

Full Length Research Paper

Networks and coalitions in the implementation of the international treaty on plant genetic resources for food and agriculture in Uganda

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Uganda acceded to the International Treaty for Plant Genetic Resources for Food and Agriculture (ITPGRFA) in the year 2003. Despite this, there are still gaps in implementation of the treaty in the country. The article provides insights into the systemic interactions and coalitions among actors in the implementation of the treaty and subsequent barriers to the implementation of the ITPGRFA. Using social network analysis, the interactions of 26 key policy actors are mapped for 4 main expertise networks that are important for implementation of the treaty; that is, the policy direction networks; scientific expertise; financial expertise; and legal networks in order to identify gaps for further action. Findings indicate that the linkages between actors are poor especially in the legal expertise and policy direction networks where the competent authority for the treaty does not have efficient connections with critical and non-critical actors. Many key actors are also excluded from the network leading poor information and resource flows among stakeholders implementing the treaty. In the interim, a memorandum of understanding has been signed by three major institutions that are key to establish clear processes for implementation of the treaty and establishing clear guidelines for access and benefit sharing and clear roles of institutions involved in the policy development and implementation. Key lessons learned from this research are that networks and coalitions are important for fostering information and exchange of expertise to enable effective implementation or domestication of the international treaty (IT). The structured engagement of other non-governmental stakeholders such as non-governmental organisations (NGOs) and international organizations that provide financial and technical support for various aspects of policy implementation is also important.

Key words: Policy implementation, policy networks, international treaty for plant genetic resources for food and agriculture (ITPGRFA), Uganda.

INTRODUCTION

Uganda is a party to the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA).

Having deposited instruments of accession on 25 March 2003, Uganda is obliged to provide facilitated access to genetic resources of 64 crops and forages that are under the management and control of the national government, and in the public domain. In return, Ugandan organizations and individuals are entitled to facilitated access to Plant Genetic Resources for food and Agriculture (PGRFA) of the same 64 crops held by the other 133 Treaty member states as part of the multilateral system (MLS) of access and benefit sharing (ABS). The process of national level Treaty implementation and domestication in Uganda has been going since 2003, necessitating both institutional and collaborative efforts to meet Treaty obligations. In 2015, Uganda also acceded Nagoya Protocol which governs access and benefit sharing (ABS) of all genetic resources.

The MLS is an efficient, effective and transparent system intended to facilitate access to and share PGRFA in a fair and equitable way. All other Annex 1 PGRFA in Uganda, which is under the management and control of farmers' or private collection holders are not automatically included in the MLS but can be voluntarily shared. In addition, non-annex 1 PGRFA of any other crops and forages are not included in the MLS. All PGRFA not included in the MLS must be accessed pursuant to 2007 ABS regulations which sets our procedures for acquiring Prior Informed Consent (PIC) under Mutually Agreed Terms (MAT).

This law was instituted in Uganda in 2003 to implement access and benefit sharing norms pursuant to the Convention on Biological Diversity. Now that Uganda has ratified the Nagoya Protocol, the Access and Benefit Sharing laws will need to be revised. Both international agreements that is, the International Treaty and the Nagoya Protocol have *national focal points* responsible for information sharing and exchange and providing clear procedures for accessing genetic resources and appoints *competent authority* responsible for granting access or, as applicable, issuing written evidence that access requirements have been met. The key measures for a country's implementation of the Treaty include:

1. Creating legal space for its implementation
2. Notifying the treaty secretariat of materials which are held by public institutions and therefore in the MLS
3. Providing a clear process for access to PGRFA in Annex1 and non-Annex 1 PGRFA; and
4. Promoting farmers' rights and incentives for voluntary inclusions of materials not in the MLS and held by natural and legal persons including potentially, implementing aspects of Farmers Rights.

It should also include various forms of capacity building

for different stakeholders to be able to take advantage of the diversity that is available in the multilateral system, helping to know what is there, how to identify potentially useful materials given their needs, to request it. (Halewood et al, 2013).

Although Uganda has provided legal space for the implementation of the Treaty through various Acts and guidelines, little progress has been made on the other three measures. Until recently, Uganda had not notified the Treaty of materials held by publicly funded institutions partly due to limitations in law but also as a result of poor information exchange among public institutions holding materials that are in the MLS. The processes for access of PGRFA are still under review; and roles of institutions involved are yet to be defined in the draft national PGRFA policy and strategy. To date, Uganda has not addressed Article 9 of the ITPGRFA regarding farmers' rights and there are no modalities or incentives for voluntary inclusion of materials into the MLS by farmers. While part of the problem could be due to the lack of a policy, legal and regulatory framework; these problems may also be as a result of weaknesses in policy actor networks and coalitions and interactions between relevant institutions responsible for implementation.

The domestication and effective implementation of International treaties relies on national networks and social relationships among policy actors and stakeholders. Among the important networks are legal expertise, financial, policy administration and scientific expertise networks. Legal expertise networks are important for the development of policies and regulations pertaining to the international treaties; scientific and technical expertise are important for providing for processes and institutional roles that ensure access and exchange of PGRFA among stakeholders within and outside the country. Financial networks provide a means by which regulations and strategies can be translated into meaningful activities and programs for implementation. Finally, policy and administrative networks provide the institutional framework by which treaty requirements are implemented.

Given this context, the main goal of this study was to analyse the existing barriers of implementation of the ITPGRFA by interrogating the policy network structures and understanding the decision-making processes for the implementation of the ITPGRFA in Uganda. This study had three specific objectives. First, to provide a map of the networks and relationships of policy actors which are important for the implementation of the ITPGRFA, and to identify the weaknesses in their interactions and coalitions. Secondly, to interrogate existing barriers of policy implementation and related outcomes in relation to

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the identified structural and institutional interactions. Third and finally, to use the results to identify possible interventions to identify opportunities and needs for interaction with or inclusion of new actors that would benefit from and could contribute to the implementation process. The paper establishes the conceptual framework developed for the analysis through a review of the literature on networks in the adoption and implementation of public policies (Section 2). In section 3 the methodology used is outlined and findings presented in section 4. The paper is concluded by discussing the practical implications from these findings for implementation of the Treaty and of the CBD access and benefit sharing measures in Section 5 and 6.

