Assessing the Nutrition-sensitivity of Agriculture Policies and Investments in Ghana

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August 2024

A thesis submitted to McGill University in partial fulfilment of the requirements for the degree of Doctor of Philosophy (Ph.D.)

Abstract

Ghana has made notable progress in reducing the prevalence of some indicators of maternal and child undernutrition. However, rural-urban disparities in child stunting and persisting micronutrient deficiencies are still a concern. Nutrition-specific interventions that are often adopted in the health sector cannot solve the nutrition problems in Ghana. Instead, a more holistic approach is needed, with a focus on adopting nutrition-sensitive approaches in other sectors, such as agriculture. Ghana has taken notable steps to prioritize nutrition in its agriculture sector by participating in various national, continental, and global initiatives. However, developing effective policies, strategies, and programs for nutrition-sensitive agriculture (NSA) requires a comprehensive understanding of the policy processes, stakeholders involved, and their capacities to implement NSA programs. This study aimed to contribute to the ongoing dialogue surrounding the gaps in understanding by (i) investigating the processes involved in the development and implementation of agriculture-for-nutrition policies and programs and (ii) assessing the organizational capacity to implement agriculture-for-nutrition policies and programs in Ghana. As such, the following objectives were pursued: (i) To examine the nutrition-sensitive characteristics of agriculture policies between 2004 and 2020, (ii) To determine how nutrition-related activities have been implemented in the agricultural sector based on national annual reports published between 2010 and 2019, (iii) To describe relevant national stakeholders' interconnections and influence in the agriculture-for-nutrition policymaking process, (iv) To describe the roles of stakeholders, their relationships, and influence in NSA program implementation in the Eastern Region, and (v) To assess the capacity of district-level agriculture staff to implement NSA programs in the Eastern Region of Ghana.

A case study approach was used to assess the first two objectives in Study 1. Two representatives from the Policy Planning, Monitoring and Evaluation Directorate of the Ministry of Food and Agriculture (MoFA) identified 27 key documents comprising 17 policies and strategies and 10 national annual reports for analysis. The 17 policies and strategies were analyzed for their nutrition sensitivity, while the 10 national annual reports were analyzed to assess how nutrition-related activities were implemented in the agriculture sector. The analysis used the 17 criteria from the Food and Agriculture Organization of the United Nations (FAO) document 'Key recommendations for improving nutrition through agriculture and food systems'. Two extraction templates were created, one for the policies and strategies and one for the annual reports. Two raters manually reviewed and extracted text from the policies and strategies, independently assessed them using the 17 criteria, and scored each criterion as not incorporated (0), partially incorporated (0.5), or fully incorporated (1). The raters independently summed the scores for each document (range 0 to 17), then the average score for each document was calculated. Next, texts reflecting each of the 17 criteria were extracted from the national annual reports and summarized narratively. In summary, the analysis indicated that while the majority of the policy and strategy documents (16 out of 17) prioritized the protection of natural resources and increasing staple food production, few (3 out of 17) emphasized micronutrient-rich foods. There were specific programs reported in the national annual reports that had been implemented between 2010 and 2019, such as the Cowpea Improvement Program, Guinea Fowl Project, the Green House Model, and Rearing for Food and Jobs Program, which revealed how a nutrition focus has been implemented in Ghana's agriculture sector. These findings suggest that the 17 criteria can serve as an effective tool in evaluating policies, strategies, and reports in the agriculture sector for their nutrition-sensitivity. The 17 criteria can be a particularly useful tool for policymakers in the NSA landscape to evaluate past and future policies and documents related to the agriculture

sector's contribution to nutrition, which can help policymakers identify areas that need improvement. By using the screening criteria as a tool, NSA policymakers can work towards ensuring that everyone has access to healthy and nutritious food.

Building upon the findings of Study 1, Study 2 aimed to identify the key stakeholders involved in the development of NSA policies and the strategies through which they are implemented in Ghana. In this study, the policy processes were identified, along with the stakeholder connections and their perceived level of influence in the development of NSA policy. Two MoFA Policy Planning Monitoring and Evaluation Directorate staff members identified 15 key staff who participated in agriculture policymaking from 10 stakeholder institutions, representing government, donors, and private sectors, to participate in a session to examine stakeholders' participation in the development of NSA policies. Ten staff from eight institutions enrolled in the study. Using a visual participatory mapping technique called Virtual Net-Map, the participants identified other stakeholders in their network, their connections, their respective roles, and their perceived level of influence. The generated data were organized in Microsoft Excel worksheets, which were then analyzed using Visualyzer version 2.2. The study identified three convening platforms for stakeholder engagement: 1) the Agriculture Sector Working Group, 2) the National Agricultural Technical Committee, and 3) the Public-Private Partnership Dialogue Platform. A total of 188 connections among 60 stakeholders (14 highly influential), were recognized for their involvement in agriculture-for-nutrition policymaking. International stakeholders, including donors and development partners, had a critical role in funding agriculture-for-nutrition policymaking activities. The identification of these convening platforms and influential stakeholders can help policymakers to work together in identifying gaps and opportunities to improve the agriculture sector's contribution to nutrition.

The third study complemented the second study by applying the Net-Map method in an in-person format at the sub-national level to identify implementation stakeholders and their connections in NSA program implementation. The Eastern Region was selected for sub-national analysis. Fifteen out of thirty eligible districts in the Eastern Region were randomly selected for inclusion. Sixteen participants were purposively selected from the Eastern Regional Department of Agriculture (DoA) office (n = 1) and fifteen district DoA offices (n = 15) based on their knowledge of the NSA activities within their jurisdiction between 2007 and 2022. The sixteen participants were made up of 14 DoA directors, one Women in Agriculture Development (WIAD) regional officer, and one WIAD district officer. The same analysis procedure described in Study 2 was applied in Study 3. Sixty-five stakeholders (nine highly influential) with 198 connections were identified for their involvement in regional NSA implementation. The findings from Study 2 revealed that MoFA played a central role in policymaking at the national level, while in Study 3 farmer-based organizations, MoFA, and the DoA were key players in NSA policy implementation at the sub-national level. This finding underscores the critical role MoFA played in developing national policies and setting priorities that guided the implementation of nutrition-related activities in the decentralized agriculture sector. The findings of Studies 2 and 3 provided valuable insights into the power structures and dynamics that shape the development and implementation of NSA policies and programs. These insights can help identify potential avenues to increase stakeholder engagement and participation in the NSA policymaking and implementation process.

The final study used qualitative methods to assess the organizational capacity of district-level agricultural staff in the Eastern Region to carry out NSA programs. One focus group discussion was held in each of 11 randomly selected districts; the eleven events included a total of 73 district-level agricultural staff. The Organizational Capacity Assessment module of the Global Capacity Needs Assessment methodology was used to guide the focus group

discussions. Data were analyzed using inductive and deductive thematic analysis approaches. The final stage of the analysis focused on developing a framework to explain the connections between the identified themes and the capacity of agricultural staff to carry out NSA programs. The study found that the implementation capacity of staff depended on many interrelated factors, including structural and financial. The decentralization of Ghana's agricultural sector has led to structural issues, such as a disconnect between the policymaking and implementation bodies. These issues have adversely impacted financial support for NSA programs, which, in turn, have affected operational support and program delivery. One of the major consequences of decentralization has been the delayed release of funds for agricultural activities, resultant of the bureaucracies arising from the disconnect. These findings underscore the need for policymakers to address the structural issues in Ghana's agricultural sector to enhance the financial support for NSA programs.

These related studies reveal that stakeholder partnerships, relationships, and level of influence are crucial in advancing NSA in Ghana. The findings highlighted the importance of Ghana's MoFA in establishing policies and setting priorities for the implementation of NSA programming with other national-level stakeholders, as well as provision of funding and technical support. These results further emphasize the need for agricultural policies and strategies that prioritize the production, processing, and marketing of micronutrient-rich foods in addition to the production of staples. Further work is needed to (i) improve skills and knowledge of current and future agricultural workers, (ii) enhance effective coordination and communication among stakeholders, and (iii) increase the availability of financial resources to expand efforts and improve nutrition-sensitive programming at the national and sub-national levels in Ghana.

Résumé

Le Ghana a réalisé des progrès notables dans la réduction de la prévalence de certains indicateurs de dénutrition maternelle et infantile. Toutefois, les disparités rurales-urbaines en matière de retard de croissance chez les enfants et les carences persistantes en micronutriments restent préoccupantes. Les interventions spécifiques à la nutrition qui sont souvent adoptées dans le secteur de la santé ne résolvent pas les problèmes de nutrition au Ghana. Il convient plutôt d'adopter une approche plus globale, en mettant l'accent sur l'adoption d'approches sensibles à la nutrition dans d'autres secteurs, tels que l'agriculture. Le Ghana a pris des mesures notables pour donner la priorité à la nutrition dans son secteur agricole en participant dans les diverses initiatives nationales, continentales, et mondiales. Cependant, l'élaboration de politiques, de stratégies, et de programmes efficaces pour une agriculture sensible à la nutrition (ASN) nécessite une compréhension globale des processus politiques, des parties prenantes impliquées, et de leurs capacités à mettre en œuvre des programmes ASN. Cette étude visait à contribuer au dialogue en cours sur les lacunes de compréhension en (i) examinant les processus impliqués dans l'élaboration et la mise en œuvre des politiques et programmes d'agriculture pour la nutrition et (ii) en évaluant la capacité organisationnelle à exécuter les politiques et programmes d'agriculture pour la nutrition au Ghana. Les objectifs suivants ont été poursuivis : (i) Examiner les caractéristiques des politiques agricoles sensibles à la nutrition entre 2004 et 2020, (ii) Déterminer comment les activités liées à la nutrition ont été mises en œuvre dans le secteur agricole sur la base des rapports annuels nationaux publiés entre 2010 et 2019, (iii) Décrire les interconnexions et l'influence des parties prenantes nationales pertinentes dans le processus d'élaboration des politiques d'agriculture pour la nutrition, (iv) Décrire les rôles des parties prenantes, leurs relations, et leur influence dans la mise en œuvre des programmes

ASN dans la région Est, et (v) Évaluer la capacité du personnel agricole au niveau du district à mettre en œuvre les programmes ASN dans la région orientale du Ghana.

Une approche par étude de cas a été utilisée pour évaluer les deux premiers objectifs de l'étude 1. Deux représentants de la direction de la planification politique, du suivi et de l'évaluation du Ministère de l'Alimentation et de l'Agriculture (MoFA) ont identifié 27 documents clés comprenant 17 politiques et stratégies et 10 rapports annuels nationaux à analyser. Les 17 politiques et stratégies ont été analysées pour leur sensibilité à la nutrition, tandis que les 10 rapports annuels nationaux ont été analysés pour évaluer la façon dont la nutrition a été intégrée dans le secteur agricole. L'analyse a utilisé les 17 critères du document de l'Organisation des Nations unies pour l'alimentation et l'agriculture (FAO) intitulé "Principales recommandations pour l'amélioration de la nutrition par l'agriculture et les systèmes alimentaires". Deux modèles d'extraction ont été créés, l'un pour les politiques et stratégies et l'autre pour les rapports annuels. Deux évaluateurs ont revu et extrait manuellement le texte des politiques et des stratégies, les ont évaluées indépendamment à l'aide des 17 critères, et ont attribué à chaque critère la note comme non incorporé (0), partiellement incorporé (0,5) ou entièrement incorporé (1). Les évaluateurs ont additionné indépendamment les notes de chaque document (de 0 à 17), puis la note moyenne de chaque document a été calculée. Ensuite, les textes reflétant chacun des 17 critères ont été extraits des rapports annuels nationaux et résumés de manière narrative. En résumé, l'analyse a montré que la majorité des documents politiques et stratégiques (16 sur 17) donnaient la priorité à la protection des ressources naturelles et à l'augmentation de la production d'aliments de base, peu d'entre eux (3 sur 17) mettaient l'accent sur les aliments riches en nutriments.

Il y avait des rapports annuels nationaux contenant de programmes spécifiques réalisé entre 2010 et 2019, tels que le Programme d'amélioration du niébé, le Projet de Pintade, le Modèle

de serre, et le Programme d'élevage pour l'alimentation et l'emploi, qui révèlent la manière dont la nutrition a été intégré dans le secteur agricole ghanéen. Ces résultats suggèrent que les 17 critères peuvent servir d'outil efficace pour évaluer les politiques, les stratégies, et les rapports dans le secteur agricole en fonction de leur sensibilité à la nutrition. Les 17 critères peuvent être un outil particulièrement utile pour les décideurs politiques dans le cadre de ASN pour évaluer les politiques et les documents passés et futurs liés à la contribution du secteur agricole à la nutrition, ce qui peut aider les décideurs politiques à identifier les domaines qui doivent être améliorés. En utilisant les critères de sélection comme outil, les décideurs politiques de l'ASN peuvent garantir l'accès de tous à une alimentation saine et nutritive.

S'appuyant sur les résultats de l'étude 1, l'étude 2 visait à identifier les principales parties prenantes impliquées dans le développement des politiques ASN et les stratégies par lesquelles elles sont mises en œuvre au Ghana. Dans cette étude, les processus politiques ont été identifiés, ainsi que les liens entre les parties prenantes et leur niveau d'influence perçu dans le développement de la politique ASN. Deux membres du personnel de la Direction de la planification, du suivi et de l'évaluation des politiques du MoFA ont identifié 15 personnels clés qui ont participé à l'élaboration des politiques agricoles dans 10 institutions parties prenantes, représentant le gouvernement, les donateurs, et les secteurs privés, pour participer à une session visant à examiner la participation des parties prenantes à l'élaboration des politiques d'ASN. Dix personnels de huit institutions ont participé à l'étude. À l'aide d'une technique de cartographie participative visuelle appelée Virtual Net-Map, les participants ont identifié les autres parties prenantes de leur réseau, leurs connexions, leurs rôles respectifs et leur niveau d'influence perçu. Les données générées ont été organisées dans des feuilles de calcul Microsoft Excel, qui ont ensuite été analysées à l'aide de la version 2.2 de Visualyzer. L'étude a identifié trois plateformes de rassemblement pour l'engagement des parties

prenantes: 1) le groupe de travail du secteur agricole, 2) le comité technique agricole national et 3) la plateforme de dialogue du partenariat public-privé. Au total, 188 connexions entre 60 parties prenantes (dont 14 très influentes) ont été identifiées pour leur participation dans le développement de politiques d'agriculture pour la nutrition. Les acteurs internationaux, y compris les donateurs et les partenaires de développement, ont joué un rôle essentiel dans le financement des activités d'élaboration des politiques d'agriculture pour la nutrition. L'identification de ces plateformes de rassemblement et de ces parties prenantes influentes peut aider les décideurs politiques à travailler ensemble pour identifier les lacunes et les possibilités d'améliorer la contribution du secteur agricole à la nutrition.

La troisième étude a complété la deuxième en appliquant la méthode Net-Map en personne au niveau infranational afin d'identifier les acteurs de la mise en œuvre et leurs liens dans la réalisation du programme ASN. La région de l'Est a été sélectionnée pour l'analyse infranationale. Quinze des trente districts éligibles de la région Est ont été sélectionnés au hasard. Seize participants ont été sélectionnés à dessein à partir du bureau du Département de l'Agriculture (DoA) de la région Est (n = 1) et de quinze bureaux de district du Département de l'agriculture (n = 15) sur la base de leur connaissance des activités des ASN au sein de leur juridiction entre 2007 et 2022. Les seize participants étaient composés de 14 directeurs du DoA, d'un représentant régional du Développement des Femmes dans l'Agriculture (WIAD) et d'un WIAD responsable de district. La même procédure d'analyse décrite dans l'étude 2 a été appliquée dans l'étude 3. Soixante-cinq parties prenantes (dont neuf très influentes) ayant 198 connexions ont été identifiées pour leur implication dans la mise en œuvre régionale d'ASN. Les résultats de l'étude 2 ont révélé que le MoFA jouait un rôle central dans l'élaboration des politiques au niveau national, tandis que dans l'étude 3, les organisations paysannes, le MoFA et le DoA étaient des acteurs clés dans la mise en œuvre de la politique de ASN au niveau infranational. Ce résultat souligne le rôle essentiel joué par MoFA dans

l'élaboration des politiques nationales et la définition des priorités qui ont guidé la mise en œuvre des activités liées à la nutrition dans le secteur agricole décentralisé. Les résultats des études 2 et 3 ont fourni des informations précieuses sur les structures et dynamiques de pouvoir qui façonnent l'élaboration et la réalisation des politiques et des programmes d'ASN. Ces informations peuvent aider à identifier des pistes potentielles pour accroître l'engagement et la participation des parties prenantes dans le processus d'élaboration et de mise en œuvre de la politique d'ASN.

L'étude finale a utilisé des méthodes qualitatives pour évaluer la capacité organisationnelle du personnel agricole au niveau du district dans la région de l'Est à mettre en œuvre les programmes NSA. Un groupe de discussion a été organisé dans chacun des 11 districts arbitrairement sélectionnés ; les onze événements ont inclus un total de 73 membres du personnel agricole au niveau du district. Le module d'évaluation des capacités organisationnelles de la méthodologie d'évaluation des besoins en capacités globales a été utilisé pour guider les discussions de groupe de discussion. Les données ont été analysées à l'aide d'approches d'analyse thématique inductive et déductive. La dernière étape de l'analyse a consisté à élaborer un cadre permettant d'expliquer les liens entre les thèmes identifiés et la capacité du personnel agricole à mettre en œuvre les programmes NSA. L'étude a montré que la capacité de mise en œuvre du personnel dépendait de nombreux facteurs interdépendants, notamment structurels et financiers. La décentralisation du secteur agricole ghanéen a entraîné des problèmes structurels, tels qu'un décalage entre les organes de décision et de mise en œuvre. Ces problèmes ont eu un impact négatif sur le soutien financier du programme d'ASN, ce qui, à son tour, a affecté le soutien opérationnel et la mise en œuvre des programmes. L'une des principales conséquences de la décentralisation a été le retard dans le déblocage des fonds pour les activités agricoles, en raison de la bureaucratie résultant de la déconnexion. Ces résultats soulignent la nécessité pour les décideurs politiques de

s'attaquer aux problèmes structurels du secteur agricole ghanéen afin d'améliorer le soutien financier des programmes ASN.

Ces études connexes révèlent que les partenariats, les relations, et le niveau d'influence des parties prenantes sont essentiels pour faire progresser l'ASN au Ghana. Les résultats ont mis en évidence l'importance du MoFA ghanéen dans l'élaboration des politiques et la définition des priorités pour la mise en œuvre de la programme ASN avec d'autres parties prenantes au niveau national, ainsi que la fourniture d'un financement et d'un soutien technique. Ces résultats soulignent en outre la nécessité de politiques et stratégies agricoles qui donnent priorité à la production, transformation, et commercialisation d'aliments riches en nutriments, en plus de la production d'aliments de base. D'autres travaux sont nécessaires pour (i) améliorer les compétences et les connaissances des agriculteurs actuels et futurs, (ii) renforcer l'efficacité de la coordination et de la communication entre les parties prenantes, et (iii) accroître la disponibilité des ressources financières afin d'intensifier les efforts et d'améliorer les programmes sensibles à la nutrition aux niveaux national et infranational au Ghana.

Contribution to knowledge

The dissertation presents a well-integrated analysis of policy documents, stakeholder participation, and institutional capacity in Ghana's nutrition-sensitive agriculture (NSA) landscape and adds to the growing body of evidence on the processes, challenges, and opportunities that affect NSA policy development and implementation.

