .....	12
3.2 Relationships Between Partners and Their Interactive Patterns .....	14
3.3 Information Flows Within the CGIAR Genebank Platform .....	16
<b>4 Conclusions and Recommendations</b> .....	<b>17</b>
<b>5 Lessons from Using Social Network Analysis</b> .....	<b>19</b>
<b>References</b> .....	<b>21</b>
<b>Annex 1: Genebank Platform Professional Network Characteristics</b> .....	<b>23</b>
<b>Annex 2: Network of Communication and Interaction Patterns</b> .....	<b>25</b>
<b>Annex 3: Network Characteristics for Leadership and Management</b> .....	<b>26</b>

## Figures

Figure 1. Distribution of Respondents by Main Role in Their Place of Work.....	11
Figure 2. Genebank Platform Professional Network .....	13
Figure 3. Communication Patterns and Interactions Between Nodes or Partners on the Genebank Platform	15
Figure 4. Network of Organizations Illustrating Funding-Related Communication and Information Flows .....	16
Figure 5. Network of Organizations Showing Perceptions of Respondents as Regards Those Providing Leadership.....	18

## Boxes

Box 1: Key Terminology of SNA.....	12
------------------------------------	----

# Acronyms

AfricaRice	Africa Rice Center
CIAT	International Center for Tropical Agriculture
CIFOR	Centre for International Forestry Research
CIMMYT	International Maize and Wheat Improvement Center
CIP	International Potato Centre
CoP	Community of Practice
Crop Trust	Global Crop Diversity Trust
CRPs	CGIAR Research Programs
CSO	Civil society organization
EA	Evaluability assessment
FAO	Food and Agriculture Organization of the United Nations
GHU	Germplasm health unit
GIZ	German Agency for International Cooperation (Gesellschaft für Internationale Zusammenarbeit)
IAES	Independent Advisory and Evaluation Services (of CGIAR)
ICARDA	International Centre for Agricultural Research in the Dry Areas
ICRAF	International Centre for Research in Agroforestry
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IDO	Intermediate Development Outcome
IDRC	International Development Research Centre
IFPRI	International Food Policy Research Institute
ILRI	International Livestock Research Institute
IITA	International Institute of Tropical Agriculture
IPTA	Paraguayan Institute of Agricultural Technology
IRRI	International Rice Research Institute
NARS	National agricultural research (and extension) system

## Executive Summary

Social Network Analysis (SNA) is part of the 2023 evaluation of the Genebank Platform<sup>1</sup>. The purpose of the evaluation is to support the institutional learning of CGIAR and the Crop Trust and provide evidence on the efficiency and effectiveness of the Genebank Platform (from 2017 to 2021). The evaluation exercise also aims to identify good practices and lessons for the Genebanks Initiative, the Genetic Innovation Science Group and CGIAR more broadly. The evaluation approach and data collection followed a mixed-methods design, leveraging both qualitative and quantitative data from primary and secondary sources to answer evaluation questions, understand operating environments, and track contextual and programmatic assumptions. Eight key evaluation questions were framed along the five evaluation criteria: relevance, effectiveness, efficiency, coherence and added-value, and sustainability and learning for impact (see the CGIAR-wide [Evaluation Policy](#)). For more information about the overall methodology of the evaluation, see the [Inception Report](#).

**Purpose and methodology:** The SNA aimed to identify and delineate the main stakeholders and study the relationships between themselves and other stakeholders as they interacted on CGIAR's Genebank Platform. The analysis focused on comprehending the flows of information between these different partners and users. Filtering and cleaning data from the 186 responses received [to the evaluation survey] eventually led to a subset of 122 responses that were processed, along with subsequent matrices indicating the ties and other network characteristics analyzed using Gephi, an open-source software. The Fruchterman Reingold<sup>2</sup> algorithm was used to show the spatialization of nodes, as this visualization disposes nodes in a gravitational way (and this helps to distinguish communities). This was followed by Force Atlas 2<sup>3</sup> to disperse groups and give space around larger nodes. Noverlap, a repulsion force to prevent node overlap, was also used.

Four clear-cut network graphs—namely, professional network, communications and interaction pattern graphs, and graphs showcasing the network of nodes for leadership, and management decision-making and funding needs—were obtained from the data. Key clusters were identified, with emerging networks showing moderate network density (0.5), implying that the network of partners and users interacting over the Genebank Platform was moderately connected. Various centrality measures pointed to the significance of each node within a given social network and provided insights into the role that these nodes can play in improving the efficiency of the Genebank Platform.

**Findings:** The findings revealed that national agricultural research (and extension) systems (NARS) and non-CGIAR partners, such as Taraba State University (Nigeria) and the University of Cambridge (England), with the most incoming connections, were the most appropriate key collaborators for extending the on-the-ground reach of CGIAR and the Genebank Platform.

Furthermore, the results identified those partners with the most external linkages as having the potential to act as potential “broadcasters” of information and innovation. They included Alliance (Bioversity International-International Center for Tropical Agriculture [CIAT]), AfricaRice, World Agroforestry (CIFOR-ICRAF), Annamalai University (India) and Bowen University (Nigeria). These organizations were perceived as playing a vital role in

---

<sup>1</sup> <https://iaes.cgiar.org/evaluation/publications/cgiar-genebank-platform-evaluation>

<sup>2</sup> See Hansen, Schneiderman, Smith and Himelboim (2011). [see query in reference section re year of publication]

<sup>3</sup> See Jacomy, Venturini, Heymann and Bastian (2014)

broadcasting the right information and disseminating much-needed information on germplasm access and availability in a timely manner.

With nearly 40% of respondents reporting regular communication, study participants perceived emerging professional ties to be of great significance in ensuring the smooth functioning of the genebanks. For the majority of communication, germplasm health unit (GHU) managers, along with community of practice (CoP) leaders, remained the focal points of contact. It was found that there was communication and a flow of information pertaining to tasks related to: a) the functioning and sustenance of various genebank-related activities and b) fulfilling the needs of partner organizations and user groups. These included a flow of information on funding, seeking leadership and taking decisions with respect to knowledge dissemination.

When it came to communications in relation to seeking funding for various genebank activities, Bioversity International, CIAT and AfricaRice were perceived to be significant partners. Plant Resource Centre, Viet Nam, National Agricultural Research (and Extension) Systems (NARS) and Taraba State University, Nigeria were cited by the majority of respondents, with incoming connections to these entities indicating the frequent connections and communication that existed between them and other partner organizations in 2017-21 on issues related to funding.

These three organizations, along with other non-CGIAR partner organizations—such as the Malaysian Agriculture Research & Development Institute, Jimma University (Ethiopia), Kimen Seed Laboratory (Norway), Mc Gill University (Canada), Lilongwe University of Agriculture and Natural Resources (Malawi)—had stronger linkages with other influential partner organizations (such as Bioversity International, CIAT and AfricaRice) and showed a consistent flow of information. Bioversity International, CIAT and CIFOR-ICRAF emerged as "star players" that CGIAR could call on to get various tasks done. They are influential organizations that partner institutions call on to make management-related decisions.

