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A NET-MAP ANALYSIS OF STAKEHOLDER CONNECTIONS AND INFLUENCE IN AGRICULTURE-FOR-NUTRITION POLICYMAKING IN GHANA

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ABSTRACT

Nutrition-sensitive agriculture approaches can improve farming household incomes, food security, and diet quality. Adopting nutrition-sensitive agriculture approaches means placing a nutrition lens on the policies, strategies, and investments in the food and agriculture sector without detracting from the sector's traditional goals of food supply. To understand the processes involved in developing agriculture-for-nutrition policies in Ghana, this paper examined the influence of stakeholders' interconnections using a visual participatory mapping technique, Virtual Net-Map. Three convening platforms were identified for stakeholder engagement: the Agriculture Sector Working Group, the National Agricultural Technical Committee, and the Public-Private Partnership Dialogue Platform. Sixty stakeholders with 188 connections were recognised for their involvement in agriculture-for-nutrition policymaking in Ghana. Fourteen stakeholders, twelve from government organizations and two from donor and development partner organizations, were identified as the most influential. International stakeholders (donors and development partners) were critical in funding agriculture-for-nutrition policymaking activities. While all stakeholders had a joint mandate to ensure policies were developed, the Ministry of Food and Agriculture led the policy development process in Ghana's food and agriculture sector. Moreover, government stakeholders notably received more support from other stakeholders for funding, advocacy, dissemination, and technical assistance than the support they offered. Generally, stakeholders were more engaged in technical assistance activities and least involved in disseminating agriculture-nutrition information in the agriculture-for-nutrition policymaking process. The information on stakeholders' interconnections and influence showed areas that had the most and least stakeholder engagements, which will enable potential stakeholders to identify niche(s) to support the nutrition agenda in Ghana's food and agriculture sector and help Ghana meet the Global Nutrition Targets and the Sustainable Development Goals for 2025 and 2030, respectively. In addition, the evidence presented on Ghana's agriculture-for-nutrition policymaking network can lead to better ways of centralizing nutrition in agricultural policies and designing initiatives that encompass most, if not all, relevant stakeholders.

Key words: Agriculture, Nutrition, Policymaking, Net-Map, Influence, Connections, Ghana, Nutrition-sensitive agriculture

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INTRODUCTION

Ghana has made notable progress in reducing the prevalence of child undernutrition [1]. Stunting decreased from 30% in 2003 to 19% in 2014, and the prevalence of wasting and underweight decreased from 8% and 18% in 2003 to 5% and 11% in 2014, respectively [2,3]. Despite this progress, the country still faces high rates of child undernutrition. More recently, the 2017/2018 Multiple Indicator Cluster Survey (MICS) reported a marginal decrease in stunting (18%) but increases in the prevalence of underweight (13%) and wasting (7%) [4]. Moreover, wide geographic disparities exist in stunting prevalence rates. While only 13% of children under five years of age in the Greater Accra region were stunted, 29% were recorded in the Northern region between 2017 and 2018 [4]. Additionally, micronutrient deficiencies persist in Ghana. Four out of ten women of reproductive age (42%) and almost seven out of ten children (66%) under five years were anemic in 2014 [2, 4, 5]. Between 2017 and 2018, only 12% of children under two years of age were fed the minimum acceptable diet [4]. Ghana's nutrition situation draws attention to the challenge of poor access to nutritious foods and limited knowledge about appropriate dietary practices, among other things.

Researchers, governments, development partners, and donor organizations have recognized that nutrition-specific interventions alone cannot solve nutrition problems and that nutrition-sensitive approaches need to be adopted in other program sectors [6,7]. Agriculture could contribute to improving nutrition outcomes due to its critical role in influencing immediate (diet and disease) as well as underlying (food security) determinants of malnutrition [8, 9].

Adopting nutrition-sensitive agriculture approaches means centralizing nutrition in policies, strategies, and investments in the food and agriculture sector without detracting from the sector's own goals [10]. Yet, how nutrition is incorporated into Ghana's food and agriculture sector policies is not adequately documented. Understanding the agriculture-for-nutrition policymaking network could lead to better incorporation of nutrition objectives and goals into agricultural policies and the design of more acceptable initiatives for a greater number of stakeholders. This study aimed to describe relevant stakeholders' interconnections and influence in the agriculture-for-nutrition policymaking process in Ghana.

Methods

Net-Map is a tool that utilizes social network mapping and visualization tools to identify stakeholders involved in a particular phenomenon, examine their connections, and define their roles and influence levels [11, 12]. Net-Map

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combines stakeholder mapping, power and influence mapping, and social network analysis [11, 12] and has been successfully used to identify stakeholders involved in infant and young child nutrition programs in multiple countries [13]. Recently, the Net-Map method was applied in Ghana's food and agriculture sector to understand the diffusion of smallholder irrigation technology and identify stakeholders involved in child stunting and anemia programming in Ghana [14, 15]. This paper is the first to apply the Net-Map tool to agriculture-for-nutrition policymaking in Ghana's food and agriculture sector.

Participant selection

Two staff from the Policy Planning, Monitoring and Evaluations Directorate (PPMED) of Ghana's Ministry of Food and Agriculture (MoFA) were asked to identify key stakeholders at the national level who were involved in agriculture-for-nutrition policymaking, with a focus on representing diverse stakeholder groups (government, donors, private sector, non-governmental organizations (NGOs), civil society organizations (CSOs), and research and academia). Fifteen stakeholder institution representatives from ten stakeholder organizations were identified, invited, and accepted to participate in a virtual Net-Mapping group meeting. Ten out of the fifteen stakeholder institution representatives (from eight stakeholder organizations) attended the virtual Net-Mapping group meeting on the 22nd of November, 2021.

Net-map process

The Net-Map Method was applied similarly to how Schiffer et al. [11] described its application in analyzing the governance effects of Community-Based Natural Resources Management in Namibia. The mode of engagement in the Net-Map exercise was virtual (Virtual Net-Map) via Zoom Video Communications, in line with COVID-19 safety protocols in Ghana and to accommodate the busy schedules of the stakeholders identified. A set of questions (Table 1) was used to engage the ten stakeholder institution representatives in a virtual group discussion. The questions for the Net-Map were adapted from a previous project on addressing child stunting and anemia in Ghana [15].

The virtual Net-Map activity began with a brief explanation of informed consent for the study. All stakeholder participants were requested to provide voluntary consent to record the virtual Net-Map session. The participants were guided through the questions (Table 1) about their existing network of stakeholders, and their responses were documented on a Microsoft PowerPoint slide (Figure 1). Participants were first asked the broad question, "Who influences agriculture for nutrition policymaking at the national level in Ghana's food and agriculture sector?"