LITERATURE REVIEW

Networks in adoption and implementation of public policies

A policy network refers to the relations between different state actors, semi-governmental organizations, private organizations and non-governmental organizations, in which processes of policy making, adoption and implementation take place (Kickert et al., 1997). Policy process involves interactions between actors to exchange information, goals and resources which in effect are interdependencies (Arnold, 2011). As an empirical phenomenon, networks have interdependencies which are complex to manage. We focus on the way networks influence the making and implementation of public policy. Goldsmith and Eggers (2004) argue that bureaucrats obtain information or resources from networks, which they then use to make policy decisions. In order to identify and implement relevant policies, governments also need cooperation of other actors to formulate and implement policies. Actors who are implementing the policies also need information, knowledge and legal expertise to be able to effectively implement these policies.

Often, the interaction between actors can influence the advancement or weakening of a policy and can shape the policy outcomes, and it is a central attribute to successful innovation or policy implementation (Isaac, 2012; Klerk et al., 2010). Because networks involve multiple actors, some authors have argued that it is the individual contact and not the ties between organizations that matter (Hoang et al., 2006), and bureaucrats may achieve policy goals by fostering supportive contacts and coalitions outside their individual capacity to act (O'Leary, 2004). Interaction between actors is done with the understanding that each of the organizations controls some resource—capital, human resources, technical expertise or information—and each of the organizations has to interact with the others in order to achieve goals.

They are dependent on each other, only varying in the level and direction of dependency.

Past empirical researches have used a resource dependency model¹ to 'map' interaction patterns using frequency of interaction, intensity and centrality as units of analysis (Aldrich and Whetten, 1981; Kickert et al., 2011). It is clear that 'interdependency' and 'exchange' relations are the key aspects of relations between organizations in inter-organizational theories. As such, analysis focuses on the direction and flow of resources as well as the direction of dependency and the conditions which influence these processes. In addition, issues of coordination, cooperation and implementation constitute important theoretical and empirical themes for research. Analyses of networks and organizational interdependency also reveal the nature of power relationships in the networks. Proponents of inter-organizational theories argue that in such networks, information is a power resource possessed by different actors with conflicting values and that power depends on the need for resources (Kickert et al., 2011).

Network structures

In analysing a network structure and its effects on policy implementation, various elements come into play, such as network size, tie strength, density and permeability (Arnold, 2011). Network structures depend on *critical actors*, which include scientists with expertise relevant to the policy innovation, national policy experts and bureaucrats (Arnold, 2011). They determine the relations between critical actors and other actors in the network, and hence structural attributes such as *network density* (which measures the number of existing ties as a percentage of all ties) can influence information exchange. Studies show that highly dense networks may result in collective action but little new information (Newman and Dale, 2007; Isaac, 2012), while low density networks have fewer ties between members and are said to have higher new information but the exchange of such information may be impeded due to weak network ties even if the path for information exchange is shorter (Isaac, 2012).

Network permeability is the ease with which a network actor can move in or out of the network. An entirely impermeable network would have compulsory and restricted membership. A highly permeable network would be characterized by entirely voluntary participation and no membership conditions (van Waarden, 1992). The permeability of a network invariably determines its

¹Resource dependency model is underpinned by the idea that resources are key to organizational successes in implementation of policies and that access and control over resources is a basis of power. Resources are often controlled by organizations that are not in need of them and this can constrain implementing organizations (Pfeffer and Salancik (1978)

resistance or acceptance to new ideas; as well as of new individuals (Carolan, 2007). In addition, *network size* determines the ease with which a network is coordinated and managed; larger networks usually have attenuated ties and are more difficult to monitor (Olson, 1965) because increasing network size increases the number of engagement options available to any one member and may reduce the frequency with which members interact (Arnold, 2011). Smaller networks on the other hand are likely to have more frequent iterated interactions which create common expectations and create 'closure' (Ferejohn, 2003; Arnold, 2011). Networks composed primarily of strong ties are likely to be smaller than those composed of weak ties because the investments of time and human capital required to forge strong ties often prevents actors from establishing as many such relationships (Alder, 2011).

METHODOLOGY

A network survey of a population of policy actors was done to provide the necessary information using semi-structured questionnaires. The nature of relationships between various types of actors and their implications for policy processes and outcomes were analysed. Further analyses focused on data on resource flows, communication frequency and policy priorities collected in the network portion of the survey. The network measures that capture different dimensions of the network, such as degree of centrality were calculated. Finally, organizations that respondents believed are not currently in the network but should be, were identified in order to see which institutional gaps exist and how they can be addressed.

Sampling design and data collection

The research team consisting of researchers from Bioversity International, University of Illinois at Chicago and national research partners from the National Agricultural Research Organization (NARO) adopted a snowball sampling approach in which two key ITPGRFA policy actors were first interviewed. These key policy actors included the focal person and the competent authority for the ITPGRFA who were already known. The survey was administered from September 2012 to February 2013 through face-to-face meetings with policy actors using a survey instrument designed to collect data online. Interviewers were able to ask questions and input data using the SSI Web CAPI version of Sawtooth Software®. Data were then collected by the team leaders, compiled and sent to the Science Technology and Environment Policy (STEP) Laboratory at the University of Illinois at Chicago where they were cleaned and organized for the research team.

As part of the network survey, the two first respondents were asked to identify other individuals and organizations with whom they interact on the implementation of the ITPGRFA policy. These named persons were interviewed as a second step, and the people they named were interviewed in a third step. This process was continued until the interviewed actors started mentioning the same names again, and no new actors were named, thereby generating a list of actors identified as participating in the implementation of the ITPGRFA. They were also asked to name organizations that were not, but should be, involved in the implementation of the ITPGRFA/MLS in their country. Survey respondents were asked to

indicate among other things, whether they provide to, or receive from, the names organizations any policy, legal, or scientific, advice or expertise related to the implementation of the ITPGRFA/MLS. They were also asked if they provide to or receive from, those same organizations, any financial resources related to the implementation of the ITPGRFA/MLS. The data revealed different resource flows among organizations for these different issues. These data were used to develop policy network maps.

Table 1 presents the descriptions of the different types of organizations identified in the survey and organizations that are not currently involved with ITPGRFA policy implementation, but should be involved. A total of 26 policy actors (5 from international organizations, 16 from national governmental organizations, and 1 each from regional, non-governmental, private, academic and local organizations) were interviewed. The respondents interviewed named a total of 95 actors (organizations) within the ITPGRFA policy network. Respondents also named 18 organizations that they said were not currently part of the ITPGRFA policy network but that they believed should be involved in the future for effective implementation of the ITPGRFA.

Data analysis

Two types of data analysis are presented in this report: descriptive statistics, network maps and metrics. The descriptive analysis is based on the data collected from the 26 policy actors, while the network analysis makes use of information generated about all actors in the network. To analyse the traditional survey data, we used descriptive statistics including frequencies, percentages and means. The results are displayed either in tables or graphs in the analysis section of the report. The network data are presented in graphic form. Network metrics are also calculated and included in the analysis section. Analysis was conducted using SPSS, STATA and UCINET software packages.