**Conclusions:** The use of SNA in the evaluation study complemented and supplemented the three key criteria of relevance, effectiveness and coherence, and aided results obtained for the other three modules, namely, policy, conservation, and use. Key takeaways from the SNA included the need for CGIAR to continue its efforts to strengthen its relationship with the NARS in each country.

Triangulation of data from other modules, along with the use of SNA analysis, revealed that though the professional network of the Genebank Platform had CGIAR partner organizations—namely, Alliance Bioversity International - CIAT, the International Institute of Tropical Agriculture (IITA), the International Potato Centre (CIP), CIFOR-ICRAF and the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)—playing important roles in the conservation and policy modules, non-CGIAR partners had the potential to play a crucial role in meeting the requirements of the use module. They also have the potential to be pivotal in meeting the needs of farmers and other user groups in time and in ensuring that farmers and other user groups, whose focus is to enhance the conservation and use of genetic diversity *in situ*, are dealt with effectively.

The Genebank Platform acted as a hub where the exchange of information about core collections took place. SNA also revealed that the CGIAR partners worked hand in hand with non-CGIAR partners. The flow of communication between the various partners underscored the significant value of their professional relationships.

The SNA revealed that while the CGIAR partners could act as important broadcasters of information on access and availability of plant genetic material and accessions, the non-CGIAR partners' network could be leveraged to expand CGIAR's existing network with end users (farmers and community-based organizations). These non-CGIAR partners, especially NARS and academic and research institutions, act as

anchor points for region-specific subgroups of users when it comes to accessing relevant information on plant and crop diversity and their conservation. This will enable CGIAR to meet its objective of enhancing the reach and timely accessibility of germplasm by ultimate user groups (in other words, farmers).

Moreover, utilizing the broadcasting potential of nodes with high degrees of centrality will ensure the cost-effectiveness of future interventions. The strategic establishment of a hierarchy to empower local and influential partners could help to further empower these partners and motivate them to build the network and implement projects independently at ground level, thereby increasing overall effectiveness.

# 1 Introduction

SNA formed part of the [2023 Evaluation of the Genebank Platform](#). The purpose of the evaluation is to support the institutional learning of CGIAR and the Crop Trust and provide evidence on the efficiency and effectiveness of the Genebank Platform (from 2017 to 2021). The evaluation exercise also aims to identify good practices and lessons for the Genebanks Initiative, the Genetic Innovation Science Group and CGIAR more broadly. The evaluation approach and data collection followed a mixed-methods design, leveraging both qualitative and quantitative data from primary and secondary sources to answer evaluation questions, understand operating environments, and track contextual and programmatic assumptions. Eight key evaluation questions were framed along five evaluation criteria: relevance, effectiveness, efficiency, coherence and added-value, and sustainability and learning for impact (see the CGIAR-wide [Evaluation Policy](#)). For more information about the overall methodology of the evaluation, see the [Inception Report](#).

SNA is the investigation of social structures using networks and graph theory. It describes networked structures in terms of nodes (that is, organizations in the context of the current evaluation study) and the connections, edges, or links (that is, relationships or interactions) that connect them. Using SNA as a research methodology in the current evaluation proved to be advantageous in examining interconnections between various entities and occurrences within the Genebank Platform. The method was used to ascertain the primary actors and their interconnections in the given social framework. It examined the way in which the entities engaged with one another, either as individuals or collectives, and elucidated the interconnected networks of association between entities, as well as the diverse pathways through which these interactions unfolded.

SNA was used to analyze communications flow within the networks of partners and/or clients (including users) on the Genebank Platform. Here, it served as a valuable tool, augmenting the data and yielding insightful information into some of the key evaluation criteria, namely, the relevance, effectiveness and coherence of the Genebank Platform. In addition, connections and relationships were uncovered using data visualization.

This analysis sheds light on the platform's ability to function as a central player, facilitating useful partnerships and interactions between different stakeholders, both within and outside CGIAR (namely, Genebank centers, universities, NARS, advanced research institutes, genebanks, non-governmental organizations, farmer groups, and the private sector), and then meeting the requirements of its users.

**Consequently, the primary objectives of using SNA as a methodology are to:**

- identify the key partners and users within the Genebank Platform network from 2017 to 2021 that are essential to achieving organizational objectives effectively and efficiently
- identify and assess the strength of relationships between the key partners and users that can save time and effort in driving initiatives and identifying optimal paths for CGIAR
- recognize how information flows within the Genebank Platform network from 2017 to 2021 and try to establish preferential information flows.

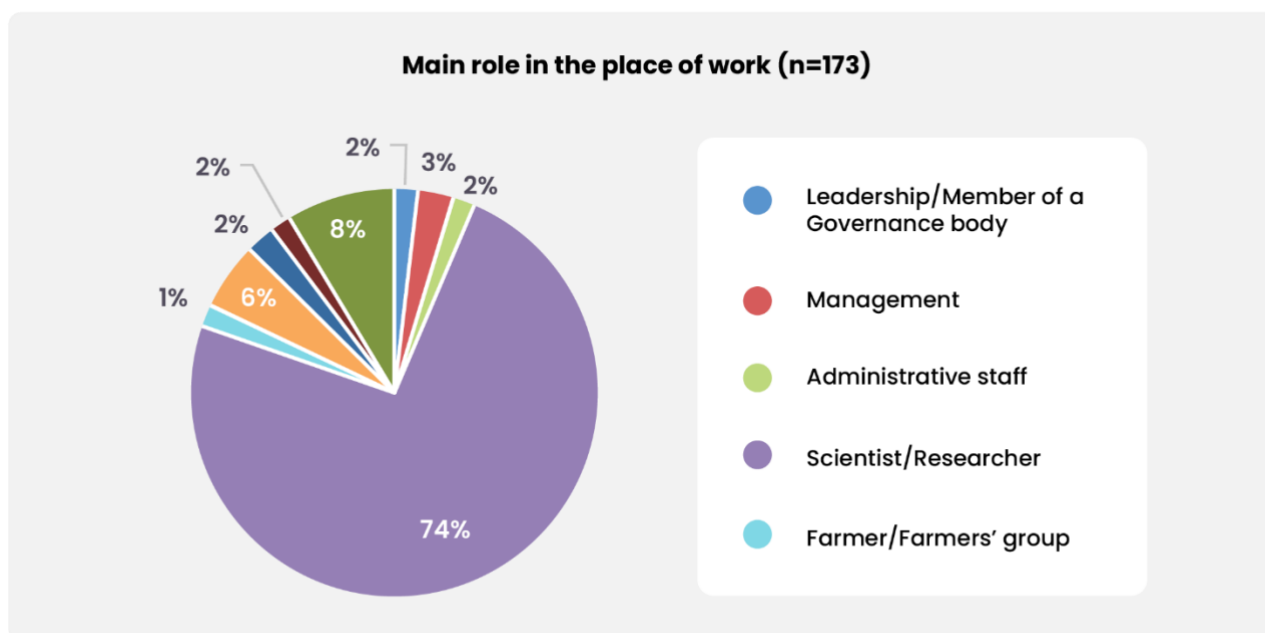
The data required to conduct the SNA were gathered concurrently with the data required to explore the Genebank Platform modules ("policy", "use" and "conservation"). Enquiries pertaining to the delineation of interactions and relationships were integrated into the primary survey instrument (an online questionnaire: <https://iaes.cgiar.org/evaluation/publications/evaluation-cgiar-genebank-platform-results-online-survey>) used for the evaluation assessment.