In Chapter 3, an in-depth analysis of policy documents and annual reports in Ghana's agriculture sector was conducted to determine their nutrition sensitivity, using the 17 criteria developed by the Food and Agriculture Organization of the United Nations. The analysis revealed that the policies and strategies in Ghana's agriculture sector were primarily focused on producing staple foods, with limited attention given to micronutrient-rich foods. This finding offers new insights into how nutrition-related activities have been prioritized in Ghana's agriculture sector and adds to the evidence of the scope and limitations of agriculture policies in adopting nutrition. Furthermore, the evaluation processes used in Chapter 3 offer a practical method that researchers and policymakers can use to assess the nutrition sensitivity of policies and strategies in the NSA policy landscape.

The stakeholder analysis presented in Chapters 4 and 5 provided insights into the interests, roles, and power dynamics of stakeholders engaged in the NSA policy landscape in Ghana. The generated stakeholder maps provide new insights for researchers and policymakers in Ghana to better understand the interests and perspectives of stakeholders in the NSA policy landscape and help develop effective strategies for engaging and collaborating with stakeholders more meaningfully. Moreover, the findings presented in Chapters 4 and 5 provide the first comprehensive data on NSA policymaking and implementation, making it a valuable resource for decision-makers seeking to navigate the complex landscape of NSA policy in Ghana.

Chapter 6 provided an analysis of the barriers to the successful implementation of NSA at the organizational level in Ghana. The framework presented in Chapter 6 provided a nuanced way of looking at how the factors that impede NSA program implementation are linked and is the first of its kind in the literature. Additionally, the interconnections between the factors illustrated in the framework are exceptional and have not been previously explored. The framework will help identify the necessary skills, resources, and infrastructure required by NSA stakeholders to implement NSA programs effectively.

In conclusion, this thesis presents a new integrated approach to examining the nutrition sensitivity of policies, strategies, and programs in the agriculture sector. This approach provides a comprehensive understanding of the focus of past and current policies, enabling policymakers to amend or create future policies, strategies, and programs that better include nutrition. By incorporating policy document analysis, stakeholder analysis, and capacity assessment in the NSA policy landscape, policymakers can make informed decisions, improve policy outcomes, and ensure that the policies meet the diverse needs of all stakeholders involved.

Contribution of authors

The authors of the manuscripts presented in this thesis have worked collaboratively to develop and complete this research project. Priscilla Boadi (the candidate) conceptualized the research project in consultation with Dr. Grace S. Marquis and Professor Richmond Aryeetey. The candidate applied for ethical clearance for the study in consultation with Dr. Grace S. Marquis. The individual contributions of the authors to the various manuscripts are outlined below:

- In the first manuscript, the candidate collaboratively worked with Dr. Grace S. Marquis to develop the extraction templates for the policy document analysis. The candidate managed all the field data collection activities, including hiring research assistants for policy document analysis. The candidate performed all the data analysis, drafted the manuscript, and worked on subsequent revisions. Dr. Grace S. Marquis provided intellectual input for the interpretation and presentation of the findings and gave critical feedback to the draft manuscript. Finally, all authors reviewed and approved the final manuscript.
- For the second manuscript, the candidate collaborated with Dr. Grace S. Marquis and Afua Tetteh to design the data collection protocol for conducting a stakeholder Net-Map interview. The candidate collected and analyzed the data with assistance from Afua Tetteh. After drafting the manuscript, the candidate received critical review and valuable intellectual inputs from Dr. Grace S. Marquis, Professor Richmond Aryeetey, and Afua Tetteh for the interpretation and presentation of the findings. Manuscript 2 has been published in the *African Journal of Food, Agriculture, Nutrition, and Development* (January 2023), with the candidate as the first author. All co-authors (Dr. Grace S. Marquis, Professor Richmond Aryeetey, and Afua Tetteh) contributed to and approved the final manuscript.

- For the third manuscript, the candidate took the lead in developing the research protocol and collaborated with Dr. Grace S. Marquis to design the data collection instrument. The candidate was responsible for the data collection process, including recruiting participants and implementing data collection protocols and tools. After analyzing and interpreting all the data, the candidate drafted the manuscript and incorporated subsequent revisions. Dr. Marquis provided valuable input with the interpretation and presentation of the results and offered critical revisions to the manuscript. All authors reviewed and approved the final manuscript.
- In the fourth manuscript, the candidate took the lead in developing the research protocol and worked collaboratively with Dr. Grace S. Marquis to design the data collection instrument. The candidate played a key role in leading the data collection process, while Sam Koenig provided assistance in coding and analyzing the qualitative data. The candidate drafted the manuscript and incorporated subsequent revisions with the help of Sam Koenig, while Dr. Marquis offered valuable input for data interpretation and critically revised the draft manuscript. All authors reviewed and approved the final manuscript.

Acknowledgements

My journey through the Ph.D. program in Human Nutrition at McGill University has been a truly transformative experience that has been both challenging, humbling, and incredibly fulfilling. Throughout this journey, I have gained invaluable skills, knowledge, and experiences and expanded my professional networks, which have shaped me personally and professionally. For this, I am forever grateful. First and foremost, I am grateful to Almighty God for giving me the strength, determination, and perseverance to complete this challenging Ph.D. His blessings have been instrumental in every step of this journey.

I want to express my most profound appreciation to my thesis supervisor, Professor Grace S. Marquis, for her invaluable guidance, unwavering support, patience, encouragement, and mentorship throughout the Ph.D. process. Working with her for five years as a Project Coordinator on Canadian Queen Elizabeth II Diamond Jubilee Scholarships: Advanced Scholars program and as the Project Lead on the Youth and Rural Women Entrepreneurship project in Ghana, and for six years as her Ph.D. student, I have been fortunate to benefit from her exceptional expertise, insightful guidance, and unwavering encouragement. Her mentorship has played a vital role in shaping the direction of my research and career, expanding my professional network, and improving my analytical and critical thinking skills. I am deeply grateful for her priceless contributions to my academic and professional development. Her unwavering commitment to maintaining high standards and integrity has instilled in me a deep sense of responsibility, and I am determined to uphold these values throughout my career.

I want to thank my thesis committee members, Dr. Kent Mullinix and Professor Paola Perez-Aleman, for their invaluable contributions to my research. Their constructive feedback and insightful comments have challenged me to think more critically and deeply, which has significantly improved the quality of my work. I am also thankful for their kindness and

prompt responses to my emails, phone calls and requests, which have made my Ph.D. process smoother and more enjoyable. I feel incredibly fortunate to have had both of you on my Ph.D. research committee. I would like to express my gratitude to Dr. Nii Addy for introducing me to Prof. Paola Perez-Aleman and other experts who have played a significant role in shaping my Ph.D. journey.

I want to express my gratitude to Professor Richmond Aryeetey for his unwavering support and for involving me in his research team in Ghana. Working with him has enabled me to foster collaborations during my data collection, which has enriched my research experience. I would also like to thank Mrs. Afua Tetteh for her friendship and for taking time out of her busy schedule to train me in conducting a Net-Map and performing stakeholder analysis. Her knowledge and expertise were instrumental in my research, and I am grateful for all that she has done. Additionally, I am thankful for the warm reception that Dr. Carl Lachat extended to me when I contacted him about analyzing the nutrition sensitivity of policy documents. His generosity in sharing resources with me has been invaluable in the research process.

I want to express my gratitude to Mr. Faisal Munkaila and Ms. Hajia Habiba Yusuf from the Ministry of Food and Agriculture and the Eastern Regional Department of Agriculture office, respectively, for their invaluable contributions to the success of my PhD. Their efforts in arranging for me to meet and interact with my research participants were instrumental in achieving my research goals. Additionally, I appreciate the dedication and hard work of my research assistant, Godsway Asamoah, who went above and beyond to ensure that quality data was collected during the data collection process in the Eastern Region of Ghana. Without the support of these individuals, my research would not have been possible.

I would also like to extend my gratitude to the *LinkINg Up* project team for their tremendous support in collecting quantitative data, which will be analyzed later after my Ph.D.

Furthermore, I am immensely grateful to the Nutrition Research and Training Center staff in Asesewa, including Naa Nyarkoa, Mr. Red, and Juliana Yohi Narh, for their unwavering hospitality and making my periodic visits a comfortable experience. I would also like to thank Comfort Pinto and Gloria Osei Owusu for connecting me to relevant stakeholders during my field visits. Their contributions have been instrumental in the success of my research.

I am genuinely grateful to my research group members, Diana Dallmann, Yvonne Goh, Mona Ghadirian, Aishat Abdu, Elahe Sharbabak, Meray Arnouk, and Shabnam Hosseini, for their unwavering support and dedication throughout the years. Their talents and knowledge have inspired me, and I am grateful for their continued interest in my project and success, even after their graduation. I would also like to extend my appreciation to Sam Koenig, my summer research intern, for his invaluable contribution to my research in qualitative data coding and analysis for Chapter 6. His assistance in helping me understand the factors influencing nutrition-sensitive agriculture implementation capacity in Ghana was truly invaluable. Furthermore, I am grateful to Emmanuella Ellis, Christine Ha, Farzaneh Barak, Lilian Lopez Leyva, and Mozhgan Kohzadi for their friendship and support in helping me prepare for my PhD comprehensive exams. Our virtual calls and brainstorming sessions have been beneficial.

I am thankful for the support I received from the Canadian Queen Elizabeth II Diamond Jubilee Scholarships: Advanced Scholars program, which facilitated my field activities in Ghana and ultimately resulted in my internship with the Ministry of Food and Agriculture of Ghana. This opportunity was instrumental in helping me build connections and enrich my Ph.D. experience. Additionally, I would like to express my appreciation to the School of Human Nutrition for providing the Graduate Excellence Award. This award was a significant

source of funding for my Ph.D. and enabled me to pursue my research with greater focus and dedication.

I am deeply grateful to my family for their unwavering support throughout my Ph.D. journey. I want to express my heartfelt thanks to my husband, NYB, for his constant love, encouragement, and sacrifices that have helped me achieve this significant milestone. My parents, Mr. and Mrs. Boadi, have always been a source of inspiration and support, and I owe them my sincere thanks for encouraging and standing by me throughout this journey. I also want to thank my daughter, OB; my siblings, Thompson Boadi and Poshia Boadi; my husband's family, Mrs. Agatha Aduna, the Asenso family, and the Bio family for their immense love and support. I am also grateful to my grandparents for their prayers and blessings throughout the years of my program. Finally, I want to express my sincere gratitude to all the participants who generously shared their time and experiences in my research project.

Dedication

I dedicate this dissertation to my beloved husband, NYB, my dear daughter, OB, and my parents, Mr. & Mrs. Boadi, whose unwavering love and support have been a constant source of inspiration and motivation throughout my academic journey. I am forever grateful for their encouragement and sacrifices that have helped me achieve this significant milestone.

Medamoase paa. Onyame nhyira mo.

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List of abbreviations and acronyms

1D1F-DorothyKComLtd	Dorothy Kam Company Limited under One District One Factory Ghana
ABL	Accra Brewery Limited
ActionAid	Action Aid
ADC	Agricultural Development Corporation
AEA	Agriculture extension agent
AfDB	African Development Bank Group
AGI	Association of Ghana Industries
AGRA	Alliance for a Green Revolution in Africa
AgriCol	Agricultural Colleges
AIDS	Acquired immunodeficiency syndrome
AMSEC	Agricultural Mechanisation Service Centres
ARochaGh	A Rocha Ghana
AssGhInd	Association of Ghana Industries
ASWG	Agricultural Sector Working Group
BAC	Business Advisory Centers
C&QM	Chiefs and Queen Mothers
CFC	Community Foundations of Canada
ChamAgribus	Chamber of Agribusiness
CI	Confidence interval
CocoaLife	Mondelez International - Cocoa Life
COCOBOD	Ghana Cocoa Board
ConRigPro	Consumer Rights Protection
Consult	Consultant

COVID-19	Coronavirus disease 2019
CRS	Catholic Relief Services
CSA	National Climate-smart Agriculture and Food Security Action Plan of Ghana
CSIR	Council for Scientific and Industrial Research
CSIR-ARI	Council for Scientific and Industrial Research - Animal Research Institute
CSIR-CRI	Council for Scientific and Industrial Research - Crops Research Institute
CSIR-CRIG	Council for Scientific and Industrial Research - Cocoa Research Institute of Ghana
CSIR-FRI	Council for Scientific and Industrial Research - Food Research Institute
CSIR-INSTI	Council for Scientific and Industrial Research - Institute for Scientific and Technological Information
CSIR-ISTI	Council for Scientific and Industrial Research - Institute for Scientific and Technological Information
CSIR-OPRI	Council for Scientific and Industrial Research - Oil Palm Research Institute
CSIR-PGRRI	Council for Scientific and Industrial Research - Plant Genetic Resources Research Institute
CSIR-STEPRI	Council for Scientific and Industrial Research - Science and Technology Policy Research Institute
CSIR-WRI	Council for Scientific and Industrial Research - Water Research Institute

CSO	Civil society organizations
DADU-WIAD	District Agricultural Development Unit - Women in Agricultural Development Directorate
DID	Difference in differences
DoA	Department of Agriculture
DP	Development partners
EAS	Extension and Advisory Services
ECH	University of Ghana Ethics Committee for the Humanities
ECOWAS	Economic Community of West African States
EMQAP	Export Marketing and Quality Awareness Project
ENVAC	Enhanced Nutrition and Value Chains
FAGE	Federation of Associations of Ghanaian Exporters
Fairtrade	Fairtrade Africa
FAO	Food and Agriculture Organization of the United Nations
FASDEP	Food and Agriculture Sector Development Policy
FBO	Farmer Based Organizations
FDA	Food and Drug Administration
FGD	Focus group discussion
FinanInst	Financial institutions
FMP	Fisheries Management Plan of Ghana: A National Policy for the Management of the Marine Fisheries Sector
FP	Fertilizer Policy for Ghana
ICE	Information, communication and education
GAC	Global Affairs Canada
GADS 2	Gender and Agriculture Development Strategy II

GAIDA	Ghana Agri-Input Dealers Association
GARDJA	Ghana Agricultural & Rural Development Journalists Association
GDHS	Ghana Demographic and Health Survey
GEPC	Ghana Export Promotion Council
GGL	Guinness Ghana Limited
GIZ	German Agency for International Cooperation
GLD	The Ghana Livestock Development Policy and Strategy
GNAFF	Ghana National Association of Farmers and Fishermen
GNCC-MP	Ghana National Climate Change Master Plan: Action Programmes for Implementation
GNCC-P	Ghana National Climate Change Policy
GoG	Government of Ghana
GOG-NEIP	Government of Ghana_National Entrepreneurship & Innovation Programme
GreenTroGrp	Green Tropics Group
GSA	Ghana Standards Authority
GSM	Grace Suzanne Marquis
GSP	National Seed Plan
HACCP	Hazard Analysis Critical Control Point
HeiferInt	Heifer International
HIV	Human immunodeficiency virus
HQCF	High-Quality Cassava Flour
HungerProj	The Hunger Project
IDRC	International Development Research Center

IFAD	International Fund for Agricultural Development
IFJ	Investing for Food and Jobs policy
JICA	Japan International Cooperation Agency
kcal/cap	Kilocalories/capita
KNUST	Kwame Nkrumah University of Science and Technology
KOICA	Korea International Cooperation Agency
KosmosIC	Kosmos Innovation Center
Krobodan	Krobo Danish Association
LDG	Livestock Development in Ghana: Policies and Strategies
LDG	Livestock Development in Ghana: Policies and Strategies
LGS	Local Government Service
LI	Local Government Instrument
MAG	Modernizing Agriculture in Ghana
MarQueens	Market Queens
MediaHous	Media Houses
MESTI	Ministry of Environment, Science, Technology, and Innovation
MESTI-GRATIS	Ministry of Environment, Science, Technology and Innovation - GRATIS Foundation
METASIP	Medium-Term Agriculture Sector Investment Plan
MICS	Multiple Indicator Cluster Survey
MinAdvBrd	Ministerial Advisory Board
MinComm	Minerals Commission
MIS	Management Information Systems

MLGRD	Ministry of Local Government, Decentralization & Rural Development
MLNR	Ministry of Lands and Natural Resources
MMDA-GenDskOff	Metropolitan, Municipal and District Assemblies - Gender Desk Offices
MMDA-PlanUnt	Metropolitan, Municipal and District Assemblies - Planning Unit
MMDAs	Metropolitan, Municipal, and District Assemblies
MOAP	Market-Oriented Agriculture Programme
MoBusDev	Ministry of Business Development
MoComm	Ministry of Communications
MoE	Ministry of Education
MoFA	Ministry of Food and agriculture
MoFAD	Ministry of Fisheries and Aquaculture Development
MoFA-PPRSD	Plant Protection and Regulatory Services Directorate of the Ministry of Food and Agriculture
MoFEP	Ministry of Finance and Economic Planning
MoGCSP	Ministry of Gender, Children and Social Protection of Ghana
MoH	Ministry of Health of Ghana
MoH_Tech.Dir.	Technical Directorate_Ministry of Health
MoH_GHS	Ministry of Health of Ghana - Ghana Health Service
MoJAGD	Ministry of Justice and Attorney General Department
MoR&H	Ministry of Roads and Highways
MoRD	Ministry of Railways Development
MoTI	Ministry of Trade and Industry

MoTourism	Ministry of Tourism, Culture and Creative Arts
MT	Metric tonnes
NatHseChiefs	National House of Chiefs
NBSSI	National Board for Small-Scale Industries
NDPC	National Development Planning Commission
NewmontGh	Newmont Corporation
NGO	Non-governmental Organization
NIP	National Irrigation Policy, Strategies, and Regulatory Measures
NRGP	Northern Rural Growth Programme
NSA	Nutrition-sensitive agriculture
NSP	National Seed Policy
OFSP	Orange Fleshed Sweet Potatoes
P	Probability
ParliaSubCom	Parliamentary Subcommittee
PB	Priscilla Boadi
PFAG	Peasant Farmers Association of Ghana
PFJ	Planting for Food and Jobs: Strategic Plan for Implementation
PPMED	Policy Planning, Monitoring, and Evaluation Directorate
PPPDP	Public-Private Partnership Dialogue Platform
PriEntFed	Private Enterprise Federation
PTB	Physikalisch-Technische Bundesanstalt
QES	The Canadian Queen Elizabeth II Diamond Jubilee Scholarships
QES-AS	The Queen Elizabeth Scholarship-Advanced Scholars

RADU-WIAD	Regional Agricultural Development Unit - Women in Agricultural Development Directorate
RELC	Research Extension Farmer Linkage Committee
RHF	Rideau Hall Foundation
SD	Standard deviation
SE	Standard error
SendGh	Send Ghana
Solidaridad	The Solidaridad Network
SSHRC	Social Sciences and Humanities Research Council
SUN	Scaling Up Nutrition movement
TBM	Triple burden of malnutrition
TC	Technical Committee
TCP	Tree Crops Policy
TechComm_MoFA	Technical Committee led by the Ministry of Food and Agriculture
Trd&Aggre	Traders and Aggregators
UG	University of Ghana
UN	United Nations Organizations
UNIDO	United Nations Industrial Development Organization
USAID	United States Agency for International Development
WB	World Bank
WFP	World Food Programme of the United Nations
WHO	World Health Organization
WIAD	Women in Agriculture Development Directorate

WTO-STDF	World Trade Organization- Standards and Trade Development Facility
WVI	World Vision International
YouthGrps	Youth Groups

List of appendices

Chapter 1. Introduction

1.1 Background and rationale

Ghana, a lower-middle-income country with a population of approximately 33.4 million people in 2022, witnessed a rapid decline in the percentage of people living in rural areas (from 56% in 2000 to 41% in 2022) (World Bank, 2024). Similarly, employment in agriculture and the sector's contribution to Ghana's gross domestic product also decreased (53% to 40% and 35% to 19% in 2000 and 2022, respectively) (World Bank, 2024). During this same period, Ghana made notable progress in reducing specific forms of malnutrition. Child stunting, wasting, and underweight decreased from 28%, 9%, and 14% in 2008 to 18%, 7%, and 12% in 2022, respectively (Ghana Statistical Service et al., 2009 & 2024). Notably, stunting rates in Ghana are lower than the average in the Africa region (30.7%), while wasting is slightly higher compared to the average for the African region (6%) (Global Nutrition Report, 2024).