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to identify the stakeholders in their network. Participants were then guided to list stakeholders based on the following categories: government, donor organizations and development partners, United Nations organizations, non-governmental organizations (NGO) and civil society organizations (CSO), private sector, research and academia, media, and opinion leaders. Participants were further asked to identify how these actors were connected using the following links: formal command (FC), funding (F), advocacy (A), dissemination (D), and technical assistance (TA) (Figure 1). Formal command referred to linkages describing formal oversight over the work or actions of another stakeholder in the network. Funding linkages described stakeholders exchanging or providing funds, loans, budgets, and payments. Advocacy linkages referred to directing or targeting evidence-based information either by themselves or through lobbying, pressure groups, or interest groups to other stakeholders to promote changes in the policy. Dissemination was when a stakeholder was involved in circulating or distributing information to other stakeholders about nutrition and nutrition-related issues and their links to agriculture. Technical assistance occurred when a stakeholder provided technical support, guidance, or advice to another stakeholder in the policy formulation process.

Finally, the perceived influence levels of the stakeholders were determined using a scale of zero (no influence) to five (the most influential stakeholders) (Figure 1). During the virtual Net-Mapping activity, participants discussed their opinions regarding the stakeholders they had listed, their connections, and the influence levels of the stakeholders in the agriculture-for-nutrition policymaking process. As a final activity, Figure 1 was validated by two stakeholder institution representatives (who were absent from the virtual group Net-Mapping meeting) from Ghana's food and agriculture sector in December 2021. The study was approved by the University of Ghana Ethics Committee for the Humanities (ECH 122/ 20-21) and the McGill University Research Ethics Board (# 21-07-001).

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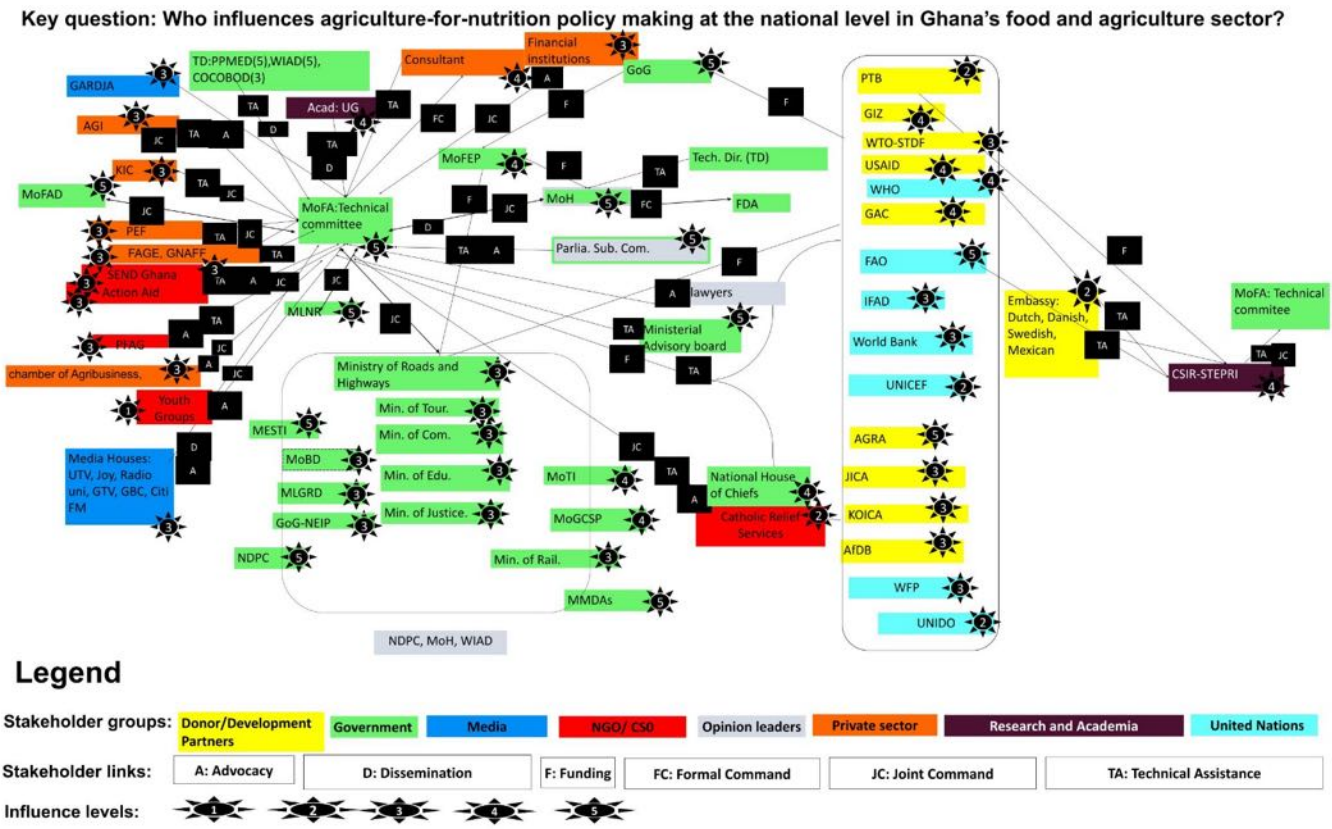

Figure 1: Participant responses from the virtual group stakeholder Net-Map at the national level showing the stakeholders, their influence, and their links in the agriculture-for-nutrition policymaking space

Data analysis

The data from the virtual Net-Map (Figure 1), notes, and discussion transcripts about the list of stakeholders, the connections among them, and their influence levels were entered into Microsoft Excel as one worksheet with six different sheets: (1) attributes, (2) formal command, (3) funding, (4) advocacy, (5) dissemination, and (6) technical assistance. The Microsoft Excel sheet was then imported into VisuaLyzer version 2.2 [16], a social network analysis software. The stakeholder categories and links were differentiated by colour and sized by the level of influence. Network image generation was done with the 'Attribute-based' function, filtering with the 'Select Relation' function, and network image visualization with the 'Spring-embedded' layout function. Statistical analysis was performed using three measures of social networks; degree centrality, network density, and network diameter within VisuaLyzer (Table 2).