Of the 186 responses gathered for the SNA, 64 incomplete or unsuitable responses were excluded. The remaining 122 responses were analyzed using Gephi, an SNA software. The data, originally organized into an actor-by-actor matrix, were converted into sociographs. These graphs provided a visual representation of the network, with individuals or entities represented as nodes, and the connecting lines between nodes symbolizing their relationships.

## 2 Methodology

With the main aim to support the institutional learning of CGIAR and the Crop Trust and provide evidence on the efficiency and effectiveness of the Genebank Platform (in 2017–21), the evaluation team conducted an online survey, aligned to the [Inception report](#). Among other questions, the [online survey](#) contained questions on partnerships and interactions within the Genebank Platform. The respondents mainly comprised Genebank Platform personnel, internal and external partners, coordinators and members of CoPs, funders, and internal and external breeders. Most of them identified their key role as a scientist or researcher and declared themselves to be staff members of CGIAR breeding programs, genebanks, or GHUs working in the CGIAR centers.

**Figure 1. Distribution of Respondents by Main Role in Their Place of Work**



To glean information for SNA, these respondents were asked to identify the names of the organizations that formed part of the professional network of the Genebank Platform and those organizations with which they communicated on a regular basis to facilitate the day-to-day functioning of the platform. Questions were also asked in a bid to understand the kind of relationships that existed, the strength of those relationships, the frequency of communication, the nature of communication, and so on. The respondents from these organizations were also asked to list the names of organizations with which they communicated to seek leadership and other management decisions on the Genebank Platform; to seek funds; and to identify those organizations or groups that had considerable influence on decision-making and knowledge dissemination. The subsets of responses received were used to construct matrices, while the open-source software, Gephi, was used to import the matrices and plot network graphs.

**Box 1: Key Terminology of SNA**

- **Nodes** – represent the organizations the respondents were part of or had interacted or communicated with in 2017–21; they are also called key actors or players (in SNA terminology).
- **Edges** – represent links or connections of a node with other nodes in a network; they represent how the different partners or users within the Genebank Professional Network are connected to each other.
- **Average degree** – is a measure of how many connections each of the different partners or users within the Genebank Professional Network has.
- **Density** – quantifies how many of the possible connections in a given network are actually present.
- **Centrality measures** – are methods or measures for assessing the importance or influence of partners or users within the Genebank Platform.
- **Eigenvector centrality** – a measure that considers both a partner or user's connections and the influence of those connections; it measures a node's influence based on the number of links it has to other nodes in the network.
- **Eccentricity** – identifies partners or users that are well connected with other partners or users.
- **Outliers** – are partners or users in the Genebank Platform that behave differently to or have unique characteristics compared with the majority of other nodes.
- **Degree centrality** – is the number of edges a node has; the higher the degree, the more central the node is

## 3 Discussion of SNA Findings

### 3.1 Genebank Platform Professional Network

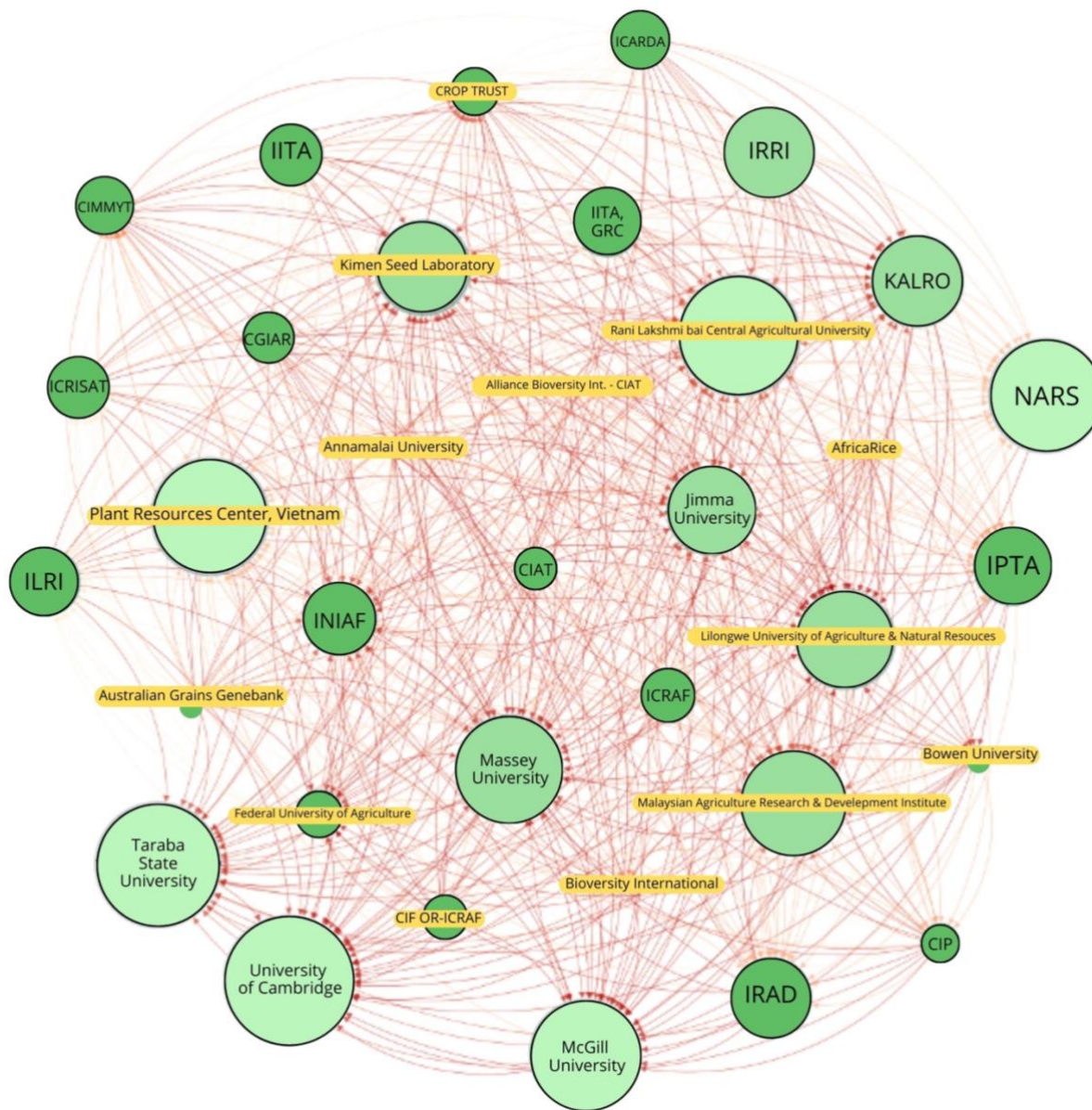
CGIAR has 2,289 partners collaborating on 32 initiatives and impact platforms, facilitated through its 15 centers (<https://www.cgiar.org/food-security-impact/new-results-dashboard/>). These partnerships largely entail needs-based and innovative research and publications by various CGIAR and non-CGIAR partners in the field of agriculture. The Genebank Platform supports the activities of the CGIAR genebanks and GHUs to conserve and make available crops, forage, and tree genetic resources, contributing to United Nations Sustainable Development Goal 2.5. Genesys, the online portal for genebank accession data, is a key part of the Plant Treaty's Global Information System. By the end of 2021, there were 4.2 million genebank accessions from 39 data providers.