Although improvements have been seen in reducing stunting in children under five years of age, rural-urban disparities exist in Ghana. According to the 2022 Ghana Demographic and Health Survey, urban areas recorded a low prevalence rate (15%) of stunting among children under five years of age, while rural areas recorded a higher rate of 20%. Moreover, micronutrient deficiencies continue to persist. Four out of ten women of reproductive age (40%) and almost half of children (49%) under five years were anemic in 2022. Only 23% of children under two years of age were fed the minimum acceptable diet in 2022 (Ghana Statistical Service et al., 2024). Ghana's nutrition problems highlight the issue of poor access to nutritious foods (Opoku-Agyemang et al., 2023).

To address the nutrition problems mentioned above, researchers, national governments, and international organizations have suggested that nutrition-specific interventions[1] alone adopted in the health sector cannot solve nutrition problems and that nutrition-sensitive approaches must be adopted in other sectors, such as agriculture (Bhutta et al., 2013; World Health Organization, 2014). Addressing the underlying determinants of malnutrition[2] requires actions by multiple sectors and collaboration among stakeholders across various sectors (Gillespie et al., 2013; Ruel, 2009). Agriculture has been identified as a sector that could contribute to improved nutrition outcomes due to its critical role in influencing the underlying determinants of malnutrition (Sharma et al., 2021). Moreover, implementing nutrition-sensitive agriculture interventions can improve nutrition by contributing to the production of diverse foods for consumption, improving the nutritional quality of agricultural produce, increasing caregivers' knowledge of and preparation of nutritious foods, and increasing services such as the number of days meals are provided through community centers (Black et al., 2013; Hoddinott, 2016; Sharma et al., 2021). Adopting nutrition-sensitive agriculture approaches involves considering nutrition when developing policies, strategies, and investments in the agricultural sector without compromising the sector's primary objectives, such as the production of staple foods and cash crops. (Herforth & Pinstrup-Andersen, 2012).

Ghana has made notable efforts to prioritize nutrition in its agriculture sector by participating in national, continental, and global initiatives. The Ministry of Food and Agriculture has a Women in Agriculture Development Directorate responsible for incorporating nutrition into the policies, strategies, and programs in the agriculture sector (Ministry of Food and

[1] Nutrition-specific interventions refer to interventions that address the immediate determinants of foetal and child nutrition and development. These include Vitamin A and zinc supplementation, exclusive breastfeeding, dietary diversity promotion and food fortification

[2] The underlying determinants of malnutrition are the food, practices, and services available to women and children in their households, communities, and environments to ensure good nutrition (UNICEF, 2021). Available at https://www.unicef.org/media/113291/file/UNICEF%20Conceptual%20Framework.pdf

Agriculture, 2024). The country participated in the Comprehensive Africa Agricultural Development Program capacity-building workshop in 2011, where representatives from the agricultural sector were trained on integrating nutrition into their agriculture policies and investments (Food and Agriculture Organization of the United Nations, 2020). In 2011, Ghana joined the United Nations Scaling Up Nutrition movement, which encouraged the country to explore multisectoral coordination mechanisms in nutrition planning, with the agricultural and health sectors benefiting from technical support (Scaling Up Nutrition Movement, 2011 & 2015). In 2014, the Government of Ghana pledged to a framework for action at the Second International Conference on Nutrition. This framework emphasized the need to review national policies and investments in the agriculture sector and integrate nutrition objectives into agriculture policies and programs to encourage nutrition-sensitive agriculture, ensure food security, and enable healthy diets (Food and Agriculture Organization of the United Nations, 2014).

Developing effective policies, strategies, and programs for nutrition-sensitive agriculture in Ghana requires a comprehensive understanding of the policy processes, stakeholders involved, and their capacities to implement nutrition-sensitive agriculture programs. Although the involvement of multiple stakeholders is often considered crucial for addressing malnutrition in the Ghanaian context, information on the systematic identification and analysis of and engagement with nutrition stakeholders is limited (Galaurchi et al., 2021; Aryeetey et al., 2022). In particular, little is known about stakeholders' capacity to implement nutrition-sensitive agriculture at the sub-national levels in Ghana. Furthermore, the United Nations Systems Standing Committee on Nutrition called for additional work to aid in understanding a country's commitment to nutrition through its agriculture sector (United Nations System Standing Committee on Nutrition, 2014). Therefore, it is crucial to analyze existing policies in the agriculture sector for their nutrition sensitivity, identify areas that need

improvement, and document how agriculture policy objectives are implemented and delivered to impact nutrition. Using Ghana as a case study, this dissertation aimed to contribute to the ongoing dialogue surrounding the gaps in understanding the policy processes, the stakeholders involved, and their capacities to develop and implement nutrition-sensitive agriculture policies, strategies, and programs.

1.2 Overall goal

This dissertation aimed to (i) investigate the processes involved in the development and implementation of agriculture-for-nutrition policies and programs and (ii) assess the organizational capacity to implement agriculture-for-nutrition policies and programs in Ghana.

1.3 Specific objectives

The objectives of this dissertation were:

1. To examine the nutrition-sensitive characteristics of Ghanaian national agricultural policies between 2004 and 2020 (Manuscript1)
2. To determine how nutrition-related activities have been implemented in Ghana's agricultural sector based on national annual reports published between 2010 and 2019 (Manuscript 1)
3. To describe relevant national stakeholders' interconnections and influence in the agriculture-for-nutrition policymaking process in Ghana (Manuscript 2)
4. To describe the roles of stakeholders, their relationships, and influence in nutrition-sensitive agriculture program implementation in the Eastern Region of Ghana (Manuscript 3)
5. To assess the capacity of district-level agriculture staff to implement nutrition-sensitive agriculture programs in the Eastern Region of Ghana (Manuscript 4)

Chapter 2. Literature review

2.1 Agriculture and food insecurity in Ghana

Agriculture plays a part in Ghana's economy, contributing to about 19% of the country's gross domestic product in 2022 (World Bank, 2023). In 2021, agriculture employed about 40% of the labour force; it is an important source of livelihood, particularly for 65% of the rural population who depend on agriculture for employment (World Bank, 2023; Ghana Statistical Service, 2019). Over the past decade, the majority (about 64.5%) of the dietary energy supply (kcal/cap/day) among Ghanaians was derived from cereals, roots, and tubers (African Development Bank Group, 2023). Additionally, Ghana heavily relies on imported rice (55% of the rice consumed), poultry, wheat, and soybeans (Boadi et al., 2022). According to Ghana's Ministry of Food and Agriculture's Food and Agriculture Development Policy (FASDEP) 2, food security is defined as *"good quality nutritious food, hygienically packaged and attractively presented, available in sufficient quantities all year round and located at the appropriate places at affordable prices*" (Ministry of Food and Agriculture, 2007, p. 24). Hence, the FASDEP 2, which is the overarching agriculture sector policy document, includes food security and emergency preparedness as a core component of Ghana's agricultural development and poverty reduction strategy (Ministry of Food and Agriculture, 2007).

Ghana made notable progress in meeting the Millennium Development Goal of halving the proportion of people suffering from hunger (from 36% in 1991 to 18% in 2006) by 2015 (National Development Planning Commission, 2015). Moreover, in line with the Sustainable Development Goals, the government of Ghana has recognized the importance of sustainable development and has set its priorities in line with the 2030 Agenda for Sustainable Development, which focuses on the five overarching themes of 'People, Planet, Prosperity, Peace, and Partnerships' (Government of Ghana, 2019). While Ghana has made significant progress towards achieving the Millennium Development Goal of reducing hunger, food

insecurity still poses a major challenge. The first comprehensive food insecurity assessment was carried out in 2004 but was limited to only five regions in Ghana[3]. To get a holistic picture of the food insecurity situation in the country, a second food insecurity assessment was carried out in 2009 through the Comprehensive Food Security and Vulnerability Analysis, which identified 3.2 million vulnerable and food insecure people, with the majority (843,000) from the three northern regions of Ghana (World Food Programme et al., 2009; World Food Programme et al., 2012). In 2012, a follow-up Comprehensive Food Security and Vulnerability Analysis survey was carried out with a particular focus on the three northern regions and showed a reduction from the 2009 figure reporting that 680,000 people were food insecure (World Food Programme et al., 2012). Moreover, the most recent nationwide Comprehensive Food Security and Vulnerability Analysis study conducted in 2020 reported that the number of individuals experiencing food insecurity had increased. Approximately 3.6 million people were food insecure in 2020, with 78% (2.8 million individuals) located in rural areas (World Food Programme et al., 2020).

At the regional level, food insecurity was more severe in northern Ghana than in the south. For instance, most (0.6 million) food-insecure people resided in the Upper East Region, with small pockets of food-insecure people ranging between 200,000 and 300,000 in the Eastern and Volta Regions (World Food Programme et al., 2020). The severity of food insecurity was partly attributed to climatic issues since agriculture in Ghana is mainly rain-fed (Ministry of Food and Agriculture, 2021). Rural households in southern Ghana experiencing two major rainy seasons per year, tended to grow more food than rural households in the north, with only one rainy season (Ministry of Food and Agriculture, 2021). Moreover, most rural households in Ghana are engaged in various agricultural value chains. For instance, 93.7% of

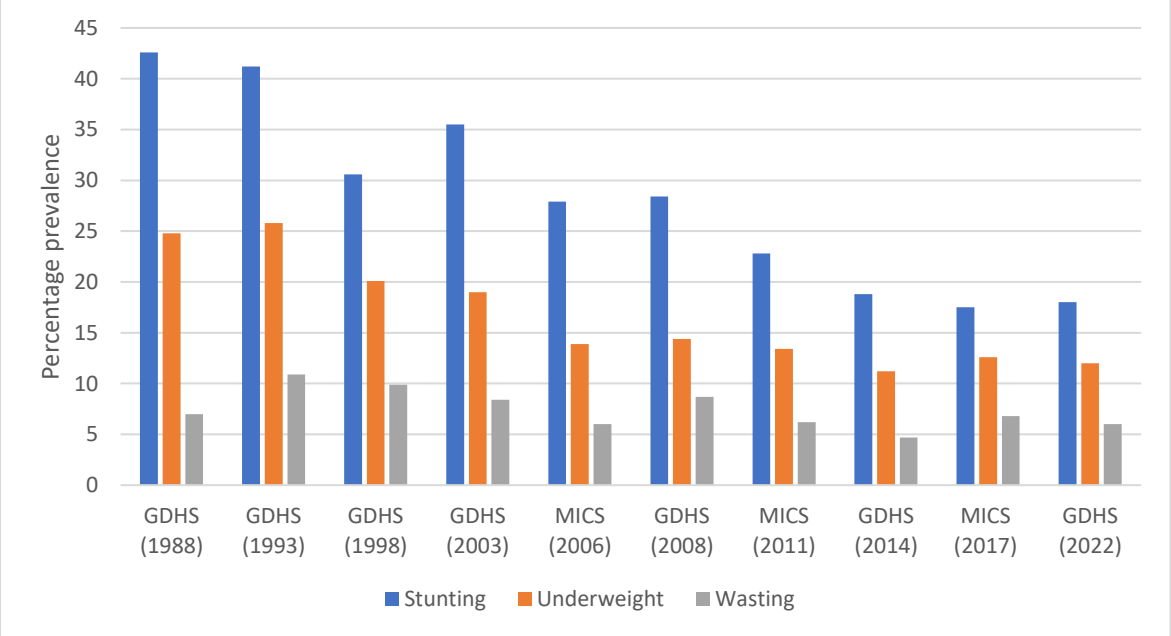
[3] The regions were Ashanti, Central, Northern, Upper East, and Upper West

rural households in the Upper East Region depend on agriculture for their livelihoods (Acheampong et al., 2022).

2.2 Nutrition situation in Ghana

National surveys have been conducted in Ghana through the Ghana Demographic and Health Survey (1988, 1993, 1998, 2003, 2008, 2014, 2022) and Multiple Indicator Cluster Surveys (2006, 2011, 2017) to assess the human nutrition situation in the country (Figure 2.1). Stunting in Ghana has been reduced from 28% in 2008 to 18% in 2022 (Ghana Statistical Service et al., 2009; Ghana Statistical Service et al., 2024). The national prevalence of child wasting reduced from 9% in 2008 to 6% in 2022 (Ghana Statistical Service et al., 2009; Ghana Statistical Service et al., 2024). Despite this achievement, anemia remains a problem in Ghana, with 51% of pregnant women and 49% of children under five years of age being anemic in 2022 (Ghana Statistical Service et al., 2024).

Figure 2.1 Trends in the prevalence of child anthropometric indices from 1988 to 2022 in Ghana



GDHS: Ghanaian Demographic and Health Survey; MICS: Multiple Indicator Cluster Surveys.
Stunting: Length-for-age/height-for-age Z-scores: < -2 SD. Underweight: Weight-for-age Z-scores < -2 SD.
Wasting: Weight-for-length/weight-for-height Zscores: < -2 SD.
Source: Ghana Statistical Service & ICF Macro, (1989, 1994, 1999); Ghana Statistical Service et al., (2004, 2006, 2009, 2011, 2015, 2019, 2024).

There is also a growing concern over the emerging problem of overweight and obesity[4] among Ghanaian women of reproductive age. (Ghana Statistical Service et al., 2009; Ghana Statistical Service et al., 2015). For instance, the prevalence of overweight women increased from 11% in 2008 to 28% in 2022, whereas women's obesity prevalence increased from 20.7% in 2008 to 22% in 2022 (Ghana Statistical Service et al., 2009; Ghana Statistical Service et al., 2024). Akowuah and Kobiah-Acquah (2020) conducted a systematic review and meta-analysis of studies published between January 2001 and October 2019 and found that 19% of children in Ghana were either overweight or obese. The prevalence of childhood overweight was 8.6% (95% CI: 48% - 13.4%), and obesity was 10.7% (95% CI: 5.9% - 16.6%). Additionally, a systematic review by Ofori-Asenso et al. (2016) showed that 43% of Ghanaian adults were either overweight or obese, with an estimated overweight prevalence of 25.4% (95% CI: 22.2% - 28.7%) and 17.1% (95% CI: 14.7% - 19.5%) for obesity. The high prevalence of overweight and obesity may increase the incidence of diet-related non-communicable diseases in the Ghanaian population.

2.3 Administrative structure of agriculture and nutrition in Ghana

Agriculture in Ghana is administered through the Ministry of Food and Agriculture (MoFA), the Ministry of Fisheries and Aquaculture Development (MoFAD), and the Local Government Service (LGS) of the Ministry of Local Government and Rural Development (Ministry of Food and Agriculture, 2018). While the MoFA is responsible for developing policies, strategies, and programs that promote sustainable crop and livestock production at the national level, the LGS, through its Department of Agriculture, is tasked with implementing the policies, strategies, and programs at the regional and district levels. Unlike

[4] According to the World Health Organization, overweight and obesity are the excess or abnormal accumulation of fat in the human body that may endanger health where overweight is a body mass index of 25.0 – 29.9 and obesity is a body mass index of 30.0 or higher (World Health Organization, 2020).

MoFA, MoFAD is responsible for policymaking as well as implementing activities at the local level in collaboration with district assemblies and the local fishing communities. On rare occasions, the Department of Agriculture in Ghana may have oversight or involvement in fisheries-related activities, particularly in areas where agriculture and fisheries intersect (Ministry of Food and Agriculture, 2018).

Furthermore, in Ghana, the administration of nutrition involves a multisectoral approach, with collaboration among governmental institutions, private sector entities, and development partners to advance good nutrition and health (World Health Organization, 2017). Funding for nutrition activities comes from the Government of Ghana, with development partners such as the United Nations and non-governmental organizations also providing financial support (World Health Organization, 2017).

Even though nutrition in Ghana is mainly administered through the Ghana Health Service of the Ministry of Health, the Women in Agriculture Development Directorate (WIAD) of the Ministry of Food and Agriculture ensures that nutrition is mainstreamed into policies, strategies, and programs in the agriculture sector (Ministry of Food and Agriculture, 2018, World Health Organization, 2017). The collection and sharing of nutrition data in Ghana is a collaborative effort involving various government agencies and development partners, with the Ghana Health Service leading the collection and analysis through surveys and surveillance systems, including the Ghana Demographic and Health Survey, the Ghana Micronutrient Survey, and the Ghana Nutrition Surveillance System (World Health Organization, 2017). Moreover, the Ministry of Food and Agriculture also plays a role in collecting and sharing nutrition data in Ghana by collecting food production and consumption data as well as food price information through its Statistics, Research, and Information Directorate (Ministry of Food and Agriculture, 2018).

Over the years, the administrative structure of the agricultural sector in Ghana has changed due to various policy reforms and programs aimed at improving the sector's productivity. In the 1970s, a centralized agricultural system was established, characterized by a strong government presence in the sector (Ministry of Local Government and Rural Development, 2016). However, this system was later replaced by a decentralized system in the 1980s through the economic recovery program, which led to the establishment of the Ministry of Agriculture and the creation of agricultural extension services providing technical advice and support to farmers at the local level. Through this same economic recovery program, District Assemblies were established in the 1990s and were responsible for implementing agricultural policies and programs at the regional and district levels (Ministry of Local Government and Rural Development, 2016).

In 2001, the Government of Ghana implemented the Agricultural Sector Investment Program to increase agricultural productivity, reduce poverty, and promote sustainable development (Government of Ghana, 2012). This program led to the establishment of the Ministry of Food and Agriculture at the national level and the Department of Food and Agriculture at the regional and district levels, which were responsible for developing and implementing policies, strategies, and programs for the growth of the sector (Government of Ghana, 2012). In 2012, the Government of Ghana initiated the process of transferring some of the functions of the Civil Service to the Local Government Service to strengthen decentralization and improve service delivery at the regional and district levels (Ghana Local Government Service, 2012). As part of this process, the regional and district levels Department of Food and Agriculture have been transferred from the Ministry of Food and Agriculture to the Ministry of Local Government and Rural Development and are now known as the Department of Agriculture. The Ministry of Local Government and Rural Development continues to work closely with the Ministry of Food and Agriculture to ensure that

agricultural policies and programs are effectively implemented at the regional and district levels in Ghana (Ghana Local Government Service, 2012). The next section of this chapter focuses on reviewing past agricultural policies in Ghana's agricultural sector to understand their focus.

2.4 A historical review of agricultural policies and strategies in Ghana

2.4.1 The colonial period (Up to 1957): Focus on export-oriented agriculture

Agricultural policies in Ghana date back to 1874 when the British government colonized Ghana (then referred to as the Gold Coast) and took possession of all lands, thus making the country a British colony. During this colonial period, agriculture policies were export-oriented as agriculture was characterized by producing food locally for export (Johnson, 1971; Jackson, 1992; Hilson, 2002). A Department of Agriculture was established in 1900 to educate farmers and assist them in producing export crops in large quantities and of better quality. During this period, agricultural policies were focused on meeting the demands and preferences of the British colonial rulers and urban elites by exporting crops such as palm oil and vegetables (Johnson, 1971; Jackson, 1992; Hilson, 2002; Seini, 2002). In the 1920s, cocoa production took over oil palm as Ghana's principal export crop due to the falling price of oil palm on international markets (Daddieh, 1994). Production of staples for local consumption was not the focus of agricultural policies during this colonial period (Brooks & Aggrey-Fynn, 2007).