FINDINGS

Policy actors in the implementation of the ITPGRFA and related policies

There are 95 actors involved in the implementation of the ITPGRFA in Uganda. The four critical actors for the implementation of the Treaty and ABS in Uganda are: the National Agricultural Research Organization (NARO); Uganda National Council for Science & Technology (UNCST); National environmental management Agency (NEMA); and the Ministry of Agriculture Animal-husbandry and Fisheries (MAAIF). These four critical actors are linked to other institutions categorized as:

1. International
2. National level government
3. Regional, provincial or county government
4. Farmer or community
5. Private sector or consultancy
6. Non-governmental; and
7. Other important organizations (universities, media, etc.) (Table 2).

Many other policy actors are involved in the

Table 1. Description of actor types queried in the ITPGRFA policy network survey.

Organization type	Brief description
International	Includes intergovernmental organizations, international non-governmental organizations and multinational corporations that operate globally
Regional	Includes intergovernmental and non-governmental organizations and private companies that operate in (a) particular region(s) of the world, usually in more than one country
National governmental	National governmental organizations in the country
National non-governmental	National and local non-governmental non-profit and charity organizations
Province/county	Governmental organizations mandated to work in (a) particular part(s) of the country
Local or farmers	Farmer organizations or associations working either for profit or non-profit generally at the sub-national or local level
Private companies/ firms	National or sub-national, private, for-profit companies
Other	Includes the remaining national or regional organizations, such as academic institutions, media organizations, and others

Source: Authors.

Table 2. Level of harmony of ITPGRFA with other policies.

Named policies	Number of ITPGRFA policy actors involved in each policy	Average level of alignment with ITPGRFA policy implementation
Access and benefit sharing policy	6	4.0
Biosafety policy	15	4.3
Farmers' rights	4	4.5
Intellectual property rights -TRIPS	1	4.0
Millennium declaration	1	5.0
National action plan	1	4.0
National environment policy	2	4.5
National poverty reduction strategy	1	5.0
NEPAD comprehensive African agricultural development program	1	5.0
Phytosanitary Policy	11	4.5
Plant breeders' rights	9	4.6
Plant variety protection (PVP)	4	4.8
Seed policy	5	4.5
Soil policy	1	4.0
Trade and investment policy	4	4.3
Water policy	1	4.0

Source: Authors.

implementation of other related policies in such areas as biosafety regulations; phyto-sanitary regulations; seed policy; plant variety protection; intellectual property; and farmers' and breeders' rights (Table 2). For the most part, respondents felt that the other policies are somewhat in harmony or absolutely in harmony with the ITPGRFA implementation activities.

Actors who should be involved but are not involved

The state of involvement of actors was measured on the basis of their interaction. Table 3 presents the status of involvement by type of organization. Of the 95 organizations, 32 are international organizations and 14 are national government organizations. Additionally, a

Table 3. Actor type and involvement in ITPGRFA policy implementation.

Type of organization	Status of involvement				Total	
	Involved		Not Involved			
	N	Percentage	n	Percentage	N	Percentage
International	32	33.7	2	11.1	34	30.1
Regional	7	7.4	6	33.3	13	11.5
National government	14	14.7	6	33.3	20	17.7
National NGOs	5	5.3	1	5.6	6	5.3
Provincial/county govt.	5	5.3	0	0.0	5	4.4
Farmer organizations	10	10.5	0	0.0	10	8.8
Private sector	10	10.5	1	5.6	11	9.7
Others (university, media)	12	12.6	2	11.1	14	12.4
Total	95	100.0	18	100.0	113	100.0

Source: Authors.

total of 18 organizations were named by respondents that are currently not involved in the implementation of the IT but should be involved. These include six governmental organizations. The most frequently mentioned organizations as those who are not involved but should be involved included Food and Agriculture Organization (FAO) and other Consortium of International Agricultural Research Centres (CGIAR) such as International Centre for Tropical agriculture (CIAT), International Institute of Tropical Agriculture (IITA) and International Crops Research Institute for Semi-Arid tropics (ICRISAT)). There are two types of non-involvement status. First, an important organization may be isolated. The survey identified 18 of these. Second, there is lack of agreement among respondents about whether an organization is involved in ITPGRFA implementation. Appendix 1 identifies 16 such organizations. Likely disagreement about involvement can be traced back to lack of knowledge about the involvement of these organizations, low density measures, infrequent communication or low connectedness².

Network structures and coalitions

The policy network and interactions between actors

During policy implementation the connections among key actors and the characteristics of their interactions are important. For example, organizations that are key national actors in the policy implementation process; organizations that provide critical supporting roles as bridges to information or resources; and the types of

resources that flow to and from organizations form the basis of interactions between organizations.

The graphs shows visualizations of the resource exchange networks and include resource type, direction of resource flow, level of priority, and organization type. Nodes represent respondent organizations and the organizations they named. Their shapes designate the type of organization. For example, triangles are national government organizations (e.g. Ministry of Agriculture Animal husbandry and Fisheries (MAAIF) and Ministry of Water and Environment (MWE)), while squares are international organizations (for example, Bioversity International (BI), International Institute for Tropical Agriculture (IITA)). Lines indicate that respondents indicated 'yes' when asked if their organization either received or provided resources to each of the organizations they named. The arrow head indicates the direction of the resource flow. An arrow head in both directions indicates that the respondent's organization both receives and provides the particular resource as part of the relationship. The size of the node indicates the total number of lines leading out of the node. The larger the node, the more the resources provided or received. For example, NARO has a larger node, because it has more reported relationships. Node shade denotes the level of perceived priority placed on ITPGRFA policy. Black, grey and white are used because other colours are more difficult to visualize when copied in black and white. Organizations that are black are perceived by others to consider ITPGRFA policy implementation to be a high priority. For example, NARO, Makerere University, and Food and Agriculture Organization (FAO) are all high priority organizations. Table 4 presents a key for reading the figures that follow.

Key observations from this overall network are that NARO, MAAIF and Makerere University are the key players in the overall policy network. NARO stands out as the main organization for the implementation of the

²Connectedness in a network is represented by the number of linkages between nodes (ie network actors). A network that is highly connected will have more direct linkages between nodes and a network with low connectedness will have few direct connections between nodes (Hanneman and Riddle, 2005).

Table 4. Key for social network graphs in this report.