In addition to collecting information to assess and analyze the use, conservation, and policy modules to evaluate the Genebank Platform, and to understand its relevance, efficiency, and effectiveness, the survey revealed information about respondents' perception of how various partners in the Genebank Platform network connect and interact. This analysis proved valuable to the SNA and helped the team to comprehend not only the structure of the network, but also the relationships and communication patterns the partners and/or users, and to supplement and complement data received for evaluation.

The key findings of the SNA analysis can be delineated under the following subheadings:

- ✓ the Genebank Platform professional network
- ✓ relationships between partners and their interaction patterns
- ✓ information flows between partners.

**Figure 2. Genebank Platform Professional Network**



Source: Sociographs were created using Gephi (an online software for SNA). The responses received for section on 'partnerships and interactions' from the online survey were utilized to create these maps.

<https://iaes.cgiar.org/evaluation/publications/evaluation-cgiar-genebank-platform-results-online-survey>

At the time of the study, the Genebank Platform professional network comprised 35 partners, boasting a network of 595 linkages and connections (see annexes). To identify the partners with the most connections (that is, those partners that other partners contacted most and who were most influential), a measure of in-degree centrality was used. The size of the nodes depicts partners with the most incoming connections from others. The bigger the size of the node, the more incoming connections it has, meaning that more and more people or organizations reached out to it for information. Hence, these nodes can be seen as influencers in the given network.

In case of the Genebank Platform professional network, it was found that the NARS and the non-CGIAR partners, such as Taraba State University and the University of Cambridge, had the most incoming connections. This implied that many of the organizations both within and outside the cohort were reaching out to these organizations for information and other related needs. These organizations emerged as key influencers, who can help the Genebank Platform to expand and connect with more partners.

### 3.2 Relationships Between Partners and Their Interactive Patterns

The findings revealed that the partners interacted in numerous ways to contribute to achieving the organizational goals of CGIAR. According to the survey, respondents agreed that the platform facilitated the exchange of information and genetic material and promoted collaboration among genebanks. Ensuring this collaboration, and to support the efficient management and distribution of germplasm, the CGIAR Genebank Platform must enable smooth coordination among both internal and external partners, which can only happen if there are good professional ties between personnel in an organization.

The respondents were, therefore, asked for their perceptions of the significance of existing professional ties within the Genebank Platform professional network. The majority of partners perceived these ties to be good and significant. Nearly 40% perceived them to be highly significant and important to the functioning of the platform.

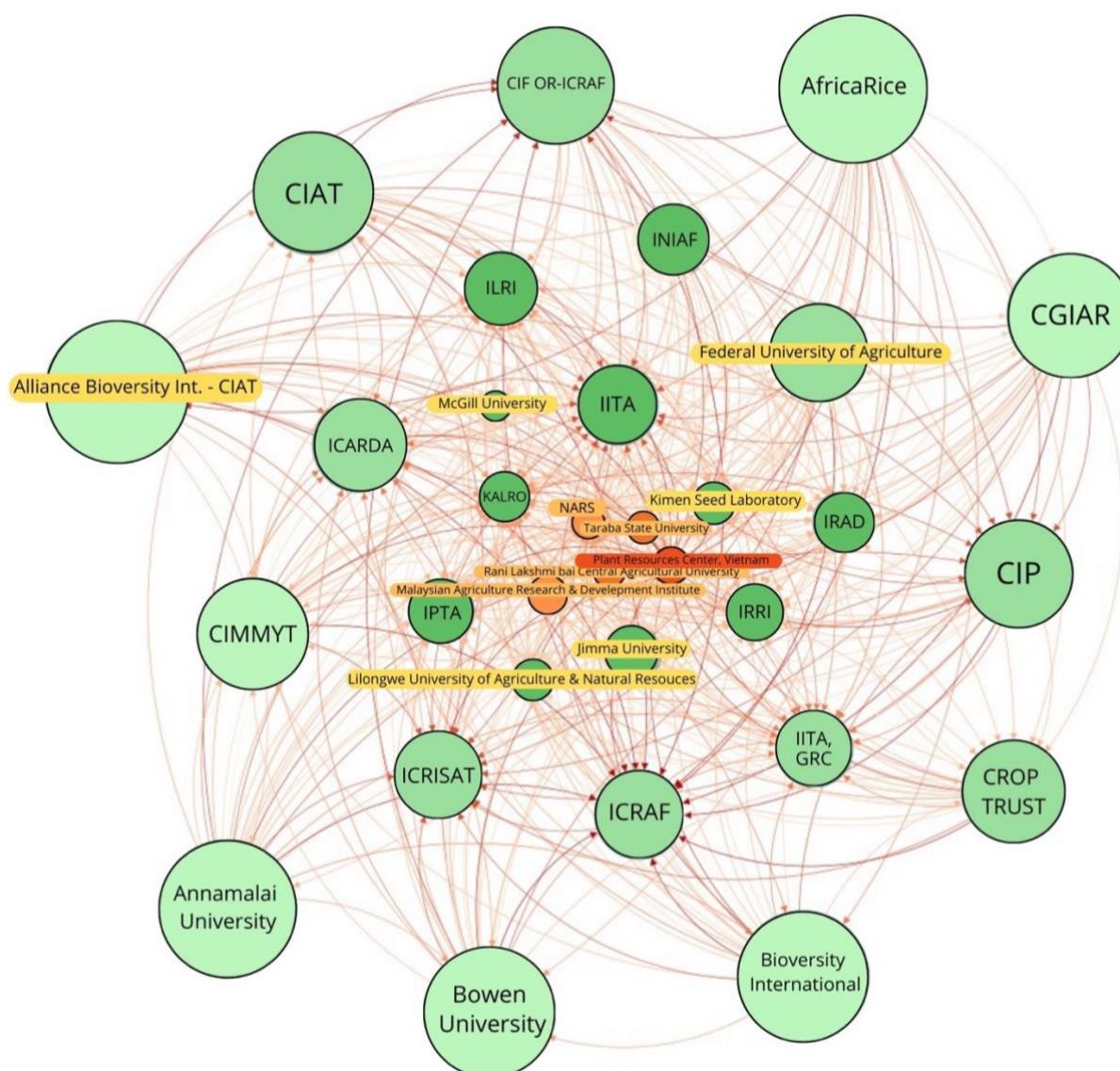
To explore the interaction patterns, respondents were asked about the frequency with which they used it to communicate with the various partner organizations for any genebank-related work. Nearly one-fourth (24.5%) reported having communicated at least once or twice a year. Another 38% reported having regular communication on a daily or weekly basis. Nearly one-third (33%) communicated with the GHU managers, while another 20% communicated with the leaders of CoPs.