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RESULTS AND DISCUSSION

Existing consultative platforms for stakeholder engagement

Stakeholder engagement is a process by which relevant stakeholders interact for a purpose to achieve accepted outcomes [17]. At the national level, three consultative platforms for stakeholder engagement in agriculture-for-nutrition policymaking in Ghana's food and agriculture sector were identified: (1) Agricultural Sector Working Group (ASWG), (2) Technical Committee (TC), and (3) Public-Private Partnership Dialogue Platform (PPPDP). These stakeholder consultative platforms were established to tackle multiple agenda and thematic areas in Ghana's food and agriculture sector. None of these platforms was dedicated to centralizing nutrition in agricultural policies. Notably, stakeholders clarified that in certain instances, nutrition was prioritized among the thematic areas in the policy dialogues to align with existing regional, continental, and international agreements. For instance, numerous policy dialogues were held for Ghana's second medium-term investment plan (METASIP) to align it with the food security and nutrition components of the Comprehensive African Agriculture Development Programme (CAADP). A program was then developed in the second phase of the METASIP to 'support improved nutrition' in Ghana's food and agriculture sector [18, 19].

The ASWG was initially a platform for engaging the Ghana government and development partners to deliver on the food and agriculture sectors' policy priorities. The stakeholders noted that the ASWG became open to stakeholders from diverse groups, including the government, donor organizations, development partners, NGOs, CSOs, the private sector, and research and academia. The Ministry of Food and Agriculture (MoFA) facilitated the ASWG to discuss topical policy issues in the sector. The ASWG identified emerging policy issues in Ghana's food and agriculture sector to reflect the sector's current needs and proposed the development of a new policy or an amendment to an existing policy, which would then be presented to the Ministerial Advisory Board for approval. For instance, several policy dialogues were held through the ASWG to review the Food and Agriculture Sector Development Policy 2 (FASDEP), which focused on food security and had been in effect for 13 years. An issue identified with the FASDEP 2 was that it was based on the Millennium Development Goals, which the Sustainable Development Goals had succeeded. Hence, to reflect the sector's current needs and align with emerging food and agriculture development trends globally, the ASWG proposed a review of FASDEP 2 and the development of the third phase of the FASDEP (currently in draft). The TC, which MoFA leads, was created from the ASWG to review and develop policies in the food and agricultural

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sector once the Ministerial Advisory Board has approved the proposal for a new policy.

The Private Enterprise Federation established the PPPDP to facilitate engagements among stakeholders in the food and agriculture sector and value chain actors in Ghana. A private-sector organization and a representative from the government, MoFA's Policy Planning, Monitoring, and Evaluation Directorate (PPMED), led the PPPDP. Although one of the roles of the PPPDP was to facilitate the development and implementation of policies in the food and agricultural sector, it was faced with a number of challenges that constrained the PPPDP from carrying out its duties: (1) lack of funding, (2) lack of commitment and clarity of member contributions, and (3) insufficient member representation and differences in member interest [20].

National-level stakeholder network

The national-level Net-Map identified stakeholders involved in the review and development of policies (members of the TC). A large number (n = 60) of stakeholders from different categories with 188 links were identified to be involved in agriculture-for-nutrition policymaking in Ghana (Figure 2, Tables 3-5). The national network of stakeholders had a high level of centralization (degree centralization = 93%) around one core: the Technical Committee led by MoFA (Figure 2). The Heads of the Nutrition Department in Ghana Health Service under the Ministry of Health (MoH), the Deputy Director of the National Development Planning Commission (NDPC), the Director of the Women in Agriculture Directorate of MoFA (WIAD-MoFA), and members of the Parliamentary Sub-committee were identified as the stakeholders with in-depth knowledge and capacity to influence agriculture-for-nutrition policymaking in Ghana. The largest distance within the network (network diameter) was three indicating how far apart the farthest two stakeholders in the network are and hence, how long it will take one stakeholder to get to the other. The average distance of the network was 2 indicating the shortest distance between any two stakeholders in the network. The proportion of connections or links in the network (network density) is 0.1, suggesting sparse connections among stakeholders (Table 2).

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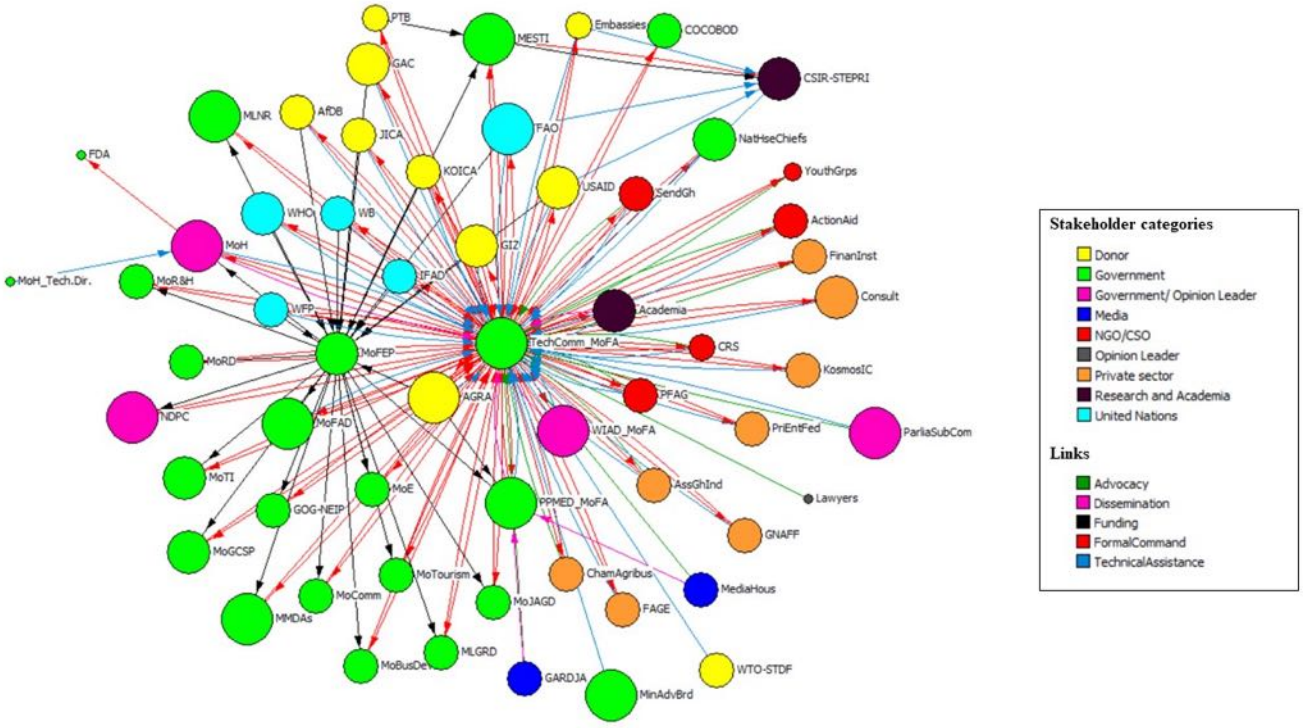