Node shape	Square: International organization
	Triangle: National government organization
	Two connected triangles: Regional organization
	Square with cross: National nongovernmental organization
	Square with circle: Private sector organization
	Diamond: Provincial or county organization
	Circle: Farmer organization
Upside down triangle: Other type of organization	
Node shade	Black: High priority
	Dark Grey: Moderate priority
	Light Grey: Low priority
	White: Don't know
Node Size	Number of connections leading out of the node

Source: Authors.

ITPGRFA because it has the highest number of uni- and bi-directional connections with other organizations. The focal person for the ITPGRFA is from NARO and is the source of key information concerning the Treaty, its implementation and requirements. UNCST, which is the national competent authority on matters of access to genetic resources, is not among the top three institutions in terms of networks with other institutions and interactions with international research organizations or national NGOs. Most of these large players are perceived to consider ITPGRFA policy implementation to be a high priority.

A second tier of actors includes international and national non-governmental organizations, such as Volunteer Efforts for Development Concern (VEDCO), Uganda National Farmers Federation (UNFFE), and Association for Strengthening Research in Eastern and Southern Africa (ASARECA). These second tier of organizations have linkages with government, and regional organizations including the private sector as well as other NGOs. They may represent 'bridging organizations' important for linking the NGO and private sector world with the government and official policy channels, and are important information conduits in both directions. The organizations identified as key bridging organizations include the National Environmental Management Agency (NEMA), which is the focal point for ABS issues under the Nagoya Protocol, and is the only connection to the rest of the network for seven other organizations including two national non-governmental organizations. Finally, many policy advocacy NGOs, such as Participatory Ecological Land Use Management (PELUM), Southern and Eastern African Trade Information and Negotiations Institute (SEATINI), are not well integrated into the network, they have poor linkages

with NARO and UNCST and other main actors even though they are perceived by others as being of high or moderate priority for implementation of ITPGRFA policy.

Legal expertise and policy direction networks

Figure 2 shows that there are three main actors regarding legal expertise: NEMA, NARO and Bioversity International (Figure 2). The arrows show the direction of expertise flow. For example, in most cases NARO provides legal expertise to other organizations. It also receives legal expertise from other government organizations (MAAIF, MWE, NEMA and UNCST) and international organizations (Bioversity (BI) and ICRISAT). ASARECA receives legal expertise from three organizations; Advocates Coalition for Development ((ACODE)³, Bioversity (BI) and NEMA). The legal expertise network is smaller and made up of fewer connections than the full network, or the policy network. And although the UNCST is the competent authority, it has fewer connections to other network actors and implementing agencies, it does not provide much legal expertise as compared to NARO and does not receive much legal expertise either. In addition, international organizations also seem to play a key role in providing legal expertise for policy implementation especially to NARO and NEMA which are the lead focal points for ITPGRFA and Nagoya Protocol respectively, but they do not appear to have connections with UNCST which is the competent authority, these create a gap in policy implementation and brings to question as to what the

³ACODE is an NGO involved in research and policy advocacy for various policies in Uganda

roles of UNCST as competent authority. A realization of these gaps has prompted the signing of a memorandum of Understanding (MoU) between the three main institutions i.e. NEMA, NARO and UNCST to define the roles of each institution and also define the processes for access and benefit sharing and create a platform for information and knowledge sharing.

Figure 3 presents the map of policy or administrative direction. This figure shows that more organizations are involved in policy and administrative direction than legal expertise. There is also more interconnectedness among the nodes. Importantly, this graph shows a number of two-way arrows between organizations. For example, MAAIF and NEMA provide direction to each other. This finding could have several different meanings.

Organizations may be exchanging information on different aspects of policy. Alternatively, the direction of authority may not be clearly defined. This interpretation may be indicative of findings in of the survey that indicate that a large proportion of people agreed (42%) that organization responsibilities have not been clarified.

On issues of legal expertise NARO and NEMA are the 'ego institutions'⁴ that is, there are more connections to them from other institutions, indicating that they provide most of the legal expertise and guidance. MAAIF on the other hand is more prominent in receiving legal expertise from institutions across the spectrum of institutions, mostly government related, research organizations and a few international NGOs. Bioversity International also seems to be an important institution albeit with fewer connections mostly providing expertise to local NGOs and ASARECA and having a mutual relationship with MAAIF and NARO. Although UNCST is identified as the national competent authority, it has fewer connections. UNCST has a mutual relationship with NEMA and provides legal expertise to NEMA. It does not have direct connections to other institutions like MAAIF and other national or national NGOs, as most of these get legal and administrative expertise from NARO, NEMA and MAAIF.

When it comes to policy and administrative direction, NARO and MAAIF are the main institutions. NARO has many more connections with international research organizations, such as Bioversity international, CIAT, IITA and CIMMYT, from which it receives most of its policy information. The connections with MAAIF are bidirectional with most of the government departments and other ministries, including NEMA and NARO, receiving and providing policy and administrative direction to MAAIF. UNCST has fewer connections with other institutions and government departments except NEMA, NARO, MWE and NSP. This has implications for the implementation of the policy at local levels, especially because UNCST is the competent authority but does not have many linkages and could result in lower level policy

implementation it relevant stakeholders.

Financial resource and scientific expertise networks

Two additional resource exchange networks are presented. Figure 4 presents the financial resource network and Figure 5 presents the science expertise network. The financial expertise network graph depicts a small number of lightly interconnected organizations. Most funding is channelled to individual organizations by either government or international organizations and donors and disbursed outward to other government organizations. NARO receives funding from the largest number of sources in the network but does not seem to disburse a lot of these funding to other organizations in the network. Many organizations neither provide nor receive resources related to ITPGRFA implementation (see left hand column in graph).

Although NARO, UNCST and NEMA are the key institutions in the policy direction and legal advice networks, the financial network seems to indicate that they lack financial capability to incentivize other implementing institutions that they advise because the flow of resources from these institutions is limited. This further creates impediment to the effective implementation of the treaty at lower levels.

By contrast, the scientific expertise network (Figure 5) looks very similar to the full network of all relationships presented above (Figure 1). Only fourteen of the named organizations are not included in the graph. In some cases the overlap can be explained by specialization. For example, in Figure 5 it is clear that MTI receives scientific expertise from NARO while in Figure 3 MTI provides NARO with policy direction. In other cases, organizations are providing or receiving the same types of expertise. For example, MTI provides both scientific expertise and policy direction to NARO. It also receives scientific expertise from NARO.