Further exploration into the ways in which personnel from the various partner and user organizations interacted with one another found that their communications ranged from interacting with some partners to ensure the smooth functioning of day-to-day tasks and activities pertaining to the Genebank Platform to seeking guidance on funding, knowledge dissemination and leadership.

Figure 3 shows the interaction patterns that existed between partners and users in 2017-21. The network graph reveals that there were 32 partners interacting with almost 496 organizations to facilitate various day-to-day activities of the Genebank Platform (for more information, see annex). On average, each partner was seen to interact with nearly 15 other partner organizations on a regular basis.

The size of the nodes in Figure 3 depicts their out-degree centrality (that is, the number of outside connections of a node or partner organization). The bigger size of an individual node indicates that the node can reach out to more partners easily and is capable of quickly disseminating information. The findings further revealed those partners with more outside linkages, which could act as possible "broadcasters" of information and innovation, to be: Alliance Bioversity International-CIAT, AfricaRice, CIFOR-ICRAF, Annamalai University, India, and Bowen University, Nigeria.

**Figure 3. Communication Patterns and Interactions Between Nodes or Partners on the Genebank Platform**



Source: Sociographs were created using Gephi (an online software for SNA). The responses received for section on 'partnerships and interactions' from the online survey were utilized to create these maps.

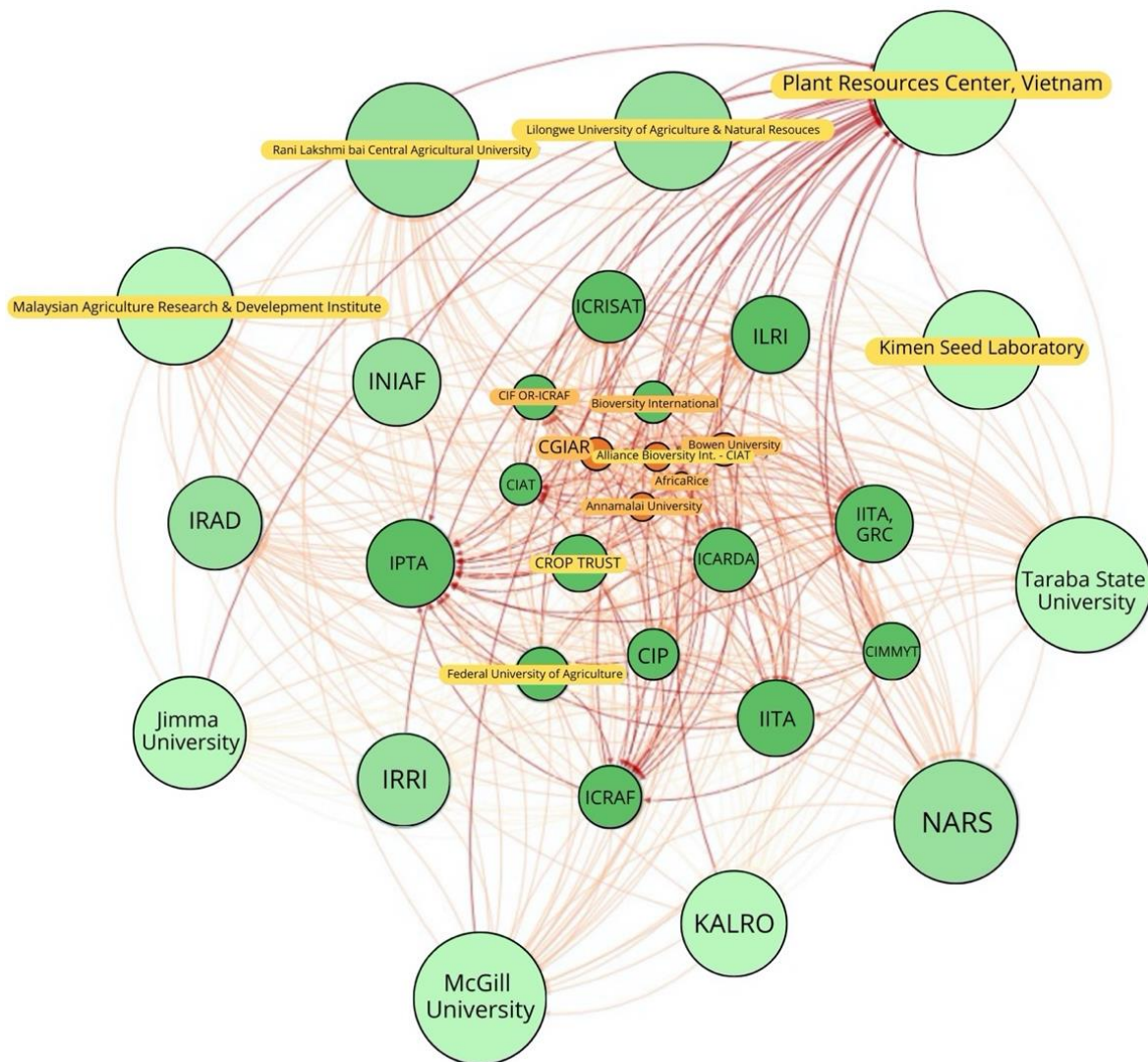
<https://iaes.cgiar.org/evaluation/publications/evaluation-cgiar-genebank-platform-results-online-survey>

Figure 3 also shows that all partner organizations were well connected with other internal and external partner organizations and users. Among the CGIAR genebanks, Bioversity International, CIAT, CIP, IITA, ICRISAT and ICRAF are well connected. Among the non-CGIAR partners, academic institutions including Bowen University and Annamalai University were found to be well connected with other partner organizations within their own individual networks. These partners were seen to interact over the CGIAR Genebank Platform to access relevant information related to germplasm and plant breeds, and they acted as nodal points of contact for other researchers, scientists, and user groups.

### 3.3 Information Flows Within the CGIAR Genebank Platform

Figure 4 represents information flows between partners interacting over the Genebank Platform for various organizational tasks and activities. Analysis found presence of communication and that a flow of information pertaining to tasks related to: a) the functioning and sustenance of various genebank-related activities and b) fulfilling the needs of the partner organizations and user groups. These included the flow of information with regard to funds, seeking leadership and taking decisions with respect to knowledge dissemination.