Figure 2: Complete national network, stakeholders sized by influence scores (stakeholders' full names found in Table 5)

Stakeholder influence in agriculture-for-nutrition policymaking

Stakeholder influence was defined as the extent to which a stakeholder identified in the Net-Map contributed or determined objectives, policy priority areas, programmes, interventions, and projects in the agriculture-for-nutrition policymaking process. The size of one circle (stakeholder) in Figure 2 represents the perceived influence score assigned to stakeholders in the virtual Net-Map exercise by the participants (Table 5). Out of sixty stakeholders identified, fourteen stakeholders, twelve from government organizations (Table 5) and two from donor or development partner organizations, were identified as having the greatest influence, with a score of 5. Stakeholders noted that the leading role MoFA played on the TC was considered critical in the policy development process due to MoFA's ability to engage with multiple stakeholders. Moreover, MoFA, NDPC, and MoH were ranked high for their prominence in nutrition because the inclusion of nutrition was often proposed by MoFA and supported by the NDPC and MoH. The NDPC also played a critical role in developing frameworks that included guidelines for centralizing nutrition in the food and agriculture sector. The NDPC and MoFA-WIAD ensured that the nutrition guidelines were adopted in policies in the agricultural sector.

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The Ministry of Environment, Science, Technology, and Innovation (MESTI) was ranked high for its interest in nutrition and its current efforts to develop the aflatoxin policy for Ghana. The Policy Planning Monitoring and Evaluation Directorate of MoFA was noted to have played an important role in the policy development process as they facilitated dialogue in the ASWG, while WIAD-MoFA was responsible for mainstreaming nutrition into the development of policies in Ghana's food and agriculture sector. The Ministry of Fisheries and Aquaculture Development (MoFAD) and the Ministry of Lands and Natural Resources (MLNR), which housed the sub-sectors of MoFA (fisheries and forestry, respectively), worked closely with MoFA in the policy development process.

The provision of funds for policy development was critical in the policymaking process. The Alliance for a Green Revolution in Africa (AGRA), the Food and Agriculture Organization of the United Nations (FAO), and the Government of Ghana (GoG) were ranked as highly influential for being major funders in the agriculture-for-nutrition policy development process. Moreover, FAO and AGRA also participated in the technical committee by providing technical support in the process. At the decentralized levels, the Metropolitan, Municipal, and District Assemblies (MMDAs) played a critical role in holding several decentralized policy dialogues and collecting and sending evidence to MoFA to support policy development at the national level. The MoFA played a crucial role in policy development in Ghana's food and agricultural sector, with the power to support or constrain agriculture-for-nutrition policymaking. The Ministerial Advisory Board and the Parliamentary Sub-committee were ranked for their advisory roles and their ability to accept or decline policy proposals presented to them by the ASWG.

An integral part of Net-Map was to evaluate stakeholders' perceptions about the influence of other stakeholders in the process. Participants in a Net-Map imposed their subjective descriptions of their networks, leading to perception gaps. Perception gaps arise from the participants' intensity or frequency of interactions with certain stakeholders and sources of information [21, 22]. A perception gap was identified among participants in the Net-Map when they assigned influence scores to each stakeholder identified on the map. For instance, influence scores were not given equally to stakeholders even when they played similar roles (for example, funding sources), and not all stakeholders were assigned influence scores (for example, lawyers) despite their existence in the network. Moreover, the current influence levels set cannot be proven stable due to perception gaps that might have overrated or underrated stakeholders in this network.

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Degree centrality for the complete national level Net-Map

The number of links or connections associated with a single stakeholder represents the degree centrality in a stakeholder network. Degree centrality can be further broken down into in-degree (number of incoming connections) and out-degree (number of outgoing connections) [16]. In-degree indicates that many other stakeholders influence a particular stakeholder, while out-degree suggests that the stakeholder is an influencer. The TC led by MoFA had the highest degree centrality (105), signalling the central role of MoFA and the importance of the TC stakeholder engagement platform in the agriculture-for-nutrition policy formulation process (Table 5). Most connections to the TC were incoming (56), including links from stakeholders in government, donor organizations and development partners, United Nations organizations, NGOs, CSOs, private sector, research and academia, media, and opinion leaders, seeking to influence the policy development process with MoFA tasked as the leader. Outgoing links (49) from the TC reflected that MoFA and other stakeholders jointly played oversight roles over the activities in the policy review and development process.

Formal command network

The formal command network (Figure 3) reflected stakeholders' contributions to the TC through their joint mandate (depicted by double arrows) with MoFA to ensure that evidence was adequately reviewed to develop the policy document. Stakeholders noted that no stakeholder had a formal oversight role over the work or actions of another stakeholder in the agriculture-for-nutrition policy development process. However, individual stakeholder organizations had a formal oversight role over their subsidiary institutions. For instance, the MoH had a formal oversight role over the work and actions of the Food and Drugs Authority in Ghana.

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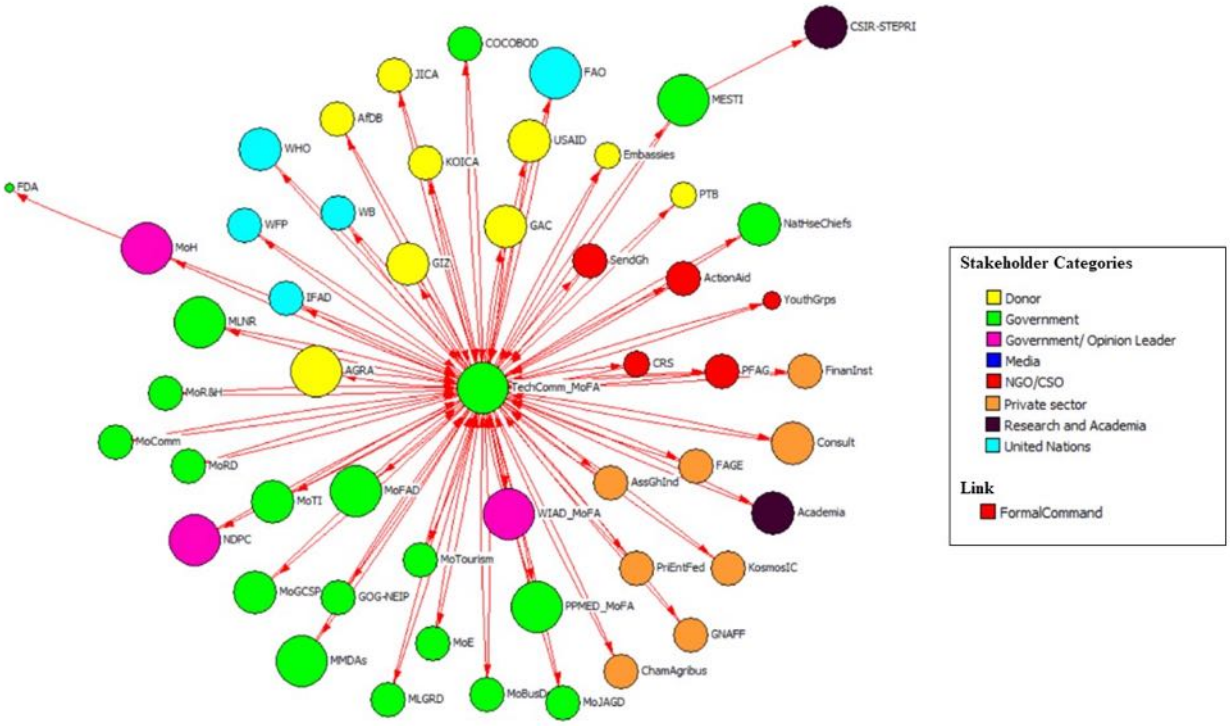