In the 1950s, programs to support food production and economic development were extended to the northern parts of Ghana to address food deficits in the urban areas (Seini, 2002). Between 1951 and 1956, agricultural policies prioritized creating employment opportunities for the unemployed youth advocating for independence. As a result, a five-year development plan (1951-1956) was released towards the end of 1950, which emphasized the limitations of

the traditional subsistence production system in meeting the demands of Ghana's growing economy. The plan also advocated for the adoption of mechanized, state-controlled, large-scale farms. Consequently, an Agricultural Development Corporation (ADC) was established to promote agricultural modernization (Seini, 2002).

2.4.2 Early post-independence period (1957 -1980): Focus on the development of commodity boards and agricultural input subsidies to improve domestic production

After Ghana gained independence in 1957, a five-year (1959 -1964) plan was developed to expand the ADC's role to include the establishment of contract farms, which was faced with financial constraints, political interference, and poor planning and management thus leading to the dissolution of ADC in 1962 (Gyasi, 1996). In the 1970s, special attention was given to producing cereals, cotton, fish, rice, and sugar to meet the population's nutritional requirements and export to earn foreign exchange (Asuming-Brempong, 2013). Hence, commodity development boards such as that for cotton and grains were established in northern Ghana to provide incentives and offer advice to smallholder farmers in cooperatives and contract farms. The Cocoa Marketing Board was also established to support research in marketing and development of cocoa, coffee, and shea (Seini, 2002).

Between 1972 and 1974, two important policies were introduced in Ghana. These were the Operation Feed Yourself and the Operation Feed Your Industries policies (Girdner et al., 1980). The Operation Feed Yourself and the Operation Feed Your Industries policies aimed to encourage the production of enough food for local consumption and raw materials for Ghanaian industries. In the late 1970s and early 1980s, small-scale development programs were introduced to support small-scale farmers in cooperatives to enable them to increase their incomes and production. Among such programs were the Upper Regional Agricultural Development Program by the World Bank, the Volta Regional Agricultural Development Programme, the Northern Regional Rural Integrated Project, and the Managed Inputs

Delivery and Agricultural Services program. All these programs aimed to increase agricultural production by providing farm inputs to smallholder farmers regularly and on time (Seini, 2002).

2.4.3 Economic and structural adjustment periods (the 1980s -2000): Removal of agricultural input subsidies

In the early 1980s, agricultural output in Ghana was severely reduced by drought accompanied by widespread bushfires, which led to the development of an economic recovery program in 1983 and the structural adjustment program in 1986 (Nyantakyi-Frimpong, 2013; Ahwoi, 2010). These programs focused on cocoa, timber, and the mining sectors and emphasized the need for a free market system, which led to the privatization of all state farms. Price controls, market boards, and subsidies on crops and farm inputs such as fertilizer were gradually removed under these programs (Ahwoi, 2010). The Agricultural Services Rehabilitation Project (1987 – 1990) was the first integrated intervention to strengthen the institutional capacity and services provided by the Ministry of Agriculture as well as support reforms that promoted the privatization of fertilizer marketing, leading to the permanent removal of subsidies in 1992 (Brooks et al., 2007; Asuming-Brempong, 2013).

In addition, agricultural strategies in the 1990s mainly focused on boosting the Ghanaian economy. For instance, the introduction of the Accelerated Agricultural Growth and Development Strategy I & II in the mid-1990s focused on producing food and industrial crops to increase economic growth. The Accelerated Agricultural Growth and Development Strategy I & II were later replaced by the first Food and Agriculture Sector Development Policy in 2002, which aimed to modernize the agriculture sector in Ghana (Ministry of Food and Agriculture, 2007).

2.4.4 Agricultural modernization (2000 – present): Focus on food security and nutrition

A poverty and social impact analysis conducted on FASDEP 1 in 2004 revealed some challenges associated with the policy. The objectives set in the FASDEP 1 could not be achieved because the policy failed to (i) target poor smallholder farmers who had limited access to credit, technology, and proper infrastructure and (ii) fully engage other Metropolitan, Municipal, and District Assemblies for interventions that were outside the scope of the Ministry of Food and Agriculture's activities. Hence, benefits accrued to wealthy farmers (Brooks et al.,2007). The challenges identified in FASDEP 1 led to the development of FASDEP 2 to address the limitations of FASDEP 1 and serve as the overarching guiding policy of the sector (Ministry of Food and Agriculture, 2007). Based on the FASDEP 2, policies, medium-term investment plans, and strategies such as the 'Investing for Food and Jobs' have been developed related to agriculture, food security, and nutrition. Although FASDEP 2 lacked explicit nutrition-related goals/objectives, the policy included a food security and emergency preparedness component focused on producing five staple crops: maize, rice, yam, cassava, and cowpea. Moreover, while stakeholder participation in the development of FASDEP 1 was minimal, the development of FASDEP 2 included stakeholders from diverse groups, including researchers, development partners, district assemblies, agricultural input dealers, traders, and non-governmental organizations (NGOs) (Kolavalli et al., 2010). Building on the agricultural and nutritional context of Ghana provided above, the next sections of this chapter will delve into understanding the connections between agriculture and nutrition, as well as the multistakeholder approaches to addressing malnutrition.

2.5 The role of agriculture in improving nutrition

Agriculture has been recognized as a fundamental driver of human nutrition and food security (Pawlak & Kolodziejczak., 2020). Agriculture produces food for consumption and influences dietary diversity, food availability, and accessibility. For instance, Sibhatu et al. (2015) reported that a higher farm production diversity was associated with higher dietary diversity in agricultural households in Indonesia, Kenya, Ethiopia, and Malawi (coefficient and standard error: 0.009±0.002, p=0.001). Moreover, increased agricultural productivity contributes to reducing poverty, which is essential for improving nutrition outcomes. For instance, a study conducted in 58 lower- and middle-income countries showed that a 1% increase in agricultural productivity resulted in a 0.6 - 1.2% reduction in the number of people living on less than $1 a day (Thirtle et al., 2003). However, a major challenge associated with agriculture's role in improving nutrition is the focus of agricultural policies, strategies, and programs on increasing yields of crops such as cash crops, which may not necessarily lead to improved nutrition outcomes (Lencucha et al., 2020; Ma et al., 2022). Thus, ensuring that agricultural systems produce diverse and micronutrient-rich foods through nutrition-sensitive approaches should be prioritized to address malnutrition and improve overall health status.

2.5.1 Agriculture-nutrition linkages

Agriculture-nutrition linkages became an issue of public concern in the early 1980s following publications from the International Food Policy Research Institute and the World Bank (Pinstrup-Andersen, 1981; Pinstrup-Andersen & Forman, 1984). Since then, several studies have attempted to identify the linkages between agriculture and nutrition by examining various potential pathways through which agriculture impacts nutrition (Haddad, 2000; Hawkes & Ruel, 2007; Masset et al., 2012; Hoddinott, 2012; Girard et al., 2012; Gillespie & Kadiyala, 2012; Haddad, 2013; Herforth & Harris, 2014; Carletto et al., 2015; Hoddinott et

al., 2015; Kumar et al., 2015; Pandey et al., 2016, Romeo et al., 2016). These studies have identified six pathways[5] through which agriculture impacts nutrition, which may be direct or indirect. According to Haddad (2000), direct linkages involve the availability and accessibility of quality foods through increased farm production, diversification, plant breeding, and post-harvest technologies, which might lead to improved food consumption. Food consumed can be acquired through one's own produce or food purchased with income from the sale of agricultural produce. Indirect linkages may be seen through agricultural sector growth, lowered food prices on domestic markets, and changing food policies at the national level.

2.5.2 Review of studies on the linkages between agriculture and nutrition

Several reviews of evidence have been conducted on the pathways through which agriculture affects nutrition. Most reviews conducted before 2014 included a range of agricultural programs (traditional home gardens, biofortification programs, livestock production, dairy production, and irrigation programs) that date as far back as 1980 (Ruel, 2001; Berti & Fitzgerald, 2004; Randolph et al., 2007; Masset et al., 2012; Webb-Girard et al., 2012; Ruel & Alderman, 2013; Webb & Kennedy, 2014; Fiorella et al., 2016; Pandey et al., 2016). Even though the studies reviewed had different methodologies and nutritional indicators, they reported consistent findings. Overall, these studies found that agricultural development programs that promoted production diversity, production of micronutrient-rich crops or biofortified crops, dairy, or small animal rearing could improve the production and consumption of the targeted commodities. Short study duration, poor evaluation design, small sample sizes, and inappropriate targeting of age groups for inclusion were the weaknesses

[5] The six pathways are 1) food availability and access from own production, 2) sale of agriculture produce for income, 3) changing food prices from fluctuations in supply and demand, 4) women's empowerment through their control over resources, 5) women's time use in agriculture, and 6) women's wellbeing reflected through their health and nutritional status

identified in the studies (Masset et al., 2012; Webb-Girard et al., 2012; Ruel & Alderman, 2013; Leroy et al., 2016). A systematic review by Ruel et al. (2018) found additional evidence on the pathways through which agriculture impacts nutrition. Their Review found 16 studies (published between 2014 – and 2017) that were not included in previous reviews. These 16 studies reported findings from impact evaluations on biofortification programs, homestead production systems, livestock production, dairy production, and irrigation programs. While dietary and micronutrient intakes improved, child anthropometric indices such as stunting did not improve. A more recent systematic review by Sharma et al. (2021) also found that studies after 2017 reported improvements in child anthropometric indices such as stunting and anemia in children and decreases in the prevalence of underweight in women of reproductive age.

2.5.3 Nutrition-sensitive agriculture

The need to address the underlying causes of malnutrition through multisectoral approaches has been internationally recognized as fundamental to attaining global nutritional goals (Gillespie et al., 2015; Ruel & Alderman, 2013). Among the strategies suggested are nutrition-sensitive agriculture[6] (NSA) interventions, which can also serve as a delivery platform for nutrition-specific interventions[7]. Promoting nutrition-sensitive agriculture involves integrating nutrition goals into agricultural policies, strategies, and programs. This approach ensures that agriculture aligns with nutrition priorities, addressing food quantity and quality. Traditionally, agricultural policies and programming have had a narrow focus on

[6] Nutrition-sensitive intervention or programs addresses the underlying determinants of fetal and child nutrition and development. These interventions or programs aim to improve household food security, provide knowledge on caregiving practices at the maternal, household, and community levels, provide access to health services and a safe and hygienic environment. Nutrition-sensitive interventions or programs also requires that specific nutrition goals and actions are set in other sectoral plans (Ruel & Alderman, 2013)

[7] Nutrition-specific interventions refer to interventions that address the immediate determinants of foetal and child nutrition and development. These include Vitamin A and zinc supplementation, exclusive breastfeeding, dietary diversity promotion and food fortification

increasing the productivity of a few staple crops and incomes without much consideration of the linkages with nutrition and health (Bouis & Welch, 2010; Center for a Livable Future, *n.d.*). Since the 1980s, agricultural interventions and strategies with health and nutrition components as part of agricultural programming have become more prominent (Ruel, 2001; Hawkes & Ruel, 2007). In this regard, two approaches that have been pursued to mitigate food insecurity are 1) biofortification, which is the process of enriching the nutritional quality of staple crops and, to a lesser degree, 2) dietary diversification, which is increasing the availability and accessibility of nutritionally diverse foods (Burchi et al., 2011; Johns and Eyzaguirre, 2007). Biofortified staples cannot provide all the nutrients needed to mitigate food insecurity and malnutrition; hence, increasing dietary diversity is essential for improving diets in subsistence settings.

2.5.4 Incorporating nutrition into the agriculture sector

The Comprehensive Africa Agriculture Development Programme has supported many African countries in integrating nutrition objectives and strategies into their agricultural investment plans (Rampa & Seters, 2013). For instance, Nigeria developed an Agricultural Sector Food Security and Nutrition Strategy, incorporating nutrition-sensitive goals into its intended agricultural transformation (Federal Ministry of Agriculture and Rural Development, 2017). Incorporating nutrition objectives and strategies into agricultural policies and investments requires identifying points of entry where nutrition can be incorporated into agricultural policies and programs. According to Jaenick and Virchow (2013), the following points of entry must be considered to improve nutrition-sensitive agriculture efforts:

1. Policies and government structures that have a goal to fight malnutrition and micronutrient deficiencies

2. Mechanisms that support intersectoral and inter-organizational collaborations within a country
3. Advocacy efforts for nutrition-sensitive agriculture and capacity to design and implement relevant projects at different levels
4. Advocacy for targeting groups that will benefit most from nutrition-sensitive approaches
5. Approaches that are familiar with the elements of the local food chain with a focus on various aspects from production through to consumption as well as economic, societal, and technological innovations

In addition to the above points of entry, Wiggins and Keat (2013) and Ecker et al. (2011) suggested that nutrition can be improved with policy support through 1) increased investments in agriculture and agriculture research and extension, 2) increased production of more diversified foods, 3) programs that empower women, enhance health, water, and sanitation, and 4) increased political will.

In 2015, the Food and Agriculture Organization of the United Nations (FAO) published key recommendations to improve nutrition through agriculture (Box 1). These recommendations call for more agricultural programs and policies targeting vulnerable groups such as smallholder farmers to improve their production systems to increase the production of nutrient-dense foods, facilitate their access to agricultural inputs, and improve market access. However, in sub-Saharan Africa, the impact of agriculture policies and strategies is reflected through the continued focus of these policies and strategies on staple crops production, such as maize and cassava, which has limited effects on improving malnutrition (Nyakurwa et al., 2017; Kinabo, 2014). For example, 80% of the targeted crops for production in Ghana, as outlined in the FASDEP 2, were staple crops. Moreover, an eight-country study assessed the

nutrition-sensitivity of agriculture policies in Brazil, Malawi, Mozambique, Nepal, Senegal, Sierra Leone, South Africa, and Thailand and found that the policies did not prioritize interventions aimed at improving the production, processing, storage, and marketing of micronutrient-rich foods to improve nutrition outcomes (United Nations System Standing Committee on Nutrition, 2014). The aforementioned evidence highlights the need for greater emphasis on agricultural policies and strategies aimed at promoting the production and availability of micronutrient-rich foods as part of the agricultural sector's goals. However, Lencucha et al. (2020) observed that the process of making the agricultural sector nutrition-sensitive is complex. A crucial initial step in addressing this complexity involves gaining a comprehensive understanding of a country's agricultural policy priorities.

Box 1: Key recommendations for improving nutrition through agriculture and food systems

For agricultural programs and investments

Key recommendations #1: Incorporate explicit nutrition objectives and indicators into their design, and track and mitigate potential harms, while seeking synergies with economic, social and environmental objectives.

Key recommendations #2: Assess the context at the local level, to design appropriate activities to address the types and causes of malnutrition, including chronic or acute undernutrition, vitamin and mineral deficiencies, and obesity and chronic disease. Context assessment can include potential food resources, agro-ecology, seasonality of production and income, access to productive resources such as land, market opportunities and infrastructure, gender dynamics and roles, opportunities for collaboration with other sectors or programmes, and local priorities.

Key recommendations #3: Target the vulnerable and improve equity through participation, access to resources, and decent employment. Vulnerable groups include smallholders, women, youth, the landless, urban dwellers, the unemployed.

Key recommendations #4: Collaborate and coordinate with other sectors (health, environment, social protection, labour, water and sanitation, education, energy) and programmes, through joint strategies with common goals, to address concurrently the multiple underlying causes of malnutrition.

Key recommendations #5: Maintain or improve the natural resource base (water, soil, air, climate, biodiversity), critical to the livelihoods and resilience of vulnerable farmers and to sustainable food and nutrition security for all. Manage water resources in particular to reduce vector-borne illness and to ensure sustainable, safe household water sources.

Key recommendations #6: Empower women by ensuring access to productive resources, income opportunities, extension services and information, credit, labour and time-saving technologies (including energy and water services), and supporting their voice in household and farming decisions. Equitable opportunities to earn and learn should be compatible with safe pregnancy and young child feeding.

Key recommendations #7: Facilitate production diversification, and increase production of nutrient-dense crops and small-scale livestock (for example, horticultural products, legumes, livestock and fish at a small scale, underutilized crops, and biofortified crops). Diversified production systems are important to vulnerable producers to enable resilience to climate and price shocks, more diverse food consumption, reduction of seasonal food and income fluctuations, and greater and more gender-equitable income generation.

Key recommendations #8: Improve processing, storage and preservation to retain nutritional value, shelf-life, and food safety, to reduce seasonality of food insecurity and post-harvest losses, and to make healthy foods convenient to prepare.

Key recommendations #9: Expand markets and market access for vulnerable groups, particularly for marketing nutritious foods or products vulnerable groups have a comparative advantage in producing. This can include innovative promotion (such as marketing based on nutrient content), value addition, access to price information, and farmer associations.

Key recommendations #10: Incorporate nutrition promotion and education around food and sustainable food systems that builds on existing local knowledge, attitudes and practices. Nutrition knowledge can enhance the impact of production and income in rural households, especially important for women and young children, and can increase demand for nutritious foods in the general population.

For agricultural policies

Key recommendations #1: Increase incentives (and decrease disincentives) for availability, access, and consumption of diverse, nutritious and safe foods through environmentally sustainable production, trade, and distribution. The focus needs to be on horticulture, legumes, and small-scale livestock and fish – foods which are relatively unavailable and expensive, but nutrient-rich – and vastly underutilized as sources of both food and income.

Key recommendations #2: Monitor dietary consumption and access to safe, diverse, and nutritious foods. The data could include food prices of diverse foods, and dietary consumption indicators for vulnerable groups.

Key recommendations #3: Include measures that protect and empower the poor and women. Safety nets that allow people to access nutritious food during shocks or seasonal times when income is low; land tenure rights; equitable access to productive resources; market access for vulnerable producers (including information and infrastructure). Recognizing that a majority of the poor are women, ensure equitable access to all of the above for women.

Key recommendations #4: Develop capacity in human resources and institutions to improve nutrition through the food and agriculture sector, supported with adequate financing

Key recommendations #5: Support multi-sectoral strategies to improve nutrition within national, regional, and local government structures.

Source: Food and Agriculture Organization of the United Nations, (2015)

2.6 Multistakeholder approaches to addressing malnutrition

2.6.1 Stakeholder definition

There are different opinions about who a stakeholder is. Many definitions of the term stakeholder have their roots in the business literature building on Freeman's (1994, p. 46) work on stakeholder theory, which stated that a stakeholder is "*any group or individual who can affect or is affected by the achievement of the organization's objective*." However, according to Ramirez (1999), the term 'stakeholder' predates Freeman's work and can be traced back to the seventh century, when it was used to denote someone entrusted with the stakes of a bet. Similar to Freeman's definition, Checkland (1981, cited in Reed et al., 2009, p. 1934) defined stakeholders as individuals who own a problem and must be co-owners to solve the problem. 'Stakeholder' also emphasizes the stake or interest of the parties in a process (Herman 2005).