Network structures in the implementation of IT in Uganda

Table 5 presents summary statistics, including centralization, density and average degree centrality that capture different dimensions of the network structure in addition to the map. Centralization is a measure of the extent to which the network is concentrated around one or more key nodes for example a high centralization is when one actor (node) is linked with many others and a low centrality is when there are many actors linked with each other such that there are several ego institutions in one network, for example a value that is closer to a 80 per cent shows a high level of concentration or linkages with one actor.

⁴'Ego institutions' are focal institutions that have many existing ties to other actors (Hanneman and Riddle, 2005)

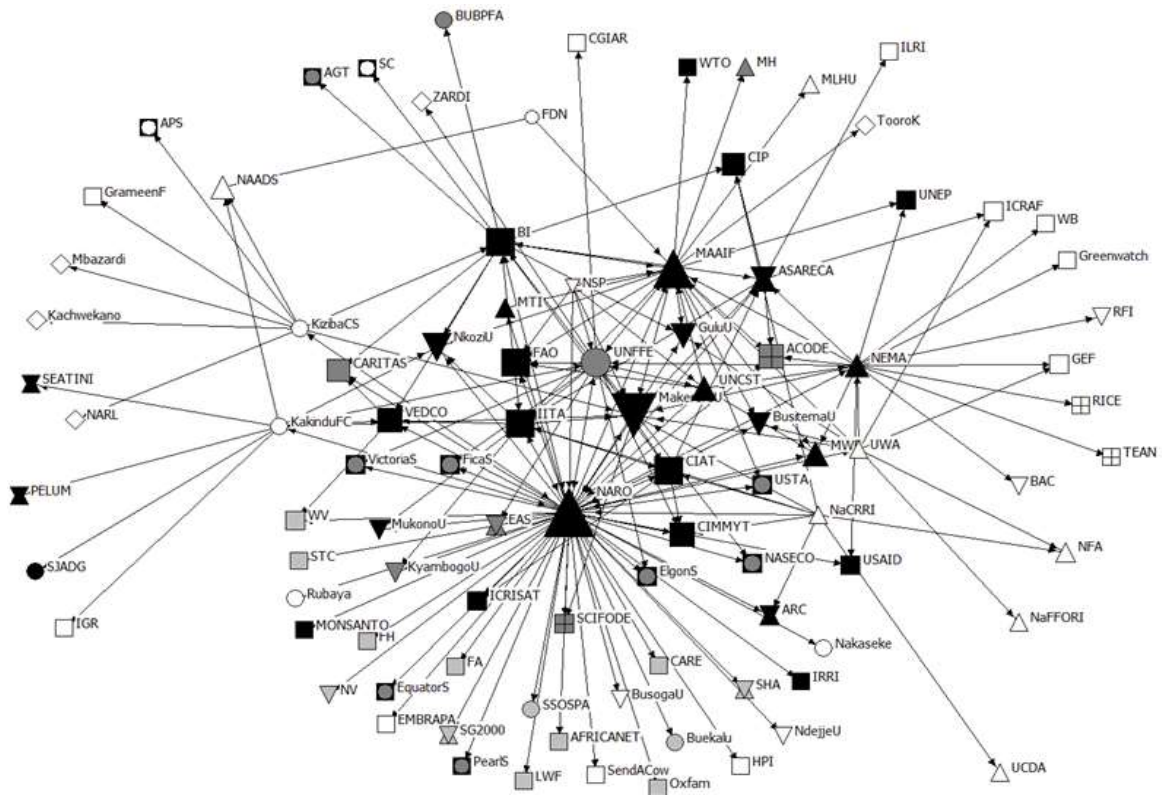


Figure 1. The policy actor network and interactions: all relationships (Source: Authors).

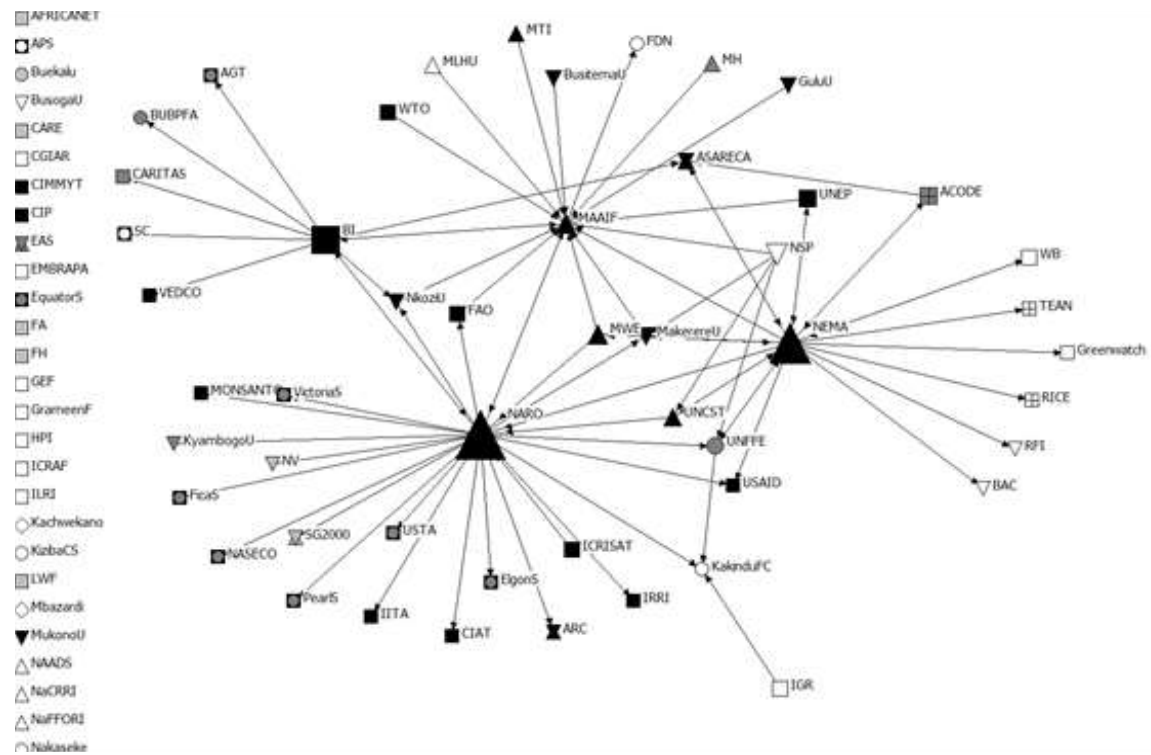


Figure 2. Legal expertise network (Source: Authors).