Figure 3: National formal command network, stakeholders sized by influence scores (stakeholders' full names found in Table 5)

Funding network

The funding network (Figure 4) comprised stakeholders mainly from the government, donors, development partners, United Nations organizations, and research and academia. Stakeholders noted that even though donors, development partners, and United Nations organizations had their priority areas of interest, they funded all areas recognized as global priorities, including nutrition. Only donors, development partners, and United Nations organizations provided funding to the GoG in this network. The ministries provided their proposed budgets to the GoG on an annual basis, indicating line items for policy, research, and development. The GoG disbursed funds to these ministries through the Ministry of Finance and Economic Planning (MoFEP) quarterly to enable the ministries to participate in the TC. The MoFEP was accessible to a wide range of stakeholders and exerted control over the flow of funds to other stakeholders. A portion of the funding the GoG provided through MoFEP was GoG money, and a part was from donors, development partners, and United Nations organizations. Some donor organizations recognized a challenge of insufficient funds along the policy development process due to the ministries' receiving quarterly funding for policy development. To alleviate this challenge, some donor organizations funded policy processes directly. For instance, when the ASWG approved the third phase of the

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FASDEP for development, AGRA, which was present at the ASWG meeting, decided to provide funding directly to PPMED-MoFA to carry out activities to get the policy developed, including the formation of the TC for developing the third phase of the FASDEP. In another instance, stakeholders noted that funding for the development of the aflatoxin policy was directly provided to the Council for Scientific and Industrial Research - Science and Technology Policy Research Institute (CSIR-STEPRI) through MESTI.

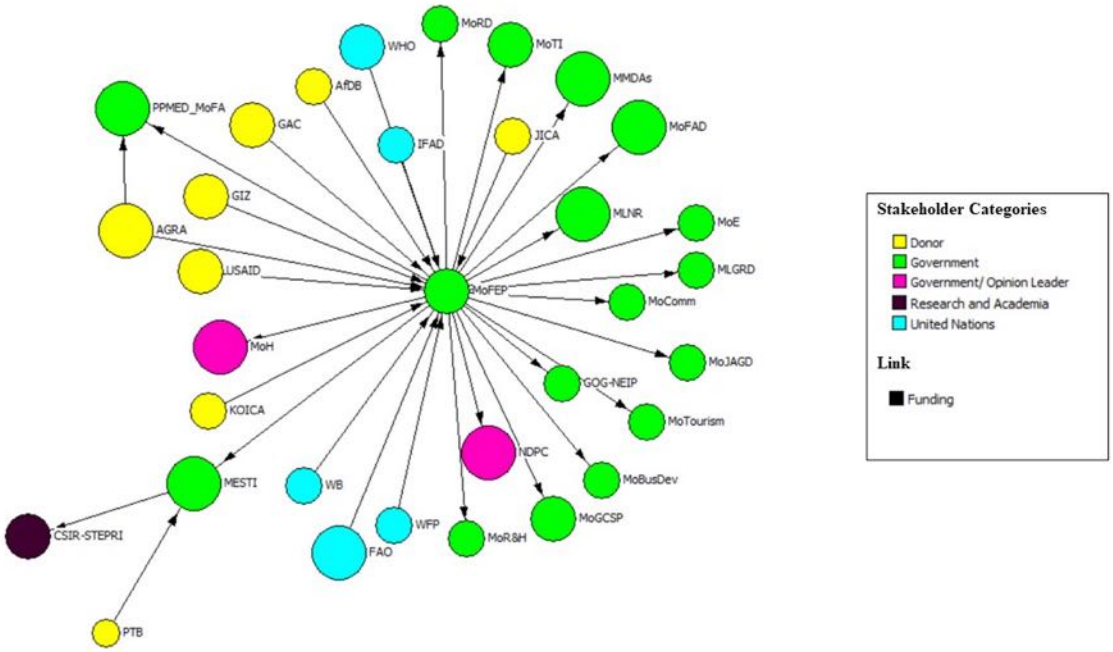

Figure 4: National funding network, stakeholders sized by influence scores (stakeholders' full names found in Table 5)

Advocacy network

A number of stakeholders, from the government, NGOs, CSOs, the private sector, and the media, played advocacy roles in the TC (Figure 5). Among the stakeholders identified for advocacy, there was a crucial role of the Parliamentary Sub-committee in law-making. The Parliamentary Sub-committee was a recognized opinion leader that advocated for a policy to go to the cabinet for approval once the policy was completed. If sections of the policy needed to be legislated, the Parliamentary Sub-committee also ensured that the sections became law.