**Figure 4. Network of Organizations Illustrating Funding-Related Communication and Information Flows**



Source: Sociographs were created using Gephi (an online software for SNA). The responses received for section on 'partnerships and interactions' from the online survey were utilized to create these maps.  
<https://iaes.cgiar.org/evaluation/publications/evaluation-cgiar-genebank-platform-results-online-survey>

The [2023 Genebank Evaluation report](#) points to the need for stable funding as a key driving factor in enabling progress on CGIAR's institutional goals. Harnessing the network of different organizations that

interact with one another to seek important information pertaining to funding for various related genebank activities is relevant to the evaluation. It was found that the information flow on issues pertaining to funding happened between 32 partners, which represented the queries and concerns of some 496 partner organizations. The respondents were asked to recall the organizations with which they had communicated more on funding-related queries in 2017–21. Here, Bioversity International, CIAT and AfricaRice were perceived to be significant partners. It was found that though the majority of funding-related queries were routed through CGIAR, the Crop Trust and Alliance Bioversity International-CIAT, the majority of respondents cited the Plant Resource Centre, Viet Nam, along with NARS and Taraba State University, Nigeria. The incoming connections to these three entities indicated frequent connections and communications between them and other partner organizations in 2017–21 on issues related to funding. These non-CGIAR partner institutions, along with others such as the Malaysian Agriculture Research & Development Institute, Jimma University (Ethiopia), the Kimen Seed Laboratory, McGill University (Canada), and the Lilongwe University of Agriculture and Natural Resources (Malawi), had stronger linkages with other influential partner organizations (namely, Bioversity International, CIAT and AfricaRice) and showed a consistent flow of information.

## 4 Conclusions and Recommendations

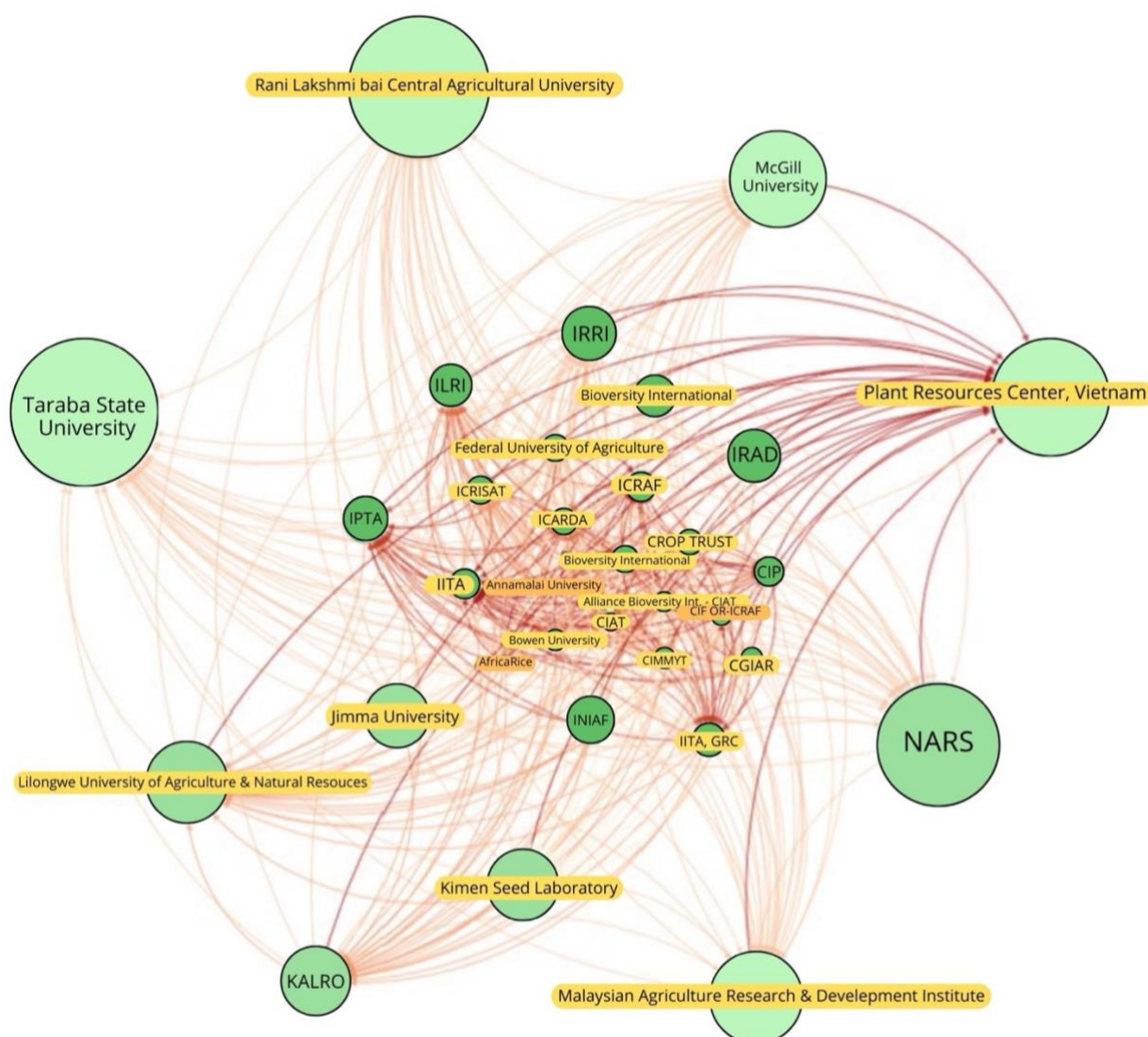
The Genebank Platform aims to increase germplasm access and enhance collaboration between CGIAR and various national research centers. This will entail building a network where there is quick access to information on the availability of germplasm and the supply of viable seeds, guidelines, materials, and duplication tools. Key priorities include training, capacity building, enabling quick response mechanisms, and the independent funding of projects.

SNA of the Genebank Platform based on respondent perceptions, per the survey, aimed to understand how to best use the existing network of partners and users to bring about greater efficiency for CGIAR. The SNA of CGIAR's Genebank Platform has enabled the identification of key actors and given an understanding of their roles within the larger network and its communications ecosystem.

**Key partners and users within the Genebank Platform network from 2017 to 2021 are essential to achieving organizational objectives effectively and efficiently.**

The survey had inherent limitations related to its respondents: survey participants were mainly scientists and researchers from CGIAR partners. This would have prevented the team from drawing out perceptions about the kind of communications taking place at organizational level, especially with respect to the use of the Genebank Platform and its effectiveness. However, the given set of data provided significant pointers as to the key partners. As an organization, CGIAR conceived of the Genebank Platform as a communications space in which partners would interact among themselves and with other stakeholders, including breeders, farmers, and national agricultural systems (NARS), to meet the larger goal of conservation of plant genetic material and to ensure easy access and availability.

**Figure 5. Network of Organizations Showing Perceptions of Respondents as Regards Those Providing Leadership**



Source: Sociographs were created using Gephi (an online software for SNA). The responses received for section on 'partnerships and interactions' from the online survey were utilized to create these maps.