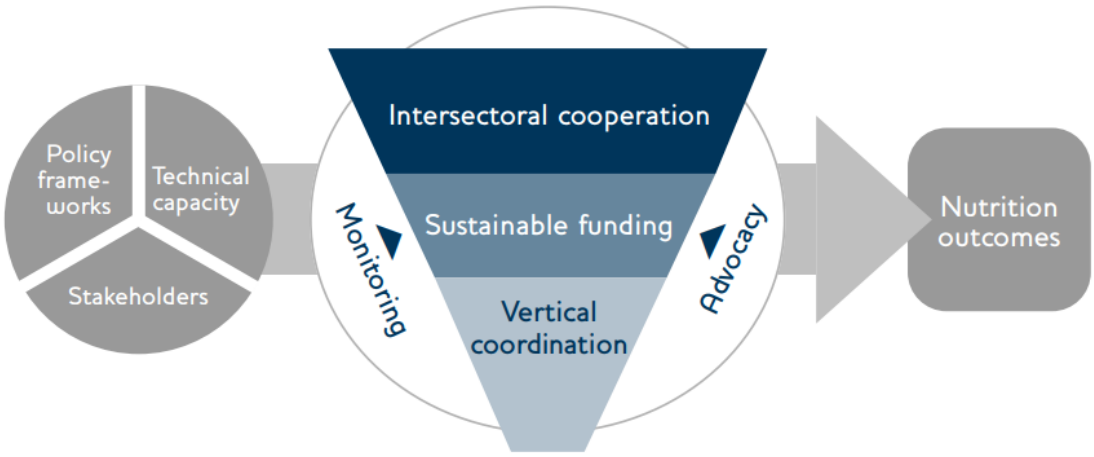
Moreover, stakeholders are vested in a policy or programme and are considered patrons in the process (Department for International Development, 2002; Schmeer, 1999). To ensure consistent use of terminology, the term stakeholder, as used in this thesis, refers to "*individuals, organizations, or communities that have a direct interest in the process and outcomes of a project, research, or policy endeavour* (Deverka et al., 2012, p.5)". Stakeholders are usually grouped into the following categories: 1) international, 2) governmental (national), 3) non-governmental organizations, 4) private, 5) civil societies, and 6) consumers (Schmeer, 1999). Garrett et al. (2014) noted that stakeholders from these

categories can work in an integrated manner depending on the objectives of the work and the partners involved. Thus, it is important to note that stakeholders can change over time and come from different sectors (Renard, 2004). Therefore, multisectoral, as used in other sections of this thesis, refers to multiple stakeholders from different sectors working together toward a common interest.

2.6.2 Multisectoral approaches in nutrition

The momentum for adopting multisectoral approaches to nutrition is increasing because there is a recognition that nutrition-specific interventions alone cannot effectively address the immediate causes of malnutrition (Black et al., 2013). The Lancet series of 2008 and 2013 stated that multiple stakeholders from different sectors must be engaged through participatory approaches to address the basic and underlying causes of malnutrition (Gilliespie et al., 2013). However, low political commitment, sector-bound organizational structures, weak coordination mechanisms, insufficient human resources, and capacity to bridge policy and implementation have been identified as barriers to enhancing multisectoral approaches (Bryce et al., 2008; Haddad et al., 2014; Morris, 2008; Pelletier et al., 2011). Moreover, Mejia-Acosta and Fanzo (2012) noted a challenge with stakeholders coming together to create governance systems to curb malnutrition. The Institute of Development Studies (2012) proposed a nutrition governance framework (Figure 2.2) that focuses on how good governance can contribute to positive nutritional outcomes. The framework highlights the importance of engaging relevant stakeholders, building their capacities, and implementing the right policy frameworks for nutrition governance. The framework also emphasizes the need for enhanced intersectoral coordination, sustainable funding, advocacy, and robust monitoring mechanisms, all of which can contribute to improved nutrition outcomes.

Figure 2.2 The nutrition governance framework shows that intersectoral cooperation, sustainable funding, monitoring, and advocacy coupled with the relevant stakeholders, their technical capacity, and the right political frameworks will lead to improved nutrition outcomes.



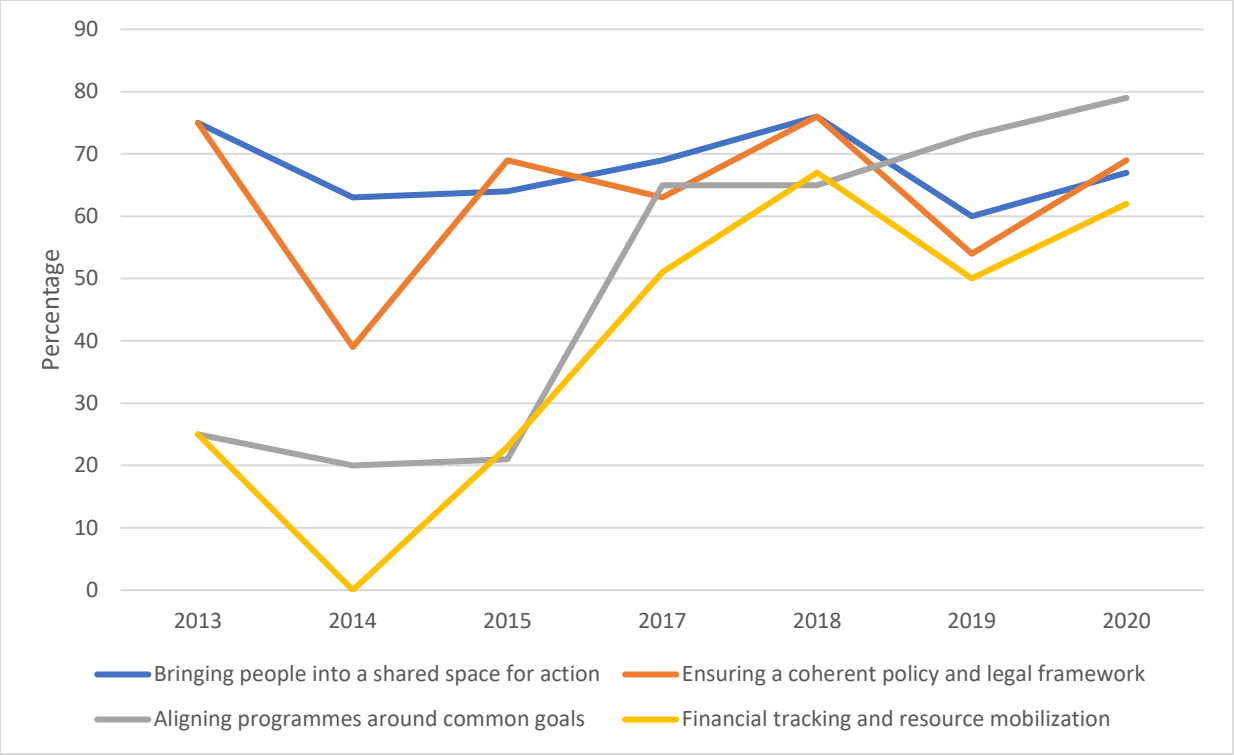
Source: Institute of Development Studies, (2012)

Additionally, the Scaling Up Nutrition (SUN) Movement is an international initiative centred on multisectoral collaboration. The SUN movement, which the Ghanaian government joined in 2011, is a country-led platform that focuses on strengthening multistakeholder (such as stakeholders from agriculture and health) efforts to develop and implement concrete political commitments and accountability measures that seek to eliminate all forms of malnutrition by 2030 (SUN Movement, 2019; SUN Movement, 2016). To track the annual progress of countries that have signed up to the SUN movement, the following self-assessment indicators are used: 1) bringing people into a shared space for action, 2) aligning actions around a common results framework, 3) tracking finances and mobilizing resources, and 4) ensuring a coherent policy and legal framework (SUN, 2019). Since 2013, Ghana has made noteworthy progress in all the indicators (Figure 2.3), signalling that there is continued effort to coordinate multiple stakeholders, develop policies and legislation, and mobilize resources for nutrition (SUN Movement, 2020).

Moreover, the Ghanaian government demonstrated its commitment to improving the nutritional status of the population by creating a National Nutrition Policy in 2013 (Government of Ghana, 2013). This initiative involved multiple stakeholders and used existing multistakeholder platforms such as the Agriculture Sector Working Group at the national level, which encompasses representatives from various categories, including the national government, donors and development partners, research and academia, and the private sector (SUN, 2019). Additionally, the Government of Ghana's representatives signed a framework for action at the Second International Conference on Nutrition in November 2014. This framework emphasized the importance of reviewing national policies and investments in agriculture and integrating nutrition objectives into agriculture policies, program design, and implementation to enhance nutrition-sensitive agriculture, ensure food security, and enable healthy diets (Food and Agriculture Organization of the United Nations, 2014).

To date, information on the roles of stakeholders, their influence on the nutrition agenda, and how they interact is scarce. The United Nations High-Level Panel of Experts on Food Security and Nutrition also recommended that to effectively implement interventions to improve nutrition, it is important to explore what can be changed within a multistakeholder platform (High-Level Panel of Experts on Food Security and Nutrition, 2018). Furthermore, documentation of experiences with stakeholders engaging in actions for nutrition at the local levels of implementation is limited, with questions about stakeholder interactions remaining unanswered (Gillespie et al., 2013).

Figure 2.3 Ghana's progress in the Scaling Up Nutrition Movement indicators from 2013 to 2020



Data source: SUN Movement, 2020

2.6.3 Understanding the roles and influence of stakeholders through stakeholder mapping and analysis

Stakeholder mapping and analysis refers to identifying individuals, communities or organizations related to a specific issue or problem and identifying their interests, objectives, power dynamics, and relationships (Neil, 2009). Stakeholder mapping and analysis needs "*to address a set of questions:*

1. *who are the stakeholders to include in the analysis*
2. *what are the stakeholders' interests and beliefs*
3. *who controls critical resources*
4. *with whom do stakeholders form coalitions and*

5. *what strategies and venues do stakeholders use to achieve their objectives*" (Weible, 2006, p.96).

Stakeholder mapping and analysis can support various stages of the programme cycle, including decision-making (policy planning), governance, and implementation/monitoring of progress. For example, stakeholder mapping and analysis were applied to reveal the stakeholders involved in the nutrition landscape in Egypt. The mapping data generated was used to update nutrition policies and programs such as the Nutrition Agenda for Action Framework in 2017 (Ministry of Health and Population et al., 2017).

Different methods can be employed in stakeholder mapping and analysis, involving participatory approaches to enable stakeholder identification, differentiation, and engagement (Reed et al., 2009). An important deciding factor for choosing a method depends on the issue to be addressed, the set objectives, the anticipated usefulness or outcomes, available funds and time, and expertise (United Nations Development Programme, 2006; Schiffer, 2007). For example, Davies (1982) suggested creating a list of individuals involved in decision-making, assessing their importance based on their influence and interest in a specific outcome, mapping the connections among these individuals, and recognizing their capacity to form partnerships. Table 2.1 shows all the different methods used in stakeholder mapping and analysis, which are dependent on three general steps: 1) Identification of stakeholders, 2) differentiation and categorization of stakeholders, and 3) investigation of roles and relationships among the stakeholders (United Nations Development Programme, 2006, Reed et al., 2009).

Table 2.1 Steps and methods employed in stakeholder mapping and analysis

Step	Method	Description
1. Identification of stakeholders	Focus group discussions	A small group of stakeholders interacts to brainstorm their interests, influence, and other attributes and to categorize them.
	Semi-structured interviews	Interviews with stakeholders to supplement focus group discussion data
	Snowball sampling	Individuals from initial stakeholder categories are interviewed, and new stakeholder categories and contacts are identified.
2. Differentiation and categorization of stakeholders	Interest-influence matrices	Stakeholders are placed on a matrix according to their relative interests and influence.
	Radical transactiveness	Snowball sampling identifies marginalized stakeholders and develops strategies to address their concerns.
	Stakeholder-led stakeholder categorization	Stakeholders themselves categorize stakeholders into categories which they have created.
	Q-methodology	Stakeholders sort statements drawn from a concourse according to how they agree with them. Analysis using the Q-methodology allows social discourses to be identified.
3. Investigation of roles and relationships among the stakeholders	Actor-linkage matrices	Stakeholders are tabulated in a two-dimensional matrix, describing their relationships using codes.
	Social network analysis	Used to identify the network of stakeholders and measure relational ties between stakeholders through structured interviews/questionnaires.
	Knowledge mapping	Used in conjunction with SNA and involves semi-structured interviews to identify interactions and knowledge

Source: Reed et al., (2009 p. 1937)

Another participatory method, Net-Map, which the International Food Policy Research Institute developed in 2007, builds on the methods described in Table 2.1. Net-Map combines social network analysis with influence mapping to understand the roles and relationships among the stakeholders and identify their priorities (Schiffer, 2007). Net-Map can aid in examining informal interactions among stakeholders, help identify leaders, and determine the extent to which they could and would exert their influence in a particular process (Schiffer & Waale, 2008). For instance, Aryeetey et al. (2022) applied the stakeholder Net-Mapping technique to identify fifteen nutrition leaders who influenced Ghana's stunting and anemia policies and programming. Moreover, stakeholder mapping and analysis pave the way for assessing the capacity needs of stakeholders identified in a mapping exercise. For instance, 90% of stakeholders identified in the 'Support for Effective Cooperation and Coordination of Cross-border Initiative' in Kenya, Somalia, and Ethiopia had limited capacity to understand cross-cutting issues that affected cross-border migration, such as gender and environment, thus necessitating a workshop to build the knowledge of these stakeholders (United Nations Development Programme, 2020). The next section of this chapter will focus on frameworks used to assess capacity gaps among stakeholders.

2.7 Frameworks for capacity assessments

The term' capacity' has different meanings to different stakeholders. For instance, Horton (2002) notes that senior managers view capacity as organizational development, whereas to non-governmental organizations, capacity is associated with empowering individuals. Building capacity helps to increase knowledge and awareness and encourages collaborative action among stakeholders to sustain long-term commitment toward a set goal, such as making the agriculture sector nutrition-sensitive. Thus, clarifying the meaning of 'capacity' is essential for initiating and expanding nutrition interventions. The FAO defines capacity as "*the sum of efforts needed to nurture, enhance and utilize the skills and capabilities of people*

and institutions at all levels - locally, nationally, regionally and internationally - so that they can better progress towards sustainable development." (Kay et al., 2003*).*

To successfully expand nutrition interventions, Gillespie et al. (2013) recommended exploring capacity at three levels: 1) individual, 2) organizational, and 3) systemic. Individual capacity focuses on the availability of resources and skilled staff to plan and deliver interventions. Organizational capacity relates to the availability of training and support facilities as well as sufficient staff members with adequate skills functioning within an environment with suitable monitoring and reporting systems that ensure accountability, incentives, and sanctions. Systemic capacity focuses on accessing and using multistakeholder platforms for discussing, debating, and deciding on nutrition issues. Moreover, systemic capacity enhances information sharing and the flow of funds in a timely and effective manner (Gillespie et al., 2013).

Two frameworks have been developed to access capacity at the individual and organizational levels: 1) the United Nations Development Programme capacity assessment framework (developed in 2008) and 2) The FAO capacity assessment framework (developed in 2012) (United Nations Development Programme, 2008; Food and Agriculture Organization of the United Nations, 2012). While the United Nations Development Programme capacity assessment framework emphasizes using existing capacities as the basis for capacity development and promoting capacity assessment for specific organizations and individuals, the FAO capacity assessment framework emphasizes the need to assess capacity using a sector-specific approach (United Nations Development Programme 2008; Food and Agriculture Organization of the United Nations, 2012). Another methodology, the Global Capacity Needs Assessment Methodology, which builds on the two frameworks mentioned above, was developed by the FAO in 2021 to assess capacity systematically (Food and Agriculture Organization of the United Nations & Global Forum for Rural Advisory

Services, 2021). The Global Capacity Needs Assessment Methodology was created to understand the learning gaps, needs, and obstacles to integrating nutrition-related objectives into agricultural programs and policies, with a particular focus on extension advisory services and identifying knowledge gaps in nutrition-sensitive agriculture training materials.

2.8 Conclusion

The literature review highlights the fundamental role of agriculture in improving nutrition. However, agricultural policies in Ghana continue to predominantly focus on staple food production despite the country's nutrition challenges. Due to the complex nature of Ghana's nutrition situation, harnessing the potential of existing and new agriculture policies can be critical in curbing malnutrition. Moreover, documentation of how Ghana prioritizes investments in the agricultural sector for improved nutrition remains scarce. Also, information on how Ghana deals with the integration of agriculture and nutrition is not common. Additionally, stakeholders' perspectives and experiences on Ghana's commitment to solving nutritional issues, particularly through agricultural policies, strategies, and investments, are not documented. While there is considerable conceptual knowledge of the links between agriculture and nutrition, there is little understanding of the needed capacity to deliver nutrition-sensitive agriculture interventions and how agriculture policy objectives translate into implementing agricultural interventions that could impact nutritional outcomes in the Ghanaian population.

Bridge 1

Evidence supporting the role of the agriculture sector in enhancing nutrition was reviewed in the previous chapter. However, historical agricultural policies and strategies in Ghana have predominantly focused on staple food production despite the increasing population rates of overweight and obesity. While substantial theoretical knowledge exists about the connection between agriculture and nutrition, information on how Ghana integrates agriculture and nutrition is scarce. To fill this gap, the next chapter (Manuscript 1) uses a case study approach to analyze the nutrition sensitivity of Ghanaian agricultural policies and implementation strategies over the last two decades.

Chapter 3. Manuscript 1

A content analysis of the nutrition sensitivity of agriculture policies and strategies and nutrition implementation in Ghana's agriculture sector

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Supported by: The Canadian Queen Elizabeth II Diamond Jubilee Scholarships (QES) is managed through a unique partnership of Universities Canada, Rideau Hall Foundation (RHF), Community Foundations of Canada (CFC), and Canadian universities. The QES-AS (QES-AS) is made possible with financial support from the International Development Research Center (IDRC) and the Social Sciences and Humanities Research Council (SSHRC).

3.1 Abstract

There is a growing recognition that reducing malnutrition requires the implementation of 'nutrition-sensitive' actions. Despite the potential of agriculture to act as a potent driver of malnutrition reduction in Ghana, the country continues to face persistent food system challenges, such as consuming highly processed foods, refined cereals, and diets rich in sugar-sweetened beverages. Tackling these food system challenges necessitates the adoption of 'nutrition-sensitive' approaches to agriculture development policies, strategies, and programs to ensure that their positive impact on nutrition is maximized. However, limited evidence exists on the nutrition sensitivity of agriculture policies and strategies. Thus, this case study assessed the nutrition-sensitive characteristics of Ghanaian agriculture policies and strategies between 2004 and 2020 and determined how nutrition-related activities were implemented in the agriculture sector between 2010 and 2019. Two Ministry of Food and Agriculture staff identified 27 documents for analysis using an adapted Food and Agriculture Organization screening tool with 17 equally weighted criteria of nutrition sensitivity. The Medium-Term Agriculture Sector Investment Plan 1 and the Investing for Food and Jobs strategy were the only documents that fell within the high range for nutrition sensitivity (11 - 14 nutrition-sensitive characteristics). Most policy and strategy documents focused on protecting natural resources and increasing staple food production, with little emphasis on producing, processing, and marketing micronutrient-rich foods. Specific donor-funded programs reported in the national annual reports with a nutrition focus included the Cowpea Improvement Program, Guinea Fowl Project, the Green House Model, and the Rearing for Food and Jobs Program. The results highlight the national-level nutrition-sensitive agriculture commitments of Ghana's agriculture policies and strategies and show important areas where the agricultural sector can improve nutrition. The screening tool can be used as a guide to improve food and agriculture policies and can be applied by external stakeholders to strengthen nutrition-sensitive accountability mechanisms in Ghana.