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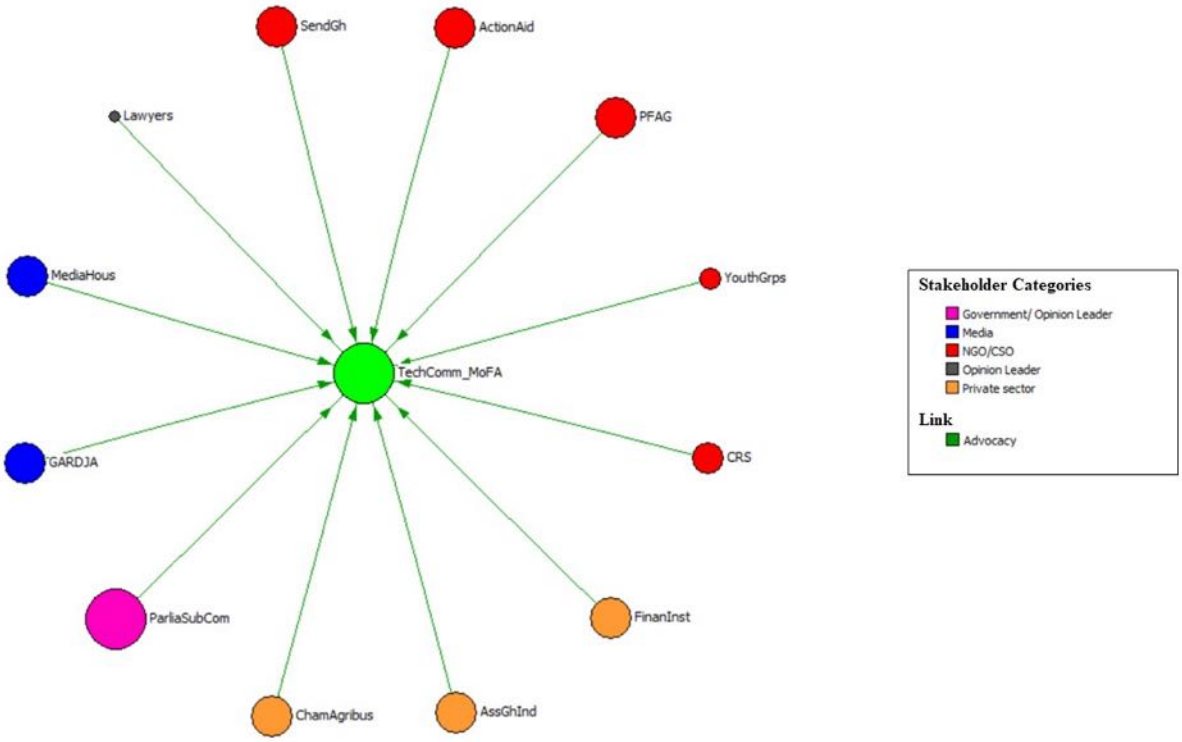

Figure 5: National advocacy network, stakeholders sized by influence scores (stakeholders' full names found in Table 5)

Dissemination network

Four stakeholder categories (government, opinion leaders, research and academia, and the media) were identified as key players in disseminating nutrition and nutrition-related information in the network (Figure 6). Most evidence-based information for agriculture-for-nutrition policymaking was sourced from research and academic institutions. The MoH and WIAD-MoFA also prepared documentaries and brochures on nutrition and nutrition-related information that they shared at the TC. Moreover, even though the media stakeholders participated minimally in policymaking, media information influenced decisions in the agriculture-for-nutrition policy space. The MoFA-PPMED identified and collated topical issues published in the media that were food and agriculture-related daily to synthesize them and determine the most pressing issues that needed policy attention. These pressing issues were compiled and passed on to the ASWG to facilitate policy dialogues. In the Net-Map discussions, it was evident that the media played a critical role in informing decisions discussed in the agriculture-for-nutrition policy space but had a limited role in influencing policies. Moreover, while the media stakeholders occasionally participated in stakeholder consultations by moderating some validation workshops, they played a critical role in publicizing policies once they had been developed.

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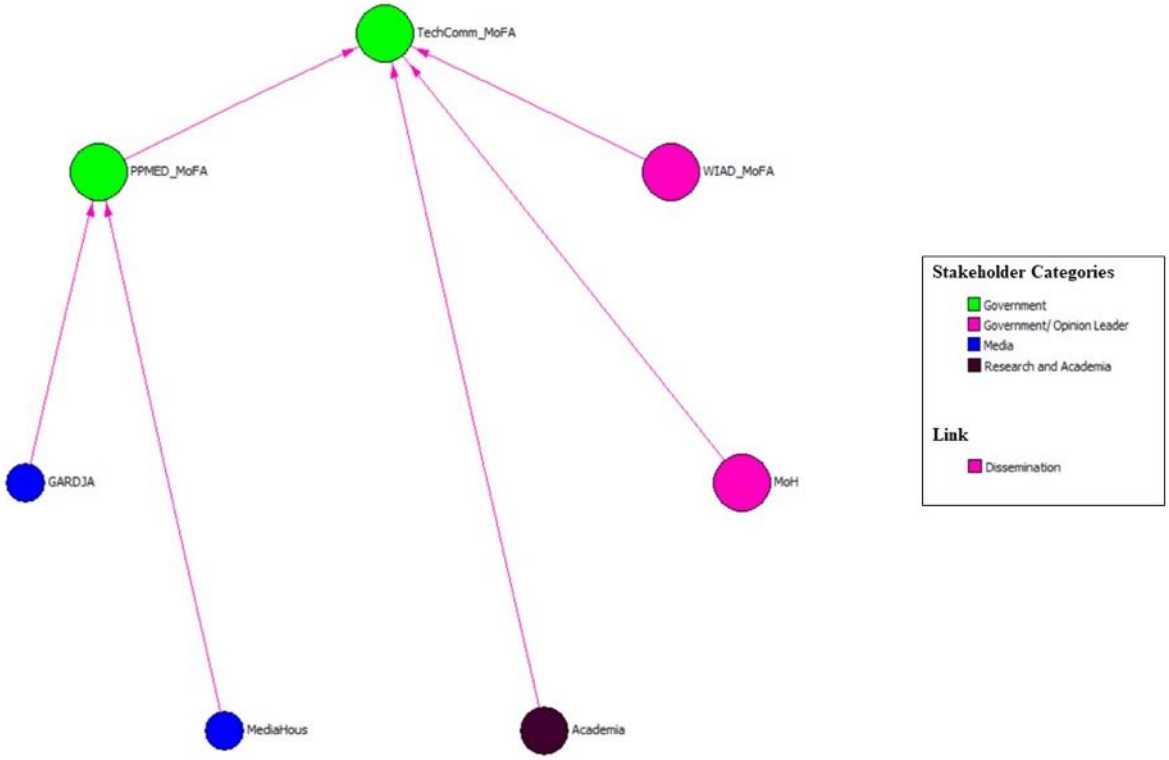

Figure 6: National dissemination network, stakeholders sized by influence scores (stakeholders' full names found in Table 5)

Technical assistance network

All stakeholder categories except the media provided technical assistance to the TC led by MoFA (Figure 7). Technical assistance in the TC platform was mainly provided by donors, development partners, United Nations Organizations, and the private sector. Donors, development partners, and United Nations Organizations also directly provided technical assistance to other stakeholders in cases where the stakeholder proposed and led the policy development process. For instance, for the development of the aflatoxin policy, the United States Agency for International Development (USAID), the Mexican Embassy, and FAO directly provided technical assistance to CSIR-STEPRI.