<https://iaes.cgiar.org/evaluation/publications/evaluation-cgiar-genebank-platform-results-online-survey>

Triangulating data obtained from the three modules<sup>4</sup>, along with the use of SNA analysis, revealed that though the professional network of the Genebank Platform had CGIAR partner organizations (namely, Alliance Bioversity International - CIAT, IITA, CIP, CIFOR-ICRAF and ICRISAT) playing important roles in the conservation and policy modules, non-CGIAR partners have the potential to play a crucial role in meeting the requirements of the use module. They also have the potential to be pivotal in meeting the needs of farmers and other user groups in time and in ensuring that farmers and other user groups, whose focus is

<sup>4</sup> Executive summaries of module reports to be featured in Annex to the evaluation report.

<https://iaes.cgiar.org/evaluation/publications/cgiar-genebank-platform-evaluation>

to enhance the conservation and use of genetic diversity *in situ*, are dealt with effectively. This would strengthen the use module.

The SNA revealed that while the CGIAR partners can act as important broadcasters of information on access to and the availability of plant genetic material and accessions, the non-CGIAR partners' network can be leveraged to expand CGIAR's existing network to its end users (farmers and community-based organizations). These non-CGIAR partners, especially NARS and academic and research institutions, act as anchor points for region-specific subgroups of users when it comes to accessing information on plant and crop diversity and their conservation.

Consequently, to advance organizational efficiency and effectiveness, CGIAR should continue to strengthen its relationships with NARS in each country and work in close collaboration with them. This will increase the reach and accessibility of information and germplasm available in CGIAR genebanks among civil society organizations and farmers' groups in each country.

### **1. Strength of relationships among the key partners**

As the strength of relationships between collaborators is essential to achieving organizational effectiveness, the perceived Importance of professional ties can be seen as advantageous to the functioning of CGIAR. The platform acted as a hub where new relationships emerged between partners. The limited responses to and bias of those who attempted the survey highlight the lack of limited understanding of the nature and type of strength of relationship between partners and end users.

### **2. Preferential information flows that can help to reduce the cost and increase the effectiveness of the organization can be visualized in a clustered approach.**

Partnerships can be used to enrich collaborations between CGIAR and key influential players (with a high degree of centrality), so that they can participate in key initiatives to help achieve organizational goals that would otherwise not be possible due to CGIAR's low proximity to end users (such as farmers' groups). Funding for projects optimized through this "influencer group" setup can help less active partners and end-user groups manage their objectives in line with CGIAR's larger objectives.

Furthermore, organizational leaders (real and perceived) among strategic partners can help establish a hierarchy that empowers certain partners to act on behalf of CGIAR and take key decisions to strengthen and build the network on the ground, or to manage projects in their own circle of influence that are governed by their cluster's uniqueness, such as language, culture, social setup, climate, local governance, and so on.

The different social graphs that have been established in this study can help pick tasks by priority, for example: building out the professional network, followed by assigning key roles to partners on certain project initiatives, followed by leadership roles among key influencers, followed by organizational communication and knowledge dissemination, and finally assigning funds among partners. This could even help optimize funding issues.

## **5 Lessons from Using Social Network Analysis**

- 1) SNA facilitates comprehension of socio-institutional structures, actors and linkages, as well as ways to improve information and knowledge transfer. However, limited number of complete attempts limited the richness of data.

- 2) A primary constraint of the online survey is its reach to a rather restricted number of respondents within specific groups, which hindered the ability to conduct a comprehensive and detailed analysis.
- 3) Apart from its online survey-related limitations and dependence, SNA is a study that has limitations in terms of data availability, model assumptions, resource constraints, parameter estimation, and inference validity.
- 4) The respondents were mostly from internal partners of CGIAR and belonged to the scientist or research community. Hence, an elaborate data comprising responses from other stakeholder groups (especially farmer groups, academic institutions etc.) can be taken up to get more details<sup>5</sup>.
- 5) The purpose of the survey was to figure out interaction and knowledge exchanges between various entities. However, sufficient data on the entities' extended networks and their connections to user groups could not be gleaned due to the limited time available.
- 6) Lastly, due to the expansive nature of the Genebank Platform, creating sociographs that accurately represented the various network actors could be challenging.

---

<sup>5</sup> The data collected in the [online survey](#) for the Genebank platform evaluation had more people who belonged to a limited category (mainly scientists, Researchers, CGIAR centre staff/ GHU staff) hence, primary data from end users could not be taken due to inherent limitations of the study (time etc.) hence data from end users like farmers, non-CGIAR partners like universities etc. if taken would have helped in more explicit and multi-variate analysis.

## References

### CGIAR-RELATED DOCUMENTS

CGIAR Genebank Platform. (2017). *Governance and Management of the Genebank Platform*. Rome. <https://www.genebanks.org/the-platform/governance-and-management/>

CGIAR Genebank Platform. (2018). *Annual report 2017: CGIAR Genebank Platform*. Rome. <https://www.genebanks.org/wp-content/uploads/2018/11/2017-Genebank-Platform-Annual-Report.pdf>

CGIAR Genebank Platform. (2019). *Annual report 2018: CGIAR Genebank Platform*. Rome. <https://www.genebanks.org/wp-content/uploads/2019/06/2018-Genebank-Platform-Annual-Report.pdf>

CGIAR Genebank Platform. (2020). *Annual report 2019: CGIAR Genebank Platform*. Rome. <https://www.genebanks.org/wp-content/uploads/2020/07/2019-Genebank-Platform-Annual-Report.pdf>

CGIAR Genebank Platform. (2021). *Annual report 2020: CGIAR Genebank Platform*. Rome. <https://www.genebanks.org/wp-content/uploads/2021/06/2020-Genebank-Platform-Annual-Report.pdf>

CGIAR Genebank Platform. (2022). *Annual report 2021: CGIAR Genebank Platform*. Rome. [https://www.genebanks.org/wp-content/uploads/2022/06/2021-Genebank-Platform-Annual-Report\\_21June2022.pdf](https://www.genebanks.org/wp-content/uploads/2022/06/2021-Genebank-Platform-Annual-Report_21June2022.pdf)

CGIAR (2021). CGIAR Genebank Platform Summary Report 2017–2021. Rome. <https://cgspace.cgiar.org/bitstream/handle/10568/120356/Genebank-Platform-Summary.pdf?sequence=3>

ICRAF (International Centre for Research in Agroforestry). (2020). *Genebank review*. Nairobi. <https://www.genebanks.org/resources/genebank-reviews/>

ICRISAT (International Crops Research Institute for the Semi-Arid Tropics). (2020). *Genebank review*. Patancheru, India. <https://www.genebanks.org/resources/genebank-reviews/>

Independent Science for Development Council. (2022). *Identifying and Using CGIAR's Comparative Advantage*. Rome: CGIAR Independent Advisory and Evaluation Service.