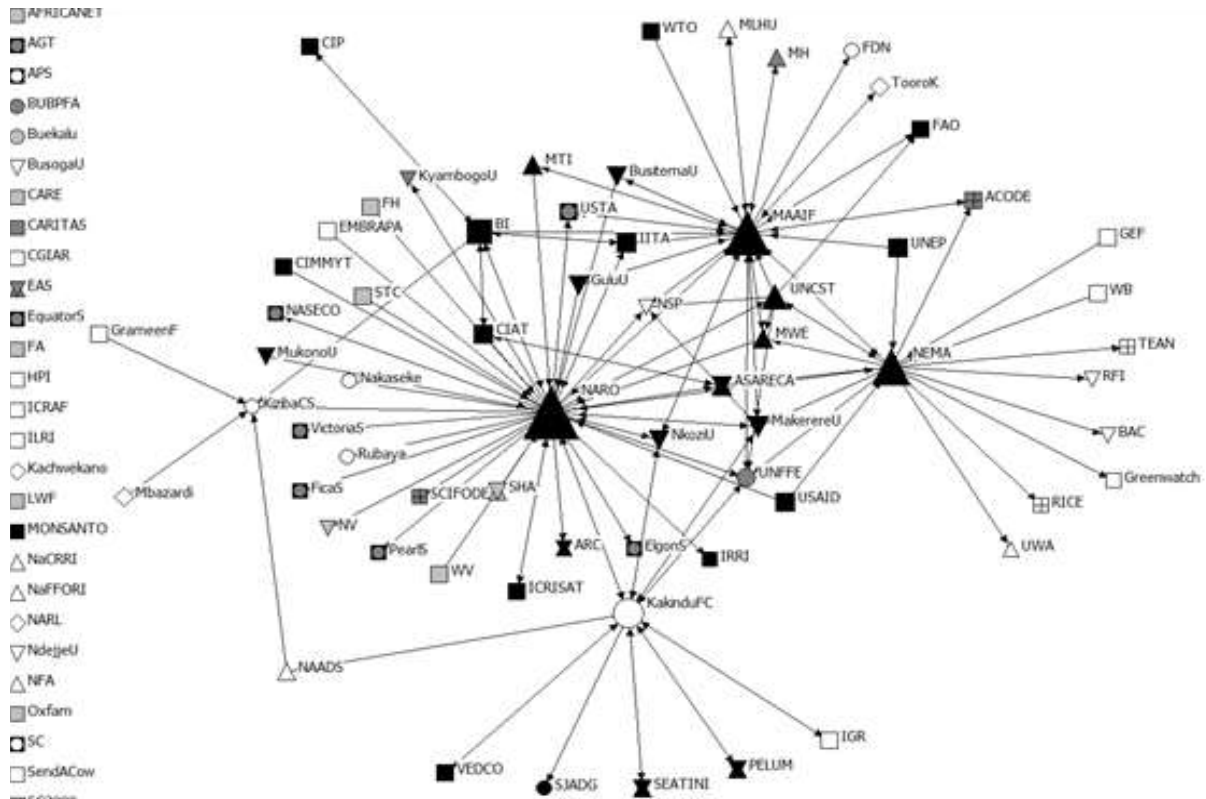


Figure 3. Policy and administrative direction (Source: Authors).

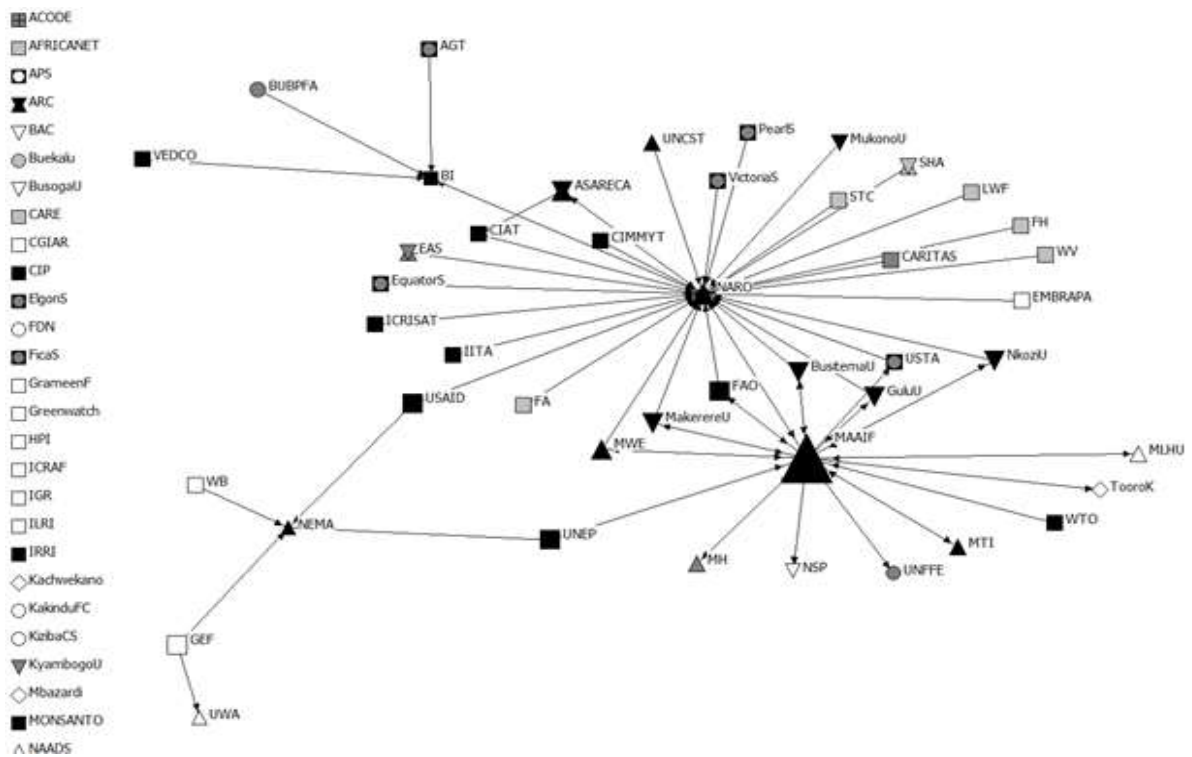


Figure 4. Financial resources network (Source: Authors).