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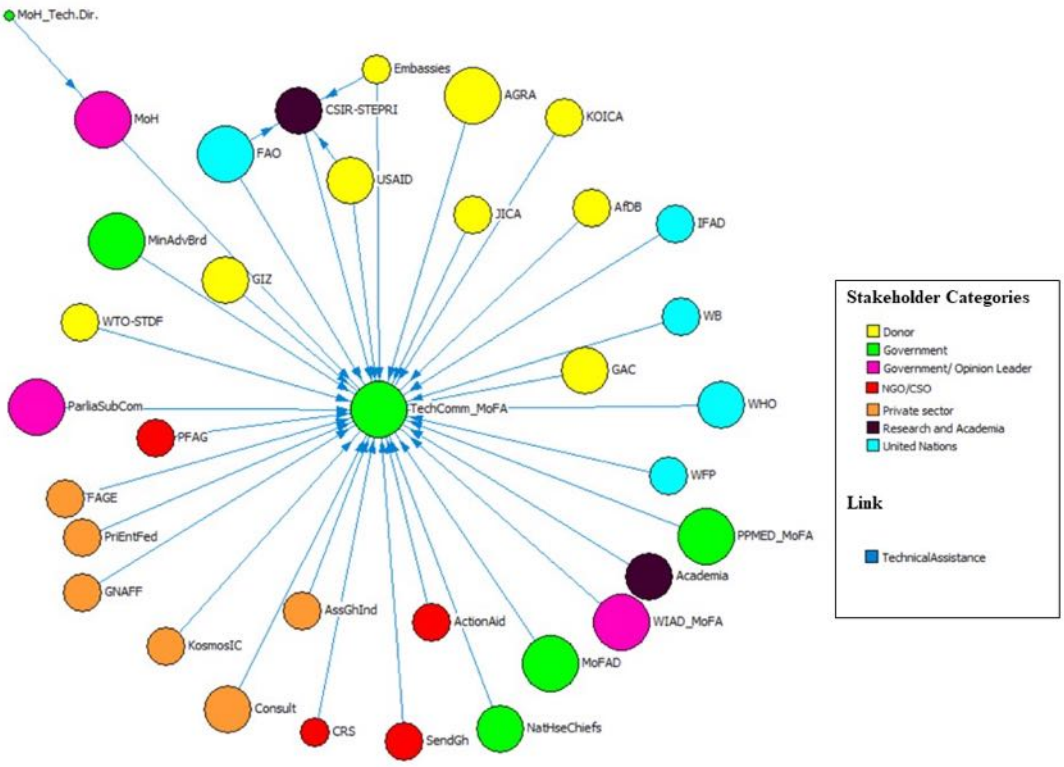

Figure 7: National technical assistance network, stakeholders sized by influence scores (stakeholders' full names found in Table 5)

Strengths and limitations of the study

Although challenging to generalize the finding of this study, the application of the Net-Map tool to agriculture-for-nutrition policymaking enabled this paper to describe the connections and influence of stakeholders from a social network perspective to allow policymakers to visualize their networks. The visual maps produced in the Net-Map for each type of connection can aid policymakers in identifying the key stakeholders and their influence within their network and also help policymakers to identify marginalized stakeholders (for example, youth groups) to be more engaged within the network through other connections (for example, training) [22]. The findings of this study demonstrated that Net-Map discussions could be done virtually as opposed to the traditional in-person method of conducting Net-Maps. However, the participant's responses in the Net-Map were highly subjective and may lead to perception gaps about the influence levels and connections among stakeholders [21, 22].

Implications for agriculture-for-nutrition policymaking

The findings of the Net-Map provided an overview of the stakeholders' influence and interconnections and constitute the first time that data are available on 'who is

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doing what' in agriculture-for-nutrition policymaking in Ghana's food and agriculture sector. Even more crucial is information on the perceived influence of the various stakeholders in the process that can benefit stakeholders (both current and potential) seeking to centralize nutrition in the food and agriculture sector. Moreover, the network maps (Figures 2 – 7) showed areas that had the most and least stakeholder engagements, which will enable potential stakeholders to identify niche(s) to support the nutrition agenda in Ghana's food and agriculture sector and help Ghana meet the Global Nutrition Targets and the Sustainable Development Goals for 2025 and 2030, respectively [23, 24].

The network maps developed (Figures 2 – 7) can be used as an advocacy tool to solicit greater support from all current and potential stakeholders for nutrition-related cross-sectoral actions. Specifically, information on stakeholders' influence and interconnections can inform discussions on updating Ghana's National Nutrition Policy. Moreover, the network maps and the stakeholders' influence in agriculture-for-nutrition policymaking can be used as a tool to inform potential stakeholders seeking to partner with and support the nutrition agenda in the agriculture sector, thus, leading to the formation of critical links and strengthening existing networks in Ghana's agriculture-for-nutrition policymaking process.

CONCLUSION

The study showed that the Net-Map tool was useful in identifying the most influential stakeholders and their connections in the agriculture-for-nutrition policymaking process. While all stakeholders had a joint mandate to ensure that policies were developed, MoFA led the policy development process in Ghana's food and agriculture sector. Moreover, government stakeholders notably received more support from other stakeholders for funding, advocacy, dissemination, and technical assistance than the support they offered. The visual maps produced in the Net-Map analysis for the various connections could be useful for targeting efforts at the national level to generate a conducive policy environment for supporting and promoting the centrality of nutrition in agriculture policies. Moreover, with the visual maps, policymakers can learn about their position and the influence and interconnections among stakeholders in the agriculture-for-nutrition policymaking space.