3.2 Introduction

Food systems are comprised of actors and their inter-connected activities ranging from food production, aggregation, processing, distribution, consumption, and disposal, as well as the socioeconomic and environmental outcomes of these activities (HLPE, 2017). To have a healthy and active life, populations require a food system that provides access to nutritious and safe food. Ghana's food system faces major challenges that contribute to poor dietary choices, including consuming highly processed foods, refined cereals, and diets rich in sugar-sweetened beverages (Laar et al., 2020). In addition, the food system contributes to the high prevalence of the triple burden of malnutrition (TBM), which is the co-existence of undernutrition (stunting and wasting), micronutrient deficiencies (e.g., anemia), and overnutrition (overweight and obesity) (Cooke & McKay, 2016; Kumar et al., 2021). The TBM poses a threat to the health and well-being of children in Ghana, with an estimated 18% of children under five years of age being stunted, wasted (6%), underweight (12%), and overweight (2%) (Ahinkorah et al., 2021; GSS & ICF Macro, 2023). Moreover, anemia among children aged 6 – 59 months (49%), pregnant women (51%), and non-pregnant women of reproductive age (40%) remains high (GSS & ICF Macro, 2023). Addressing these challenges requires coherent agricultural policies, strategies, and programs that are nutrition-sensitive and address both the supply and demand side of food to make healthy foods readily available and accessible and to enable consumers to make food-related decisions that will enhance their health.

There is increasing recognition that nutrition-specific interventions alone cannot address malnutrition and that nutrition-sensitive actions are needed (Bhutta et al., 2013). The agriculture sector has been recognized as potentially playing a critical role in ensuring positive nutrition outcomes (Sharma et al., 2021). Thus, nutrition-sensitive agriculture aims to maximize the impact of agriculture policies on nutrition outcomes by prioritizing

nutritionally rich foods, dietary diversity, and food fortification without detracting from the agricultural sector's goals of increased food production and incomes (Food and Agriculture Organization of the United Nations, 2014; Herforth et al., 2012). Nutrition-sensitive agriculture has been prioritized in international development and has gained momentum through repeated calls by the agriculture-nutrition international community to leverage agriculture to improve nutrition outcomes (Food and Agriculture Organization of the United Nations, 2015a,b; International Food Policy Research Institute, 2012a,b; International Food Policy Research Institute, 2011). Moreover, high-level policy initiatives, such as the Scaling Up Nutrition movement, have contributed to the increased priority given to improving nutrition in international and national development (Scaling Up Nutrition, 2022).

Thus, it is critical for food systems to meet the nutrition needs in addition to the food security needs of a population. Moreover, good food system governance emphasizes the role agricultural policies, programs, and strategies could play in making food accessible, safe, and healthy for all (Martin et al., 2022). There is general agreement among researchers on the theoretical pathways linking agriculture to nutrition and a recognition of the critical role of the agriculture sector in improving nutrition outcomes (Black et al., 2013). However, there is limited evidence on the extent to which agriculture policies and strategies are nutrition-sensitive. Moreover, information gaps exist on how nutrition-related activities have been implemented within the agricultural sector. Using Ghana as a case study, this analysis examined the nutrition-sensitive characteristics of agriculture policies and strategies and examined how nutrition-related activities have been implemented in Ghana's agricultural sector.

3.3 Methods

3.3.1 Research Setting

Ghana had an estimated population of 30.8 million in 2021 (Ghana Statistical Service, 2021). Ghana is comprised of 16 administrative regions[8], and administrative power starts from the national level and then moves to the regional, municipal, and district levels. The government of Ghana is structured under 27 ministries (Government of Ghana, 2023). Agriculture falls under the Ministry of Food and Agriculture (MoFA) and the Ministry of Fisheries and Aquaculture Development, while human nutrition is primarily the mandate of the Ministry of Health. The Ministry of Food and Agriculture's Women in Agriculture Development Directorate (WIAD) is also mandated to mainstream nutrition into the sector's policies, strategies, and programs (Ministry of Food and Agriculture, 2021).

3.3.2 Search strategy for policy documents and annual reports

Two representatives from the Policy Planning, Monitoring and Evaluation Directorate of Ghana's Ministry of Food and Agriculture identified and verified seventeen policy and strategy documents published between 2004 and 2020 (Table 3.1) and ten national annual reports published between 2010 and 2019 for analysis in August 2020.

3.3.3 Inclusion criteria for policy and strategy documents and annual reports

All seventeen national agricultural policies, action plans, medium-term investment plans, agricultural sub-sectoral policies, and ten national annual reports containing information relevant to nutrition-sensitive agriculture and published between 2004 and 2020 were included in the analysis.

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[8] The regions are 1) Ahafo, 2) Ashanti, 3) Bono East, 4) Brong Ahafo, 5) Central, 6) Eastern, 7) Greater Accra, 8) North East, 9) Northern, 10) Oti, 11) Savannah, 12) Upper East, 13) Upper West, 14) Western, 15) Western North, and 16) Volta.

3.3.4 Data extraction and analysis

3.3.4.1 Quantitative content data extraction and analysis of the 17 policy documents

A 17-point screening criteria (Table 3.2) was adapted from the Food and Agriculture Organization of the United Nations (FAO) guidelines, 'key recommendations for improving nutrition through agriculture and food systems' (Food and Agriculture Organization of the United Nations, 2015a). The guidelines propose fifteen recommendations that are considered to enhance the nutrition sensitivity of agricultural policies and programs. To emphasize nutrition, two[9] of the fifteen recommendations were further divided into two additional screening criteria, namely, 1) increase the production of micronutrient-rich foods and 2) expand market access to micronutrient-rich foods (Table 3.2).

In order to ensure consistency and comparability with other studies, this study adapted a scoring grid proposed by Lachat et al. (2015). The grid was formulated based on the screening criteria outlined in Table 3.2, derived from the 'key recommendations for improving nutrition through agriculture and food systems' document (Food and Agriculture Organization of the United Nations, 2015a). Two raters independently reviewed and scored all the policy documents using the screening criteria (Table 3.2) and a scoring guide (Table 3.3). First, a screening criterion was considered present if a word, derivative, or synonym of the item was found in any relevant section of each policy document. Then, a policy document was allocated a score of 0 (not incorporated), 0.5 (partially incorporated), and 1(fully incorporated) to denote the degree to which a nutrition-sensitive characteristic was present. Each policy document was also manually reviewed to ensure that each screening criterion was thoroughly assessed. The scores for each policy document were summed for a maximum

[9] The recommendations that were broken down were 1) increase the production of food and 2) expand markets and enhance market access (Table 3.2).

total of 17 points, indicating that all 17 nutrition-sensitive characteristics were present and fully incorporated.

The average score and interrater reliability coefficients[10] (Table 3.4) for each policy document were calculated using the AgreeStat360 software (AgreeStat Analytics, 2019). Finally, each policy document was assigned a category[11] based on a numerical score which reflects the degree of nutrition sensitivity of a policy or strategy document: (i) "Very low" = 0 to 3 points, (ii) "Low" = 4 to 6 points, (iii) "Medium" = 7 to 10 points, (iv) "High" = 11 to 14 points, and (v) "Very high" = 15 to 17 points (Lachat et al., 2015). 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).

3.3.4.2 Qualitative content data extraction and analysis of the ten annual reports

A Microsoft Excel data extraction template was used to collect information under the following themes from the ten annual reports: year of the annual report, nutrition goals, context analysis, nutrition objectives and indicators, targeting the vulnerable, empowering women, food production, production of micronutrient-rich foods, post-harvest losses, diversification of agricultural production, nutrition promotion and education, processing to enhance convenience in preparation, processing to retain nutritional value, storage and preservation, market expansion and market access, market access to micronutrient-rich foods, multisectoral collaboration and coordination, and protecting the natural resource base. Relevant information was extracted using Table 3.2 as a guide by a research assistant in regular consultations with the first author (PB), as required. The extracted data were analyzed

[10] The interrater reliability coefficient is the extent to which two or more raters agree on how to score the same content using a set criteria. It addresses the issue of consistency of the implementation of a rating system.
[11] The categorization for the degree of nutrition sensitivity was developed by eight teams conducting a nutrition-sensitive assessment of agricultural policies and strategies in eight countries (UNSCN, 2014).

and summarized narratively in relation to the key themes by the first author (PB) with feedback from the second author (GSM).

3.4 Results

3.4.1 Description of policy documents reviewed

Seventeen policy documents were reviewed (Table 3.1). The overarching guiding policy (the Food and Agriculture Sector Development Policy [FASDEP] 2) in Ghana's agriculture sector served as the legal framework for the development and implementation of Medium-Term Agriculture Sector Investment Plans (METASIP) (n=3), sub-sector policies (in tree crops, livestock, and fisheries) (n=4), service delivery policies (e.g., gender mainstreaming; n=6), and cross-cutting policies (n=3). The FASDEP 2, the Investing for Food and Jobs strategy (IFJ), the Planting for Food and Jobs program, the Ghana National Climate Change Master Plan: Action Programmes for Implementation (GNCC-MP), and the National Climate-smart Agriculture and Food Security Action Plan of Ghana were the only current policies based on the stated timeframes. Eight policy documents had no reported timeframe; thus, it was unclear whether they were still used.

3.4.2 Alignment of 17 policies with 'key recommendations for improving nutrition through agriculture and food systems'

The majority of the policies and strategies focused on increasing food production (94%; 16 out of 17) and protecting natural resources (77%; 13 out of 17), with little emphasis on the production, processing, and marketing of micronutrient-rich foods (Figure 3.1). Almost all policy and strategy documents (88%; 15 out of 17) partially incorporated the expansion of markets and consumer access to markets, focusing on developing infrastructure and creating market outlets. Reducing post-harvest losses was covered by more than half of the policies and strategies (59%; 10 out of 17) reviewed. Multisectoral collaboration was partially (53%;

9 out of 17) or fully incorporated (24%; 4 out of 17) in the policy and strategy documents. Nutrition promotion and education were minimally incorporated in the policy and strategy documents (29%; 5 out of 17), as was women's empowerment (29%; 5 out of 17). Almost none of the policies and strategies had explicit nutrition goals (6%; 1 out of 17), improved processing to retain nutritional value (6%; 1 out of 17), or provided market access to micronutrient nutrient-rich foods 6%; 1 out of 17).

The FASDEP 2 contained no specific nutrition goals and considered nutrition from the perspective of 'food security and emergency preparedness.' The Ghana Livestock Development Policy and Strategy (GLD) was the only policy with an explicit nutrition goal to produce animal source foods. The IFJ strategy was the only one that stated efforts to improve market access to micronutrient-rich foods (through developing market support services for selected vegetables).

Moreover, activities related to the marketing of agricultural produce, in general, were less frequently included in the policy documents. Most policy documents focused on protecting the natural resource base alongside increasing staple food production in general, with no particular emphasis on increasing the production of micronutrient-rich foods.

Moreover, only the Livestock Development in Ghana: Policies and Strategies (LDG) hinted at improving processing to retain nutritional value (by training all stakeholders in the milk industry on processing to maintain and/or enhance the quality of milk produced). Most policies lacked sufficient emphasis on reducing postharvest losses and integrating nutrition education. Only six policy documents (FASDEP 2, METASIP 1, METASIP 2, IFJ, GNCC-MP, and Gender in Agriculture Development Strategy 2) included nutrition-related strategies to improve diets or nutritional status or a monitoring and evaluation system with nutrition and/or dietary indicators to some extent in their framework.

3.4.3 Nutrition sensitivity of the 17 policy and strategy documents

The FASDEP 2, its corresponding METASIPs, and the GNCC-MP were the only policies with more than ten nutrition-sensitive characteristics. The most nutrition-sensitive document in Ghana's agriculture sector was the IFJ strategy (also known as the third METASIP), with a score of 14. While the majority of policies and strategies (n=9) reviewed fell within the medium range of nutrition sensitivity (7 – 10 characteristics present), six policies and strategies recorded six characteristics or below (Figure 3.2). The lowest-scoring policy documents were the Fertilizer Policy and the Ghana Seed Plan. Their low score (3) was not surprising because these documents covered policies that were remotely related to nutrition.

3.4.4 How has nutrition been implemented in Ghana's agriculture sector based on the FAO recommendations?

The 17 policy and strategy documents included the criteria of the FAO 'Key recommendations for improving nutrition through agriculture and food systems' to varying degrees (Figures 3.1 & 3.2). Supplementary Tables 1a and 1b provides a detailed description of how the 17 criteria of the FAO recommendations have been implemented in Ghana's agriculture sector between 2010 and 2019. Almost all reports on increased food production over the period (2010 – 2019) were mainly focused on staple foods (such as maize, yam, and cassava). Programs that contributed to the increase in staple food production were the Block Farming Program, the Fertilizer Subsidy Program, the Planting for Food and Jobs Program, Modernising Agriculture in Ghana Project, One District One Factory Program, irrigation projects, conservation agriculture practices, and improved seed varieties. Moreover, donor-specific efforts to increase the production of micronutrient-rich foods were centred on vegetable and legume, fish, meat, guinea fowl, grasscutter, sweet potato, and vitamin A yellow/orange maize production. The Cowpea Improvement Program, the Guinea Fowl

Project, the Green House Model, and the Rearing for Food and Jobs Program were specific programs to increase the production of micronutrient-rich foods.

As indicated in Supplementary Tables 1a and 1b, nutrition-sensitive indicators such as agricultural commodity prices and income earned on agricultural produce were tracked within the reporting period. However, there was no indication that the tracking led to mitigation strategies such as price stabilization or improved nutrition. Aside from 2013, 2016, and 2019, where no actions were taken to support nutrition in the form of nutrition education, all other years reported awareness creation, education, and demonstration on food-based nutrition and food safety, provision of meals to school-going children via the Ghana School Feeding Program, and trials on indigenous recipes. Specific projects such as the Livestock Development Project, the National Cockerel Project, and the Rearing for Food and Jobs program had nutrition-sensitive goals to increase livestock and domestic meat production, increase smallholder household incomes, and reverse the trend of meat imports. In 2014, the WIAD of Ghana's Ministry of Food and Agriculture, with support from FAO and the World Food Program, organized a national workshop to build the capacity of 89 staff (48% females) on nutrition-sensitive agriculture. The workshop aimed to educate the participants on the malnutrition situation in the country, the role of agriculture in improving health through good nutrition, and the development of a nutrition-sensitive agriculture action plan. Even though efforts to increase market access to micronutrient-rich foods were among the least reported, specific initiatives centred on introducing the Green Label Scheme (2014) and the Obaasima Seal (2016) to promote the marketing of micronutrient-rich foods. Another area that was least reported was improving processing to retain nutritional value.

3.5 Discussion

This analysis of agricultural policies and strategies in Ghana is the first conceived to understand the content of these policies, their nutrition sensitivity, and how they align with the FAO 'key recommendations for improving nutrition through agriculture and food systems.' Most of the policy documents reviewed had 7 – 14 nutrition-sensitive characteristics, showing that the government of Ghana has recognized the importance of agriculture for nutrition and is gradually making an effort to mainstream nutrition into agriculture. In 2011, the Ministry of Food and Agriculture developed an action plan to mainstream nutrition into agriculture in response to the malnutrition problems in the country and to align with the West African Regional Comprehensive Africa Agriculture Development Programme Nutrition Program (CAADP, 2011). However, none of the policies and strategies enacted after 2011 had explicit nutrition goals.

Recognizing the heterogeneity between the objectives and scope of the policy and strategy documents, several areas offer a margin for improvement. While several policies and strategies focused on increasing food production, which is also evident in the annual reports, there were no clear mechanisms in the policy and strategy documents to increase the production and marketing of micronutrient-rich foods and improve the processing of foods to retain nutritional value. Given the established linkages between nutrition-sensitive agriculture and improved nutritional status (Sharma et al., 2021), there is a need for reforms that engage and convince leaders in other sectors beyond the Ministry of Food and Agriculture to take specific actions, such as establishing cross-sectoral policies. Moreover, an increase in multisectoral collaboration to mainstream nutrition into agriculture and the development of explicit nutrition goals, objectives, and indicators, as well as appropriate monitoring and evaluation for nutrition within the agriculture sector, will ensure further integration of nutrition in Ghana's agriculture sector.

Issues on post-harvest losses were not adequately addressed in some of the documents reviewed, which is consistent with a study from Senegal and another three-country study (Lachat et al., 2015; Sibanda et al., 2023). Moreover, few documents have targeted efforts to empower women to access productive resources, which presents a concern considering that nearly half of the agricultural workforce globally are women (FAO, 2018). Moreover, women's control over productive resources has been linked to better nutrition for individuals in the household (Quisumbing, 2003; Hodge et al., 2015). Women's empowerment through income opportunities was partly addressed, but there was limited priority regarding decision-making roles, labour, and time-saving technologies for women. Considering that women's well-being and empowerment influence the reduction in child malnutrition, every component of nutrition strategies must include women.

Another area for improvement is increasing market access to micronutrient-rich foods since it was not incorporated in almost all the documents reviewed. According to FAO (2013), improved access to markets positively affected food access, including increasing income for farmers, incentivizing food production, and improving consumer dietary diversity. A study from Ethiopia, Indonesia, Kenya, and Malawi indicated that farmers' access to markets had a significant impact on dietary variety (Sibhatu et al., 2015). Additionally, children in Ethiopia who resided nearer to markets had more varied diets and higher average weight for height and weight for age z-scores (Abay and Hirvonen, 2016).

Growth in the agricultural sector is effective in reaching rural populations who are often affected by poverty and poor nutrition and depend on agriculture for their livelihoods (World Bank, 2014). However, growth in the agriculture sector was mainly focused on increased production of staple foods that were low in micronutrients, which does not necessarily result in better nutrition for the population. To ensure nutrition-sensitive growth within the agriculture sector, it is crucial to include strategies that support increased production of

micronutrient-rich foods to ensure dietary diversity and improved diet quality. These strategies should encompass nutrition education, as well as processing and marketing of micronutrient-rich foods. Furthermore, it's essential to consider setting specific targets and providing incentives to farmers to cultivate and promote micronutrient-rich crops.

Some efforts outlined in the reviewed documents to create markets for smallholder farmers included initiatives such as the provision of food outlets, market information centers, and the expansion of markets for staple foods like cassava. However, these efforts often neglected micronutrient-rich foods, which could impede the promotion of their consumption, considering that access to food markets and food prices can greatly influence consumers' food choices (Griffith et al., 2015). In line with a study in Senegal (Lachat et al., 2015), the marketing of micronutrient-rich foods was relatively low in Ghana based on the annual reports reviewed, even though the Obaasima Seal and the Green Label Scheme existed to promote the marketing of micronutrient-rich foods.

Almost half of the documents reviewed did not address knowledge-based nutrition interventions, including nutrition education. Interventions to reduce malnutrition across different age groups and populations must be prioritized. Dietary diversity was also not promoted in the documents reviewed, and some documents did not clearly establish the link between a diverse diet and preventing malnutrition, including micronutrient deficiencies. Instead, regarding micronutrient deficiencies, the promotion of orange-fleshed sweet potato production and consumption was mainly emphasized.

3.5.1 Strengths and weaknesses of the study

The policy analysis demonstrated a key strength in its application of the FAO's ‘key recommendations for improving nutrition through agriculture and food systems’ to assess the nutrition sensitivity of policies, strategies, and programs within Ghana's agricultural sector.

Yet, the study has several limitations. First and foremost, the interpretations of the presence or absence of screening criteria in the policy and strategy documents, as well as the national annual reports, were based on the subjective judgements of the researcher. Secondly, the analysis is not comprehensive since other policies (e.g. The National Nutrition Policy) affecting food and nutrition but outside the agriculture sector were not included in the analysis. Moreover, the search strategy employed in the study excluded data sources from the internet. Finally, since content analysis of documents only examines texts and requires considerable summarization, some information may be lost due to oversimplification. Despite the weaknesses mentioned above, the study identified gaps and contributed to the knowledge of the areas where policies, strategies, and programs could be strengthened to mainstream nutrition into agriculture and address the growing burden of malnutrition more effectively in Ghana.