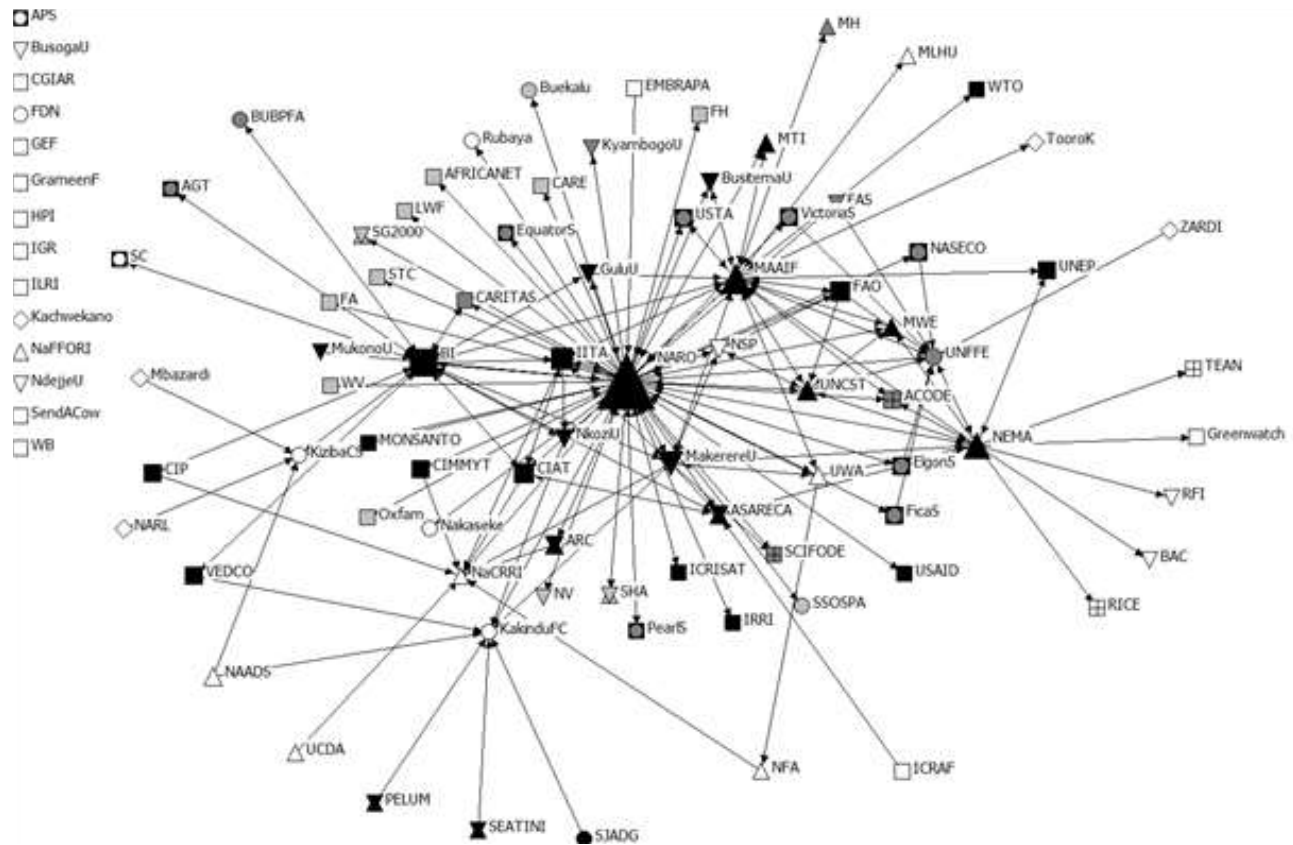


Figure 5. Scientific expertise network (Source: Authors).

Table 5. Relevant network metrics.

Variable	Number of ties	Number of connected nodes	Number of all nodes	Centralization (out degree) (%)	Density	Average degree centrality
All relationships	196	95	95	60.1	0.022	2.1
Legal expertise	79	50	95	22.8	0.009	0.8
Policy and administrative direction	135	65	95	26.4	0.015	1.4
Scientific expertise	218	81	95	55.6	0.024	2.3
Financial resources	64	45	95	14.3	0.007	0.7

Density⁵ represents a measure of interconnectedness among nodes. The metric ranges from zero to one, where a density of one indicates that all possible connections exist. Average degree centrality measures the average number of ties for any particular node in the network. Findings reflect the graphs depicted in Figures 1 to 5.

⁵Network density describes the portion of the *potential* connections in a network that are *actual* connections. A “*potential connection*” is a connection that could potentially exist between two “nodes” – regardless of whether or not it actually does. By contrast, an “*actual connection*” is one that actually exists for example when there could potentially be 3 connections but there are only two, the network density is 2/3 (67%) (Hanneman and Riddle).

Respondents reported a total of 95 different organizations and a total of 196 connections among them for an average of 2.1 connections per node (Average degree centrality, last column). The “all” relationship network (first row) has a low density indicating that although many organizations exist as policy stakeholders, they are not connected in the network. The centralization metric indicates that much of the resources flowing out are highly concentrated around its most central actor, in this case NARO. NARO is the most central actor because it is responsible for the management, conservation and sustainable use of PGFRA in the country including

research and development.

Moving down the table, it is clear that the other networks are smaller: the financial resource network has only 64 ties among 45 actors and the legal expertise network has 50 actors connected with 79 ties. Another way to interpret these numbers is that 50 of the total 95 actors are not included in the financial resource network and 45 actors are excluded from the legal expertise networks which further impeded policy implementation and feedback from lower levels. Centralization scores are lower for these networks indicating that resource flows out are less concentrated around the most central actor (NARO).

The science expertise network appears most similar to the “all” relationship network again. This kind of network structure with many weak linkages may impede information and other resource flows among actors and lead to weaknesses in the implementation of the IT and poor outcomes.

DISCUSSION

The policy network structure and its implications on the implementation of the IT and Nagoya

The policy network structure reveals that NARO is the main institution for the policy networks with high connectedness and many linkages with government, NGOs and private institutions. This is because the expertise concerned with conservation, management and sustainable use of PGRFA is concentrated in NARO and its related research institutes and the focal person for the treaty is from NARO. The other institutions that are key to the implementation of the treaty such as UNCST- which is the competent authority; MAAIF – which is the overall coordinating ministry in charge of policy; and NEMA which is in charge of ABS for all genetic resources have weak network ties. The rest of these institutions are not linked with each other and their network ties are weak especially in the policy and administration network; the legal network; and financial resource networks.

In addition, UNCST which is the competent authority for both the IT and Nagoya protocol has low connectedness and appears to have weaker ties with other NGOs, government institutions and international research organizations. As a result of these, there are gaps in the implementation of the treaty, the most important ones being the lack of clear legal instruments for the implementation of the treaty; lack of clear processes for access of germplasm; lack of a clear understanding of what collections should be included in the Multilateral system of access and benefit sharing; and most importantly lack of clear understanding of the roles of the main institutions and their linkages with others in the network.