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Table 1: Questions used in the national-level virtual stakeholder Net-Map exercise

Theme explored	Question
Stakeholder identification	1. Who influences agriculture-for-nutrition policymaking at the national level in Ghana's food and agriculture sector?
Connections/links	1. Who gives formal command to who? 2. Who gives funding to who? 3. Who gives technical assistance to who? 4. Who provides advocacy to who? 5. Who disseminates nutrition or nutrition-related information to who?
Opinion leaders	1. Are there any individuals you would describe as opinion leaders in the policy formulation process? Probe: Are there any champions in the policymaking process that influenced these policies into being? (NB: they may not necessarily be in the field of agriculture)
Influence levels	1. How influential is each actor in the policy formulation process in Ghana's food and agriculture sector? Rate each stakeholder's influence on a scale of zero to five (0=not influential at all; 5=highest level of influence)

Table 2: Definition of network descriptions from statistical analysis output

Network property	Definitions
Degree centrality	The number of links/edges connected to a stakeholder (for example, the stakeholders with the most connections)
Network density	The proportion of actual links or connections in a network. A network density of 1 means all stakeholders are connected in the network. A network density lower than 1 signals sparse connections across stakeholders in the network.
Network diameter	The longest graph distance between any two stakeholders in the network (i.e., how far apart are the two most distant stakeholders)

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Table 3: Number of stakeholders identified in the virtual Net-Map exercise

Stakeholder category	Number of stakeholders	Percent of total stakeholder
Government	23	38%
Donor	10	17%
Private sector	8	13%
United Nations	5	8%
NGO/CSO	5	8%
Government/ Opinion Leader	4	7%
Research and Academia	2	3%
Media	2	3%
Opinion Leader	1	2%

Table 4: Number of stakeholder links identified in the virtual Net-Map exercise

Link type	Number of links	Percent of total links
Formal Command	100	53%
Technical Assistance	37	20%
Funding	33	17%
Advocacy	12	6%
Dissemination	6	3%

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Table 5: List of stakeholder acronym, influence level, stakeholder category, and full names identified in the virtual Net-Map exercise

Stakeholder abbreviation	Full name	Category	Influence score	Degree[a]	In-Degree[b]	Out-Degree[c]
AGRA	Alliance for a Green Revolution in Africa	Donor	5	4	1	3
FAO	Food and Agriculture Organization of the United Nations	UN	5	4	1	3
PPMED_MoFA	Policy Planning Monitoring & Evaluation Directorate of the Ministry of Food and Agriculture	Government	5	6	5	1
WIAD_MoFA	Women in Agricultural Development Directorate of the Ministry of Food and Agriculture	Government/ Opinion Leader	5	2	1	1
TechComm_MoFA	Technical Committee led by Ministry of Food and Agriculture	Government	5	105	56	49
MoH	Ministry of Health of Ghana	Government/ Opinion Leader	5	5	3	2
ParliaSubCom	Parliamentary Subcommittee	Government/ Opinion Leader	5	1	0	1
MLNR	Ministry of Lands and Natural Resources	Government	5	3	2	1
MinAdvBrd	Ministerial Advisory Board	Government	5	1	0	1
MoFAD	Ministry of Fisheries and Aquaculture Development	Government	5	3	2	1

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MESTI	Ministry of Environment, Science, Technology and Innovation	Government	5	5	3	2
NDPC	National Development Planning Commission	Government/ Opinion Leader	5	3	2	1
MMDAs	Metropolitan, Municipal and District Assemblies	Government	5	3	2	1
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit	Donor	4	3	1	2
USAID	United States Agency for International Development	Donor	4	4	1	3
GAC	Global Affairs Canada	Donor	4	3	1	2
WHO	World Health Organization	UN	4	3	1	2
MoFEP	Ministry of Finance and Economic Planning	Government	4	19	1	18
MoTI	Ministry of Trade and Industry	Government	4	3	2	1
MoGCSP	Ministry of Gender, Children and Social Protection of Ghana	Government	4	3	2	1
NatHseChiefs	National House of Chiefs	Government	4	2	1	1
CSIR-STEPRI	Council for Scientific and Industrial Research - Science and Technology Policy Research Institute	Research and Academia	4	5	4	1
Academia	Public Tertiary Institutions in Ghana	Research and Academia	4	2	1	1
Consult	Consultant	Private sector	4	2	1	1

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WTO-STDF	World Trade Organization-Standards and Trade Development Facility	Donor	3	1	0	1
JICA	Japan International Cooperation Agency	Donor	3	3	1	2
KOICA	Korea International Cooperation Agency	Donor	3	3	1	2
AfDB	African Development Bank Group	Donor	3	3	1	2
IFAD	International Fund for Agricultural Development	UN	3	3	1	2
WB	World Bank	UN	3	3	1	2
WFP	World Food Program	UN	3	3	1	2
COCOBOD	Ghana Cocoa Board	Government	3	2	1	1
MoR&H	Ministry of Roads and Highways	Government	3	3	2	1
MoRD	Ministry of Railways Development	Government	3	3	2	1
MoBusDev	Ministry of Business Development	Government	3	3	2	1
MLGRD	Ministry of Local Government, Decentralization & Rural Development	Government	3	3	2	1
GOG-NEIP	Government of Ghana_National Entrepreneurship & Innovation Programme	Government	3	3	2	1
MoComm	Ministry of Communications	Government	3	3	2	1

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MoTourism	Ministry of Tourism, Culture and Creative Arts	Government	3	3	2	1
MoE	Ministry of Education	Government	3	3	2	1
MoJAGD	Ministry of Justice and Attorney General Department	Government	3	3	2	1
SendGh	Send Ghana	NGO/CSO	3	2	1	1
ActionAid	Action Aid	NGO/CSO	3	2	1	1
PFAG	Peasant Farmers Association of Ghana	NGO/CSO	3	2	1	1
FinanInst	Financial institutions	Private sector	3	2	1	1
AssGhInd	Association of Ghana Industries	Private sector	3	2	1	1
KosmosIC	Kosmos Innovation Center	Private sector	3	2	1	1
PriEntFed	Private Enterprise Federation	Private sector	3	2	1	1
GNAFF	Ghana National Association of Farmers and Fishermen	Private sector	3	2	1	1
FAGE	Federation of Associations of Ghanaian Exporters	Private sector	3	2	1	1
ChamAgribus	Chamber of Agribusiness	Private sector	3	2	1	1
GARDJA	Ghana Agricultural & Rural Development Journalists Association	Media	3	2	0	2
MediaHous	Media Houses	Media	3	2	0	2
PTB	Physikalisch-Technische Bundesanstalt	Donor	2	3	1	2
Embassies	Embassies	Donor	2	3	1	2
CRS	Catholic Relief Services	NGO/CSO	2	2	1	1

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YouthGrps	Youth Groups	NGO/CSO	1	2	1	1
FDA	Food and Drug Administration	Government	0	1	1	0
MoH_Tech.Dir.	Technical Directorate_Ministry of Health	Government	0	1	0	1
Lawyers	Lawyers	Opinion Leader	0	1	0	1

[a] Degree - The number of links/edges connected to a stakeholder

[b] In-coming connections - a measure suggesting many others influence one stakeholder

[c] Outgoing connections - an indication that a stakeholder is an influencer

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