3.6 Conclusion

This study provides a comprehensive snapshot of the nutrition sensitivity of agriculture policies in Ghana. The strengths and weaknesses of Ghanaian agriculture policies in relation to incorporating nutrition-sensitive characteristics contributed to understanding national-level nutrition-sensitive agriculture commitments. The results provide a baseline for repeat assessments of the nutrition sensitivity of Ghana's future agriculture policies. Moreover, the results highlight important areas where the agricultural sector can improve nutrition, particularly in promoting the production, processing, and marketing of micronutrient-rich foods and nutrition education. The screening criteria and the scoring grid used in this study can be utilized as a guide to improving agriculture policies and strategies in Ghana and can be applied externally by relevant stakeholders to strengthen nutrition-sensitive accountability mechanisms in Ghana.

3.7 Acknowledgements

This paper was supported by the Canadian Queen Elizabeth II Diamond Jubilee Scholarships: Advanced Scholars (QES-AS) program. "The Canadian Queen Elizabeth II Diamond Jubilee Scholarships (QES) is managed through a unique partnership of Universities Canada, the Rideau Hall Foundation (RHF), Community Foundations of Canada (CFC) and Canadian universities. The QES-AS is made possible with financial support from IDRC and SSHRC".

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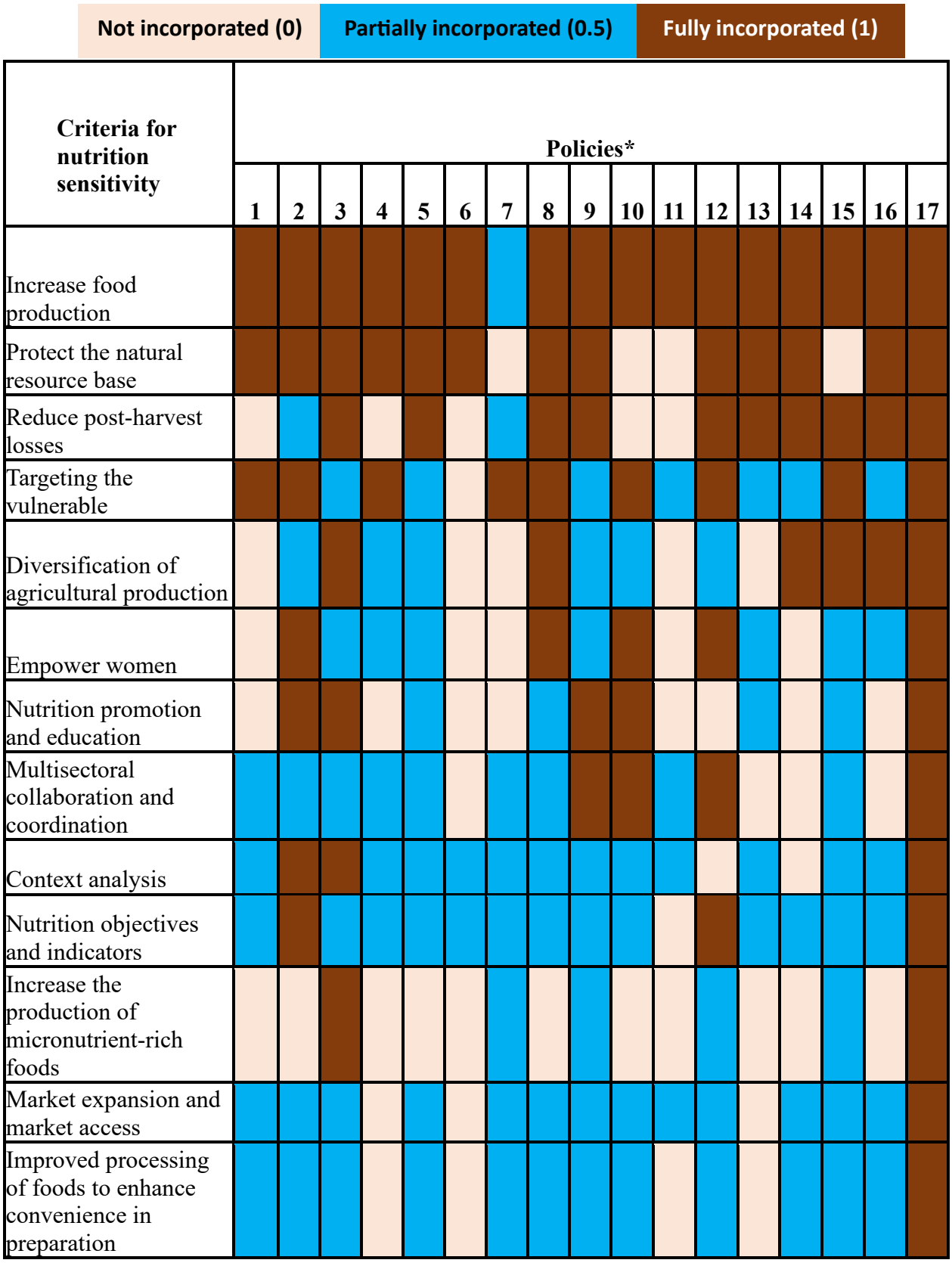
Figure 3.1 Seventeen Ghanaian Ministry of Food and Agriculture policy and strategy documents and their alignment to the 17 nutrition-sensitive themes of the FAO's 'Key recommendations for improving nutrition through agriculture and food systems'*



Improved storage and preservation		■	■		■		■	■	■		■	■		■	■	■	■
Explicit nutrition goals															■		
Improved processing to retain nutritional value	■																
Market access to micronutrient-rich foods																	■

*[1] Livestock Development in Ghana: Policies and Strategies, [2] Food and Agriculture Sector Development Policy II, [3] Medium-Term Agriculture Sector Investment Plan, [4] National Irrigation Policy, Strategies, and Regulatory Measures, [5] Tree Crops Policy, [6] Fertilizer Policy for Ghana, [7] National Seed Policy, [8]Ghana National Climate Change Policy, [9]Medium Term Agriculture Investment Plan II, [10]Gender and Agriculture Development Strategy II, [11]National Seed Plan, [12]Ghana National Climate Change Master Plan: Action Programmes for Implementation, [13]Fisheries Management Plan of Ghana: A National Policy for the Management of the Marine Fisheries Sector, [14]National Climate-smart Agriculture and Food Security Action Plan of Ghana, [15]Ghana Livestock Development Policy and Strategy, [16]Planting for Food and Jobs: Strategic Plan for Implementation, [17]Investing for Food and Jobs: An Agenda for Transforming Ghana's Agriculture

*Source: FAO, 2015

Figure 3.2 Degree of nutrition sensitivity of the 17 Ghanaian Ministry of Food and Agriculture policy and strategy documents and their alignment to the nutrition-sensitive themes of the FAO's 'Key recommendations for improving nutrition through agriculture and food systems'*

*Source: FAO, 2015

Table 3.1 List of the 17 Ministry of Food and Agriculture policy documents identified for review

No.	Document type	Document title	Abbreviation	Time frame	Policy category
1	Policy and strategy	Livestock Development in Ghana: Policies and Strategies	LDG	2004 - NR	Sub-sector policy
2	Policy	Food and Agriculture Sector Development Policy II	FASDEP 2	2007	Overarching policy
3	Strategy	Medium-Term Agriculture Sector Investment Plan	METASIP	2011 - 2015	Investment plan
4	Policy and strategy	National Irrigation Policy, Strategies, and Regulatory Measures	NIP	2011 - NR	Service delivery
5	Policy	Tree Crops Policy	TCP	NR	Sub-sector policy
6	Policy	Fertilizer Policy for Ghana	FP	2013 - NR	Service delivery
7	Policy	National Seed Policy	NSP	2013 - NR	Service delivery
8	Policy	Ghana National Climate Change Policy	GNCC-P	2013 - NR	Cross-cutting policy
9	Strategy	Medium-Term Agriculture Investment Plan II	METASIP 2	2014 - 2017	Investment plan
10	Strategy	Gender and Agriculture Development Strategy II	GADS 2	2015 - NR	Service delivery
11	Strategy	National Seed Plan	GSP	2015 - NR	Service delivery
12	Strategy	Ghana National Climate Change Master Plan: Action Programmes for Implementation	GNCC-MP	2015 - 2020	Cross-cutting policy
13	Policy	Fisheries Management Plan of Ghana: A National Policy for the Management of the Marine Fisheries Sector	FMP	2015 - 2019	Sub-sector policy
14	Strategy	National Climate-smart Agriculture and Food Security Action Plan of Ghana	CSA	2016 - 2020	Cross-cutting policy

15	Policy and strategy	Ghana Livestock Development Policy and Strategy	GLD	2016 - NR	Sub-sector policy
16	Strategy	Planting for Food and Jobs: Strategic Plan for Implementation	PFJ	2017-2020	Service delivery
17	Strategy	Investing for Food and Jobs: An Agenda for Transforming Ghana's Agriculture	IFJ	2018 - 2021	Investment plan

*NR: not reported

Table 3.2 A 17-point screening criteria of nutrition sensitivity for the 27 Ghanaian Ministry of Food and Agriculture policy and strategy documents

No.	Screening criteria of the policy documents	Score
1	**Incorporate explicit nutrition goals**	1
2	Have **nutrition objectives and indicators** in their design and link them with a nutrition monitoring and evaluation system. The monitoring and evaluation could entail monitoring dietary diversity and access to safe and nutritious foods. Monitoring and evaluation data could include food prices of diverse foods and dietary consumption indicators (such as dietary diversity score, food consumption score, etc.) and nutrition-specific indicators (such as % child underweight, % child stunting, % of women with anemia, etc.) for vulnerable groups.	1
3	**Assess the local context** and design activities that address the types and causes of malnutrition*. Assessing the local context can include focusing on local priorities, which stresses issues such as potential food sources, seasonality of production, access to productive resources, market opportunities and infrastructure, opportunities for multisectoral collaboration, gender dynamics and roles and income.	1
4	**Target vulnerable populations**** and improve equity through participation, access to resources, and decent employment.	1
5	**Empower women** by providing productive resources such as access to inputs, extension services, and credit, access to income opportunities and labour and time-saving technologies. The policy must empower women by including measures that protect and support their voices in decision-making and provide equitable opportunities for women to earn and learn, which are compatible with safe pregnancy and young child feeding. The policy must include safety nets that allow women access to nutritious food during shocks and seasonal changes (including low incomes and land tenure changes).	1
6	**Increase the production of foods**.	1
7	**Increase the production of micronutrient-rich foods.** The focus must be on horticulture, legumes, and small-scale livestock and fish. The policy must increase incentives for the environmentally sustainable production of nutritious and safe foods.	1
8	**Reduce post-harvest losses**	1
9	Facilitate **diversification of agricultural production** (particularly horticultural products, legumes, small-scale livestock and fish, biofortified crops, and underutilized foods). Diversified production systems include off-farm activities that are important to vulnerable producers to enable them to withstand shocks and fluctuations in the climate, incomes and food prices. Diversified production systems must help vulnerable producers access more diverse foods and generate more income.	1
10	Include **nutrition promotion and education** around food and sustainable food systems. Nutrition promotion and education must build on local food and nutrition knowledge, attitudes and practices.	1

11	**Improve processing and make healthy foods convenient to prepare**	1
12	**Improve processing of foods to retain nutritional value**	1
13	**Improve storage and preservation** to enhance shelf life and make food safe	1
14	**Expand markets and enhance market access** for vulnerable groups. The policy must expand and improve market access for foods and products that vulnerable populations can produce at a lower opportunity cost than their competitors. In creating market opportunities, the policy can include value addition technologies, access to food prices, creation of farmer associations, and targeted promotion (such as marketing based on nutrient content).	1
15	**Expand market access to micronutrient nutrient-rich foods**	1
16	**Support multisectoral collaboration and coordination.** The policy must support joint strategies and have common goals with other sectors to address malnutrition. The policy must develop human resource capacity and support institutions to improve nutrition through the agriculture sector.	1
17	**Do no harm or improve the natural resource base.** The natural resource base, which includes water, soil, air, climate, and biodiversity, is critical for the sustenance of the livelihoods of vulnerable farmers; thus, the policy must include measures that protect the natural resource base for sustainable food and nutrition security for all.	1

*Malnutrition includes undernutrition, vitamin and mineral deficiencies, and overnutrition (obesity and chronic disease).
**Vulnerable groups include smallholders, women, youth, the landless, urban dwellers, and the unemployed.
Adapted from the 'Key Recommendations for Improving Nutrition Through Agriculture and Food Systems' document (FAO, 2015)

Total: 17

Table 3.3 A scoring guide for scoring the 17 policy documents of the Ghanaian Ministry of Food and Agriculture

Score	Meaning	Explanation
0	Not incorporated	The item is not included in the policy document text.
0.5	Partially incorporated	Assign a rating of "0.5" when the screening criterion is mentioned, but: • The stated statement is a recommendation, aspiration or suggestion. • The policy contains loopholes that weaken the enforcement of the criterion • Statements within the policy are confusing, unclear or vague. • The policy used words such as 'may,' 'might,' 'can,' 'could,' 'should,' 'encourage,' 'suggest,' 'urge,' 'some,' 'partial,' 'make an effort,' and 'try' to denote a future plan; however, the exact timing is not stated.
1	Fully incorporated	Assign a rating of "1" when the screening criterion is mentioned, and it is clear that the policy is committed to making the screening criterion happen because: • There is a clearly stated goals with accompanying strategies and activities to accomplish the goal • The screening criterion has concrete plans in the policy document for implementation • Words such as 'will,' 'must,' 'shall,' 'have to,' 'insist,' 'enforce,' 'all,' 'total,' 'comply,' and 'require' are used to indicate that an action will be taken.

Table 3.4 Interrater reliability coefficients of the 17 policy and strategy documents

Policy *	Average score	Agreements							
		Percentage agreement				Krippendorff's Alpha			
		Coeff.	S.E.	95% CI	P-value	Coeff.	S.E.	95% CI	P-value
1	10	0.97	0.03	0.91 - 1	3.82E-16	0.93	0.07	0.78 -1	5.038E-10
2	11	0.91	0.05	0.81 - 1	1.89E-12	0.79	0.12	0.54 -1	6.406E-06
3	10	0.94	0.04	0.86 - 1	8.57E-14	0.85	0.11	0.62- 1	6.518E-07
4	14								
5	3	0.97	0.03	0.91 - 1	3.82E-16	0.89	0.12	0.65 - 1	1.025E-06
6	8	0.97	0.03	0.91 -1	3.82E-16	0.94	0.07	0.80 -1	1.719E-10
7	7								
8	10	0.97	0.03	0.91 - 1	3.82E-16	0.94	0.07	0.80 - 1	1.743E-10
9	3	0.94	0.04	0.86 -1	8.57E-14	0.78	0.17	0.43 -1	2.247E-04
10	5	0.97	0.03	0.91 - 1	3.82E-16	0.91	0.10	0.69 - 1	1.02E-07
11	9	0.94	0.04	0.86 - 1	8.57E-14	0.87	0.10	0.67 - 1	7.755E-08
12	8	0.94	0.04	0.86 - 1	8.57E-14	0.85	0.11	0.63 - 1	6.274E-07
13	8	0.94	0.04	0.86 - 1	8.57E-14	0.82	0.11	0.55 - 1	8.338E-06
14	6	0.94	0.04	0.86 - 1	8.57E-14	0.86	0.11	0.63 - 1	6.930E-07
15	5	0.94	0.04	0.86 - 1	8.57E-14	0.85	0.11	0.62 – 1	9.773E-07
16	8	0.94	0.04	0.86 - 1	8.57E-14	0.87	0.10	0.67 - 1	1.038E-07
17	5	0.97	0.03	0.91 - 1	3.82E-16	0.93	0.08	0.76 -1	2.154E-09

S.E. – Standard error

*[1] Food and Agriculture Sector Development Policy II, [2]Medium-Term Agriculture Sector Investment Plan [3]Medium Term Agriculture Investment Plan II, [4]Investing for Food and Jobs: An Agenda for Transforming Ghana's Agriculture, [5]Fertilizer Policy for Ghana, [6]National Climate-smart Agriculture and Food Security Action Plan of Ghana, [7]Gender and Agriculture Development Strategy II, [8]Ghana National Climate Change Master Plan: Action Programmes for Implementation, [9]National Seed Plan, [10]National Seed Policy, [11]Ghana National Climate Change Policy, [12]Ghana Livestock Development Policy and Strategy, [13]Tree Crops Policy, [14]Livestock Development in Ghana: Policies and Strategies, [15]National Irrigation Policy, Strategies, and Regulatory Measures, [16]Planting for Food and Jobs: Strategic Plan for Implementation, [17]Fisheries Management Plan of Ghana: A National Policy for the Management of the Marine Fisheries Sector

Supplementary Table 1a Implementation of the 'Key recommendations for improving nutrition through agriculture and food systems' in Ghana's agriculture sector between 2010 and 2014

Years	**2010**	**2011**	**2012**	**2013**	**2014**
Policy document(s)	FASDEP 2*	METASIP	METASIP	METASIP	METASIP
*Policies/ strategies appearing only once have no reported end date. Note: Tree Crops Policy has no specified timeframe	LDG*	NIP*		FP* NSP* GNCC-P*	
Themes, category of incorporation and the corresponding number of policy documents containing the theme					
Increase food production Fully incorporated 16 Partially incorporated 1 Not incorporated 0 **Note: The baseline year is the preceding year. Figures for 2009 were not reported.**	**Block Farming Program, Fertilizer Subsidy program, irrigation projects, improved seed varieties and improved extension services:** A 4% increase in the production of major staples ***Increased*:** maize [1.9 million MT], rice [295,000 MT], cassava [13.5 million MT],	**Block Farming Program, Fertilizer Subsidy program, irrigation projects, improved seed varieties and improved extension services:** ***Increased*:** rice [279,000 MT], cassava [14.2 million MT], yam [6.3 million MT],	**Fertilizer Subsidy program:** ***Increased*:** Maize [2 million MT], rice [289,000 MT],	**Fertilizer Subsidy Program, West African Agricultural Productivity Project, and Roots and Tuber Improvement and Marketing Program**: ***Increased***: Rice [411,000 MT], cassava [16 million], yam [7.0 million MT],	**Fertilizer Subsidy Program, Public Private Partnership, Export Development and Agricultural Investment Fund Rice Project, West African Agricultural Productivity Project, Roots and Tuber Improvement and Marketing Program, Ghana Irrigation Development Authority irrigation schemes**: ***Increased***: Rice [604,000 MT], maize [1.768 million MT],

	yam [5.9 million MT], groundnut [531,000MT], cowpea [219,000MT], and soybean [146,000 MT] ***Decreased*****:** Cocoyam [1.4 million MT] (10%), millet [219,000 MT] (11%), sorghum [324,000MT] (7%), plantain [3.5 million MT] (1%)	cowpea [240,000MT], soybean [165,000 MT], plantain [3.6 million MT] ***Decreased*****:** maize [1.7 million MT], groundnut [479,000MT], cocoyam [1.3 million MT], millet [184,000 MT], sorghum [287,000MT]	cassava [14.6 million], yam [6.6 million MT] ***Decreased*****:** groundnuts [475,000MT], millet [180,000MT], sorghum [280,000MT], cocoyam [1.27 million MT], plantain [3.55 million MT], cowpea [223,000MT], soybean [152,000MT] .	soybean [153,000MT], plantain [3.57 million MT] ***Decreased***: millet [179,000MT], sorghum [277,000MT], cocoyam [1.26 million MT], cowpea [206,000MT], Maize [1.764 million MT]. ***Unchanged***: Groundnuts [475,000MT]	cassava [16.5 million MT], and yam [7.1 million MT) ***Decreased***: sorghum [259,000 MT] and soybean [141,000 MT] ***Not reported***: Plantain, millet, groundnut, cowpea, and cocoyam
Protect the natural resource base Fully incorporated 13 Partially incorporated 0 Not incorporated 4	**Sustainable Land and Water Management Project** plan was Completed.	**Awareness creation and use of sustainable Land Management Technologies** - 664 training sessions were organized **Natural Resources Management Activities** The number of beneficiaries increased from 52,819 to 92,821 **Sustainable Agricultural Land Management Strategy** – 9136 farmers benefitted. Twenty-six demonstration sites were established to train farmers on land and water management technologies.	**Awareness creation and adoption of sustainable land management technologies** – No numbers were reported for training and sensitizations. **Capacity building to support the promotion of sustainable land management** – 200 farmers and AEAs were sensitized on the Plant and Fertilizer Act (Act 803) 2010 and Part II of EPA Act (Act 490) 1994. **Training on safe use and handling of fertilizer** - 30 agro-input dealers trained **African Stockpile and Safeguarding Project**: 62.89 MT of assorted pesticides were removed from different locations and safeguarded at the Temporary Storage Facility.	**Awareness creation and adoption of sustainable land management technologies** - No numbers were reported for training and sensitizations. **Stakeholder meeting on climate change adaptation** - The panel discussed the ongoing Climate Change Adaptation actions, which resulted in producing a communique for consideration by MoFA. Two seminars on climate change were held in collaboration with Environmental Protection Agency.	**Sustainable Land and Water Management Project** - 930 interventions benefiting 3,249 farmers were implemented under the Sustainable Land and Water Management Project. 8,215 farmers were trained in natural resource management. **Awareness creation on issues relating to climate change** - National Climate Change Task Force and 4 Regional Environment Officers were trained on climate change and adaptation measures. **Awareness creation on climate change adaptation measures**: Members of the Parliamentary Select Committee on Food and Agricultural and Cocoa Affairs were trained on "Climate Change and Benefits of Seasonal Forecast" in the Ashanti Region. 235

Reduce post-harvest losses	
Fully incorporated	10
Partially incorporated	2
Not incorporated	5

'Triple bags'- a specially made air-tight polythene bag - for cowpeas was introduced, with 100 people benefiting.