The level of centralization for the ‘all relationships’ and

the scientific expertise networks are much higher than the legal expertise and financial resource networks, implying better relations among actors in these networks. The institutions with the mandates, expertise and connections to provide policy advice don’t have financial resources to support programs or strategies to put system in place to implement the MLS.

The weak network ties coupled with low centralization and low density measures for the legal and financial resources networks have negative implications on policy implementation. A weak legal network means that many organizations do not participate in the domestication of the treaty and the processes of formulating policies, legal and regulatory frameworks that govern the treaty and that may affect them. A weak financial resources network also implies that institutions may face challenges in implementation of the treaty due to lack of resources.

Many organizations are also excluded from the network, and most importantly some international organizations that could help by providing technical expertise or financial resources. Most of the regional organizations such as COMESA, EAC and a number of government departments and international NGOs have been identified as actors who should be involved in the Treaty implementation, this is mainly because these organizations are driving policy development in the region and ensuring that policies in the region are harmonized at country level.

There are existing weak linkages between the critical actors and other actors which led to some problems in implementation of the Treaty. For instance, the status of materials under management and control of the government and within the public domain for inclusion in the MLS is not clear. Although the national gene bank has recently notified the Treaty secretariat of its collections, many government research organizations still hold materials that have not been notified to the Treaty. Across the country, several other institutions, like Makerere University, hold materials as well and these should be in the public domain but it is not clear whether they were collected without a PIC and therefore they cannot be included in the MLS. During the interactions with stakeholders a number of issues came up including: multiple sources of germplasm which may require a series of consultations on: who holds the power to designate material; who should avail material (provider) to users under the MLS; how a designated provider should interface with the holders of germplasm; and whether material designated into the MLS should be centralized and how.

In view of these, there is a need to improve the policy network interactions among actors. A clearer institutional framework needs to be put in place with more clearly defined roles of each institution- especially the competent authority and the focal points on the IT and Nagoya protocol. As a result of these findings, a national stakeholders’ workshop was held to scrutinize the

implication of the international and national regimes of the ABS to access and exchange PGRFA and streamline the administrative and institutional arrangements. The workshop proposed an amendment of the Uganda ABS regulations to provide for access to PGRFA in the spirit of the ITPGRFA. NEMA (focal point for the Convention on Biological Diversity) was chosen to take a lead and constitute a multi- sectoral task force comprising UNCST (which is the competent authority for exchanging all genetic resources) and NARO-Plant Genetic Resources Centre (PGRC) (in charge of PGRFA) to handle this task. The task force was requested to come up with a temporary procedure for accessing plant genetic resources for food and agriculture (Statutory Instrument) in Uganda as the amendment of the ABS laws is still in process.

The temporary procedure was initiated through development of a Memorandum of Understanding between the three institutions, whose purpose is to facilitate cooperation and mutual assistance between these parties in the discharge of their respective statutory obligations as far as the exchange of PGRFA is concerned. The Parties to the MoU committed themselves to drafting and agreeing on interim measures for access to PGRFA and the implementation of the MLS and benefit sharing.

Conclusions

Uganda and other countries are in the process of domesticating the ITPGRFA and other ABS mechanisms for PGRFA. As such this research was very timely in identifying the bottlenecks in the policy, legal and scientific structures for its implementation as well as recommending measures to be taken to improve policy implementation processes and outcomes.

A number of conclusions can be drawn from this research. First, weaknesses in the policy actor networks especially mean that the current framework is not sufficient for the implementation of the treaty. In order to improve the situation, the policy and administrative network, legal expertise and the financial resources networks need to be improved with key actors such as UNCST which is the competent authority, MAAIF and NEMA making more connections which are reciprocal with each other as critical actors and with other institutions which are non-critical actors.

UNCST as the competent authority needs to make connections with more actors in the legal and policy direction networks as a key provider of legal expertise but also a key recipient of legal and technical expertise from international organizations and other regional organizations. The roles of NARO and NEMA in the scientific expertise network albeit strong, also need to include and link up with UNCST and other organizations in the network especially NGOs that work at the

grassroots. The roles of lead institutions in policy development and dissemination needs to be more defined and linkages need to be improved with other organizations to enable a policy feedback loop and improved participation of these non-critical actors in the policy development process.

Secondly, the results of this research have prompted the development of an MOU, which in the interim provides guidelines for access to PGRFA and does to some extent articulate the roles of the focal institutions and the competent authority. The MoU will act as a platform for consultation between the lead institutions as to their specific roles. Thirdly, the institutional arrangements and the roles of key actors need to be defined more clearly, including how non-critical actors can participate in policy or legal platforms. Furthermore, efforts to improve communication and formally integrate isolated organizations are likely to be important for on-going ITPGRFA implementation efforts.

As many countries are currently in the process of domesticating the ITPGRFA, some lessons can be drawn from this research. It is important to foster structures and networks through which policy stakeholders can engage in the exchange of information, legal and scientific expertise and policy advice. In order for effective implementation of policies finances are required to develop programs into strategies and activities. The financial resources network is important and integral in determining policy outcomes.

Furthermore, it is important to have the full participation of stakeholders in the implementation process through better coordinated networks with proper feedback loops for information exchange among NGOs, private sector, and international stakeholders offering various forms of support for the policy implementation process.

Conflict of Interests

The authors have not declared any conflict of interests.

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Appendix 1.

Organization name	Identified by <u>at least one</u> respondent as “Not involved in IT implementation, but should be”	Identified by <u>all</u> respondents as “Not involved in IT implementation, but should be”
AATF	✓	✓
ADRA	✓	✓
AMREF	✓	✓
COMESA	✓	✓
EA	✓	✓
EAC	✓	✓
IGADD	✓	✓
ME	✓	✓
MG	✓	✓
MLG	✓	✓
NIUF	✓	✓
PABRA	✓	✓
UHG	✓	✓
UNBOS	✓	✓
URA	✓	✓
URCS	✓	✓
URPA	✓	✓
VG	✓	✓
ACODE	✓	-
ASARECA	✓	-
CARITAS	✓	-
FAO	✓	-
KyambogoU	✓	-
MukonoU	✓	-
NAADS	✓	-
NEMA	✓	-
NkoziU	✓	-
SG2000	✓	-
UNCST	✓	-
UNFFE	✓	-
USAID	✓	-
USTA	✓	-
VEDCO	✓	-
WV	✓	-