### REFERENCES FOR SOCIAL NETWORK ANALYSIS

Clauset, A. and Moore, C. (2003). *How do networks become navigable?* Ithaca, NY: Cornell University. <http://arxiv.org/pdf/cond-mat/0309415.pdf>

Ekboir, J.M. (2002). Developing no-till packages for small-scale farmers. In Ekboir, J. (Ed.). *World Wheat Overview and Outlook*. El Batán, Mexico: CIMMYT (International Maize and Wheat Improvement Center).

Ekboir, J., Canto, G.B. and Sette, C. (2013). *Monitoring the composition and evolution of the research networks of the CGIAR Research Program on Roots, Tubers and Bananas (RTB)*. Rome: ILAC and CGIAR. <https://www.researchgate.net/publication/256667172>

Hansen, D., Schneiderman, B., Smith, M. and Himelboim, I. (2011). *Analyzing Social Media Networks with NodeXL: Insights from a Connected World*. Elsevier Inc. <https://www.sciencedirect.com/topics/computer->

[science/reingold-](#)

[layout#:~:text=The%20Fruchterman%2DReingold%20layout%20is,the%20energy%20of%20the%20system](#)

Horton, D., Prain, G. and Thiele, G. (2009). *Perspectives on Partnership: a Literature Review*. Working Paper 2009-3. Lima: CIP (International Potato Center).

Jacomy, M., Venturini, T., Heymann, S. and Bastian, M. (2014). ForceAtlas2, a continuous graph layout algorithm for handy network visualization designed for the Gephi software. *PLoS One*, 10;9(6): e98679.

Lyrette, J. (2002). Innovations through linkages and networks at the National Research Council: measuring the output. In de la Mothe, J. and Link, A.N. (Eds.). *Networks, Alliances and Partnerships in the Innovation Process*. Boston, MA: Kluwer Academic Publishers.

Marschall, M. (2012) *Methodological Pitfalls in Social Network Analysis: Why Current Methods Produce Questionable Results*. Saarbrücken, Germany: AV Akademikerverlag.

Newman, M.E.J. (2003). The structure and function of complex networks. *SIAM Review*, 45: 167–256.

Newman, M.E.J. (2004). Coauthorship networks and patterns of scientific collaboration. *Proceedings of the National Academy of Science of the United States of America*, 101(Suppl. 1): 5200–5205.

Scott, J. (2000). *Social Network Analysis: A Handbook*, Second Edition. London, UK, Sage Publications Ltd.

Stokes, T.D. and Hartley, J.A. (1989) Coauthorship, social structure and influence within specialties. *Social Studies of Science*, 19: 101–125.

# Annex 1: Genebank Platform Professional Network Characteristics

Genebank Platform Professional Network Characteristics	
Nodes	63
Edges	1279
Network overview	
Average degree	20.302
Average weighted degree	31.46
Network Diameter	2
Graph density	0.327
Connected components	2
Community detection	
Modularity	0.129
Statistical inference	1914.254
Node overview	
Average clustering coefficient	0.439
Edge overview	
Average path length	1.139

Evaluation of CGIAR GENE BANK Platform Module Study: Social Network Analysis (SNA)

ID	Label	Interval	Weighted	Weighted	Weighted	In Degree	Out Degree	Degree	Eccentric	Closenes	Harmonic	Between	Authority	Hub	PageRank	Inferred C	Modulari	Eigenvect	Component ID
Source	Source		0	2	2	0	2	2	1	1	1	0	0	0	0.00777	0	2	0	0
Target	Target		1	0	1	1	0	1	0	0	0	0	0	0	0.01108	0	1	0	0
Links	Links		1	0	1	1	0	1	0	0	0	0	0	0	0.01108	0	0	0	0
AfricaRice	AfricaRice Center		0	82	82	0	49	49	1	1	1	0	0	0.21971	0.00777	1	52	1	5
Alliance B	Alliance Bioversity I		1	80	81	1	45	46	2	0.95918	0.97872	0	0.0077	0.21559	0.00791	1	51	1	1
4	4		50	0	50	16	0	16	0	0	0	0	0.10222	0	0.01322	1	20	1	11
Alliance E	Alliance Bioversity		2	78	80	2	46	48	1	1	1	0.29167	0.01527	0.21864	0.00806	1	50	1	4
5	5		23	0	23	9	0	9	0	0	0	0	0.0598	0	0.01032	1	26	1	5
Alliance E	Alliance Bioversity I		3	76	79	3	44	47	2	0.97826	0.98889	0.125	0.02293	0.21635	0.00821	1	49	1	3
Alliance E	Alliance Bioversity		4	74	78	4	40	44	2	0.91667	0.95455	0	0.03052	0.20513	0.00837	1	48	1	2
2	2		147	0	147	29	0	29	0	0	0	0	0.16912	0	0.02897	1	7	1	21
Alliance E	Alliance Bioversity I		5	72	77	5	38	43	2	0.89583	0.94186	0	0.03771	0.19788	0.00854	1	47	2	8
McGill Ur	McGill University		36	10	46	36	6	42	2	0.8	0.875	0	0.20063	0.0431	0.0302	1	11	2	18
NARS	NARS		37	8	45	37	7	44	1	1	1	10.4741	0.20214	0.04641	0.03448	1	10	2	19
Plant Res	Plant Resources Ce		38	6	44	38	5	43	1	1	1	3.38095	0.20377	0.0348	0.03867	1	8	2	13
Rani Laks	Rani Lakshmi bai Ce		39	4	43	39	3	42	1	1	1	0	0.20499	0.02168	0.04524	1	6	2	4
Taraba St	Taraba State Unive		40	2	42	40	2	42	1	1	1	0	0.20575	0.01447	0.05807	1	5	2	24
World Ag	World Agroforestry		41	0	41	41	0	41	0	0	0	0	0.20625	0	0.08276	1	3	2	23

## Annex 2: Network of Communication and Interaction Patterns

Network of Communication and Interaction Patterns	
Nodes	53
Edges	1023
Network overview	
Average degree	19.302
Average weighted degree	32.528
Network Diameter	2
Graph density	0.371
Connected components	2
Community detection	
Modularity	0.1
Statistical inference	1457.168
Node overview	
Average clustering coefficient	0.441
Edge overview	
Average path length	1.07

## Annex 3: Network Characteristics for Leadership and Management

Network Characteristics for Leadership and Management	
Nodes	55
Edges	1019
Network overview	
Average degree	18.527
Average weighted degree	31.345
Network Diameter	2
Graph density	0.343
Connected components	2
Community detection	
Modularity	0.105
Statistical inference	1477.638
Node overview	
Average clustering coefficient	0.433
Edge overview	
Average path length	1.125



Independent  
Advisory and  
Evaluation  
Service

**Independent Advisory and Evaluation Service**

Alliance of Bioversity International and CIAT

Via di San Domenico, 1 00153 Rome, Italy

[IAES@cgiar.org](mailto:IAES@cgiar.org)

<https://iaes.cgiar.org/>