Promotion of post-harvest management techniques such as the use of grain super bags - 45 farmers and 52 traders were trained in using super bags in the storage of dry commodities.

Focus shifted from grains to yam, where the solar cooler yam barn was developed.

Training on handling post-harvest facilities - 381 beneficiaries were trained.

Promotion of post-harvest management technologies, such as the management of grain in pro-cocoons, use of super grain bags, use of solar dryers, construction of storage barns, and agro-processing storage machinery operation – 381 beneficiaries were reached.

Demonstrations on post-harvest loss management and food storage - 121,138 farmers and processors benefitted.

Export Marketing and Quality Awareness Project - Construction of a temperature-controlled pack house with a total capacity of 40 metric tonnes in the Volta Region.

Construction of a tomato processing factory in the Brong Ahafo Region to reduce post-harvest losses in tomatoes.

Capacity building to reduce post-harvest losses – the FBO capacity building project organized a trainer of trainers' workshop for 10 regional extension officers and 100 farmers participated in field days at demonstration sites. 600 hectares of eucalyptus and 94 hectares of teak were cultivated to improve the Ashanti Region's micro-climate.

The Greater Rural Opportunity for Women project: Selected farmers were introduced to Conservation Agriculture to protect degraded lands.

The Ghana Environmental Management Project: 11,000 farmers in 32 project communities were trained to address desertification.

HQCF Dryer and hydraulic press developed - to reduce post-harvest losses in the cassava value chain.

Construction of five Good Practice Centres – for training in post-harvest handling of grains.

Introduction to the use of insulated ice boxes to reduce post-harvest losses in fish.

An action plan for post-harvest losses was developed.	AEAs on post-harvest losses. **Agricultural Technical & Vocational Education & Training project:** 15 citrus and pineapple tutors were sponsored to participate in an intensive ten-day training in GAPs and post-harvest handling of pineapple and citrus to enable them to prepare learning materials, assessment tools and teach two curricula developed along the value chains. **Provision of cold stores** - The Ministry of Fisheries and Aquaculture Development provided 6 cold stores and 6 cold vans to the fishing communities in the Western Region.

Targeting the vulnerable

Fully incorporated	9
Partially incorporated	7
Not incorporated	1

Government fertilizer subsidy program: 90,000 metric tonnes of chemical fertilizer supplied to smallholder farmers

Livestock Development Project: 1171 livestock distributed to smallholder farmers in 35 districts.

Credit-in-kind Project: 1,000 pigs and 4,500 small ruminants distributed to smallholder farmers in the Greater Accra, Volta, Western and Central Regions.

Youth in Agriculture Program: 57,319 youth targeted for vegetable production, aquaculture, dry season farming, and input support.

The school feeding program, fertilizer subsidy programme, the block farming concept, and the expansion of the Agricultural Mechanisation Service Centres (AMSEC) program – Interventions to alleviate the condition of the vulnerable.

National Cockerel Project: 81,803 cockerels were distributed to 4,378 smallholder farmers at a subsidized price.

Out-grower and Value Chain Fund: 1,203,473 smallholder farmers were reached with technologies on crop, livestock and fisheries production, food processing and marketing. 7% increase in female participation due to the conscious effort targeted at women farmers through trainings and awareness creation.

Female participation in sensitization programs organized by MoFA reduced from 51% in 2008 to 48.0% in 2012.

Youth in Agriculture Programme: 80,000 youth were provided with inputs to produce rice, maize, soya and vegetables.

Efforts to ensure inclusive development - targeted and supported less privileged women and physically challenged farmers in Ghana through interventions such as the Credit-in-kind Scheme and the Cockerel project.

Nucleus-Out-grower and Input Support Scheme - Established to increase domestic aquaculture production from 38,547 metric tonnes (2014) to 120,000 metric tonnes (2017) and provide direct jobs for about 900 unemployed persons (especially graduates) annually and over 500 indirect jobs for women fish processors and traders.

Sustainable Land and Water Management Project – conscious effort at targeting women with sustainable land management programs since 1602 females (out of 3249 participants) were reached with 930 interventions.

Diversification of agricultural production Fully incorporated 6 Partially incorporated 6 Not incorporated 5	**Diversification and development of new products**: the number of females reached increased from 23 in 2009 to 101 in 2010. **Diversification of off-farm livelihood options linked to agriculture** – WIAD collected information on the existing and potential off-farm income generating activities to develop a manual on agro-related off-farm livelihood activities for the sector especially by women.	**Production of differentiated farm products** – 60% of the beneficiaries (1996 out of 3,326) mostly from the northern part of Ghana produced more differentiated products such as soya fortified products.	**None reported**	**Sensitization on profitable off-farm activities** - In the year 2010 to 2013, Women in Agricultural Development organized training on diversification and development of new recipes and products (e.g. soya-fortified gari, potato yogurt) for 973 smallholder farmers across the country. Government interventions such as **Rural Enterprises Programme of the Ministry of Trade and Industry and NRGP of the Ministry of Food and Agriculture** have over the years recorded successes in diversifying smallholder farmers' economic activities.	**Sensitization on profitable off-farm activities –** Trainings organised by WIAD on processing and value addition to crops, resulted in improvement in the pepper and ginger industries in the Volta Region. Through **the Ministry of Trade and Industry's Rural Enterprises Programme and Ghana Social Opportunities Project, NRGP and WIAD** put in place interventions to mitigate the stress on on-farm household income during off-farming seasons.
Empower women Fully incorporated 5 Partially incorporated 7 Not incorporated 5	**Women empowerment-related training** - 3283 women were trained in diversification and development of new recipes and products – potato yogurt, soy gari etc. **Gender-sensitive programs** - Planned gender-sensitive programmes increased by 60.5% with a corresponding increment in budgets allocated to gender-sensitive activities by 83.4% in comparison with 2009.	**Women empowerment-related training –** 5211 women were trained in diversification and development of new recipes and products – potato yogurt, soy gari etc. 2,574 women trained on improved packaging of shea nut and also in gari processing into high-quality flour. 2,574 were involved with 2,458 (95.5%) being women.	**Women empowerment-related training –** 3243 women were trained in diversification and development of new recipes and products – potato yogurt, soy gari etc. **Training on agro-processing to boost women's incomes** - 3,370 women were reached. **Poultry husbandry training and input support from the Ghana Poultry Network and Sankofa Foundation to**	**Training on agro-processing to boost women's incomes** – 3257 women were trained on home and farm resource management, diversification, and development of new recipes and products – potato yogurt, soy gari etc. **Dissemination of improved technologies** - to 375 improved technologies were disseminated to 1,708,558 of which 83% were female beneficiaries.	**Dissemination of improved technologies** - 349 improved technologies were disseminated to 1,358,642 of which 43% were female beneficiaries compared. **In-service training** - 4,926 participants benefited out of which 18.6% were women. **Training on agro-processing to boost women's incomes** - 4,338 women were reached with

		Staff recruitment - Female recruitment increased significantly by 82.9%, while the number of females in decision-making levels doubled in 2010. **MoFA developed an accountability framework for achieving gender equality results in the sector.**		**members of Asutsuare Women Development Society.** **In-service training-** 146, 033 participants benefitted from different training, of which only twenty-eight percent were women. No female regional director benefitted. from any of the training in the year 2012 because only one of the ten regional directors is a female.	**In-service training-** 48,314 participants benefited out of which 4.9% were women.	Processing technologies on cassava products such as gari, tapioca and konkonte, use of soybean in local dishes, preparation of potaghurt drinks, and improved rice parboiling using the improved equipment.
Nutrition promotion and education Fully incorporated 5 Partially incorporated 4 Not incorporated 8		**Awareness creation, education, and demonstration on food-based nutrition and food safety** – 94,096 participants attended nutrition training sessions. **Nerica Rice Project** – 125 caterers were educated on the use of local rice and patronize it as a way of consuming our local foods. **Provision of meals to school-going children through the Ghana School Feeding Program** – 685,223 pupils benefited.	**Awareness creation, education, and demonstration on Food-based nutrition and food safety** – 108,282 participants attended nutrition training sessions. **Provision of meals to school-going children through the Ghana School Feeding Program** – 1,077,061 pupils benefited.	**Trials on indigenous recipes -** The Women in Agriculture Directorate conducted trials on indigenous recipes to determine the weights of the ingredients, nutrient profiles, portion, sizes and the number of servings to reduce malnutrition. A recipe booklet was yet to be developed based on the result of the trials to aid in extension delivery in the form of trainings and demonstration. **Awareness creation, education, and demonstration on Food-based nutrition and food safety** – 91,151 participants attended nutrition training sessions.	**None reported.**	**Capacity building on nutrition-sensitive agriculture** – 89 MoFA staff were informed about the malnutrition situation in the country, the role of agriculture in improving health through good nutrition, and to develop nutrition-sensitive agriculture action plan. **Production of educational videos** - Extension Services, produced four (4) video documentaries on Good Agricultural Practices for sweet potato, cassava and chilli pepper coupled with safe use of pesticides, which was aired on Ghana Television.

Multisectoral collaboration and coordination

Fully incorporated	4
Partially incorporated	9
Not incorporated	4

Food security and nutrition monitoring - The World Food Programme, the Canadian International Development Agency, and MoFA.

Agricultural Sector Working Group - Dialogue platform for MoFA, DPs and Ministers to review policies and important actions on a monthly basis.

Improved inter-ministerial coordination to promote implementation of METASIP (2011 – 2015) – MoFA's regular weekly meeting of the Ministers, Chief Director and Directors of MoFA.

Designation of a mango plantation as a seed bank under the Export Marketing and Quality Awareness Programme – MoFA, the Plant Genetic Resources Research Institute and the Crops Research Institute

Agricultural Sector Working Group – Dialogue platform for MoFA, DPs and Ministers to review policies and important actions on a monthly basis.

Improving the livelihoods of farmers in the Brong Ahafo Region through the Ahafo Agriculture Improvement and Land Access Programme and the Ahafo Agribusiness and Growth Initiative – MOFA, Newmont Ghana Gold Limited, the Land Access Unit, Community Relations, and traditional authorities such as the Traditional Councils, Chief farmers.

Strategic Analysis and Knowledge Support Systems - Private sector, Civil Society Organization (CSO), and Non-Governmental Organization (NGO) actors.
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Nine technologies were developed to meet the increasing demands of productivity improvement – MoFA and Council for Scientific Information and Research- Food Research Institute

Agricultural Sector Working Group – Dialogue platform for MoFA, DPs and Ministers to review policies and important actions on a monthly basis.

Strategic Analysis and Knowledge Support Systems - private sector, CSO, and NGO actors.

Review efforts aimed at reducing stunting and underweight and Vitamin A, iron and iodine deficiencies in children and women of reproductive age – MoFA and the Ministry of Health.

Sensitization on Agricultural insurance for 794 MoFA staff and 120 farmers in Northern Ghana – MoFA, German Agency for International Cooperation, and Ghana Agricultural Insurance Pool.

Trained farmers and Agricultural Extension Agents in making fruit fly traps with Methyl Eugenol – MoFA and the Animal Biology and Conservation Sciences Department of the University of Ghana.

Formation of the Ghana – Israel – German Trilateral cooperation on the citrus value chain to find a permanent solution to the menace in citrus.

250 agro input dealers were trained on safe use and handling of pesticides and fertilizers – MoFA and Export Marketing and Quality Awareness Project.

Establishment of 10 plant clinics in the Eastern Region which served 507 farmers – MoFA, CAB International and CSIR

Agricultural Sector Working Group – Dialogue platform for MoFA, DPs and Ministers to review policies and important actions on a monthly basis.

Strategic Analysis and Knowledge Support Systems - private sector, CSO, and NGO actors.

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Context analysis

Fully incorporated	3
Partially incorporated	12
Not incorporated	2

Data on chronic and acute malnutrition were reported based on Ghana Health Service surveys indicating a decrease in underweight children from 23% (1993) to 14% (2008). Stunting in children reduced from 33% in 1993 to 28% in 2008. Wasting followed a similar trend, i.e. a reduction from 14% to 9% among children.

Even though the report claims that a decrease in malnutrition among children could be attributed to food-based nutrition education and programs, the report lacked descriptions of the activities/ programs carried out to address malnutrition and referenced the Ministry of Health as the institution that carries out nutrition education.

Data on chronic and acute malnutrition were reported based on Ghana Health Service surveys indicating that while the national level for children underweight was 14%, that of the Northern Region was 22% and Upper East 27%. With stunting, national average was 28%, but Northern Region was 32% and Upper East 36%. Food-based nutrition education and the school feeding program were carried out to improve the nutritional status of the people.

No data were reported on malnutrition. However, data on food insecurity was reported based on the results from the Comprehensive Food Security and Vulnerability Analysis by the World Food Programme which indicated that more than one million people were food insecure in Northern Ghana. Food-based nutrition education and trials and other NGO strategies (not described) were implemented to achieve food security and poverty reduction.

Data on chronic and acute malnutrition were reported based on Ghana Health Service surveys indicating a decrease in underweight children from 23% (1993) to 14% (2008). Several nutrient-rich foodstuffs production and consumption were promoted alongside fortification technologies.

Data on chronic and acute malnutrition were reported based on the Multiple Indicator Cluster Survey in 2011 which reported that cases of underweight were reduced by 1%, stunting level was reduced by 5%, wasting by 3% and overweight by 2%. The improved nutritional status can be attributed to the nutrition-based education, dietary diversification, and bio-fortification programs.

Nutrition objectives and indicators

Fully incorporated	3
Partially incorporated	13
Not incorporated	1

The food and nutrition monitoring system - The nutritional status of selected children under two years of age in the Northern, Upper West, and Upper East Regions was assessed using the weight-for age (WFA) indicator. The information was gathered during growth monitoring sessions carried out by the Ghana

Data on nutrition indicators (stunting, wasting, and underweight) were based on Demographic and Health Surveys. No indication that MoFA tracked and mitigated these indicators

The food and nutrition monitoring system - A monthly bulletin on food security situation in the regions was

No data reported for nutrition indicators (stunting, wasting, and underweight)

Tracking of a nutrition-sensitive indicator -income earned on agricultural produce. However, no indications that the extra income went towards improving nutrition - The income from poultry

Data on nutrition indicators (stunting, wasting, and underweight) were based on Demographic and Health Surveys. No indication that MoFA tracked and mitigated these indicators

Tracking of a nutrition-sensitive indicator - agricultural commodity prices. However, no actions were in place to mitigate high prices - In the Northern

Data on nutrition indicators (stunting, wasting, and underweight) were based on Multiple Indicator Cluster Survey. No indication that MoFA tracked and mitigated these indicators

Development of an action plan to operationalize the National Nutrition Policy.

Health Service (GHS) at outreach points of these health centres.

Tracking of a nutrition-sensitive indicator - agricultural commodity prices. However, no actions were in place to mitigate high prices - the prices of maize, millet, and sorghum were 33%, 19%, and 51% higher than the five-year average respectively.

produced for use by various stakeholders for decision making, which improved the choice of crops to be planted and also affected positively the choice of time of sale of farm products. Information on the weather was also made available through the bulletin to the stakeholders.

Tracking of a nutrition-sensitive indicator - agricultural commodity prices. However, no actions were in place to mitigate high prices - The average nominal wholesale food price increased for selected commodities. The price of maize, local rice and millet increased by 35%, 9% and 7% respectively. Sorghum, cocoyam and cassava also had their average nominal wholesale prices increasing by10%, 17% and 21% respectively. Amongst all the commodities, groundnut had the highest increase (42%) in its average nominal wholesale price. The average nominal wholesale food price for plantain and tomatoes decreased by 4% and 15% respectively.

improved by 49% over the baseline value of GH¢31,056.00. The income from goats, pigs, sheep, and cattle grew by 22%, 19%, 14%, and 9%, respectively. According to MoFA, this improved the individual holder's sources of income and therefore enhanced the ability of the farm family's chances of sending their wards to school and hospitals.

Region, for example, a monthly bulletin on food security situation was published. This allowed for planning to prevent any severe food shortages in and around the region. The Statistical Research and Information Directorate of the Ministry throughout the twelve months monitored and published commodity prices. The prices of all commodities monitored increased, on average, from 14% to 32% in 2013 over 2012 prices. Maize prices however, decreased by 19% over the same period.

Increase production of micronutrient-rich foods (including efforts to increase micronutrient-rich food production)

Fully incorporated	2
Partially incorporated	4
Not incorporated	11

Fish production - Annual fish production from marine, inland capture, and aquaculture stood at 415,036.42MT, approximately a 4.4% increase over 2009 level (396,698.29MT).

The block farm programme of the youth in agricultural programme and the Fertilizer Subsidy Programme contributed to the increased yields of crops like soybean, tomato, pepper, garden eggs and watermelon. However, no data to support the preceding statement.

Meat production – 111,392MT

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Fish production (Compared to 2010 figures) – ***Increased*** - Annual fish production from marine, inland capture, and aquaculture stood at 439,713MT.

Meat production (Compared to 2010 figures) – ***Increased*** – 118,504MT

An increase in the amount of animal slaughtered – animals legally slaughtered in 2011 was 407,880 as compared to 426,287 in 2010 showing a decrease of 4.3%. The increase in sheep, goats, and pigs slaughtered was attributed to the Livestock Development Project's Credit-In-Kind scheme which supported farmers with over 40,000 sheep/goats and 1000 pigs for commercial rearing in 2009 and 2010, respectively.

Fish production (Compared to 2011 figures) – ***Increased*** **-** Annual domestic fish production was estimated at 455,697MT.

Meat production (Compared to 2011 figures) – ***Increased*** – 127,038MT

Fish production (Compared to 2012 figures) – *Decreased* – Annual domestic fish production was estimated at 434,120MT.

Meat production (Compared to 2012 figures) – ***Increased*** – 135,412MT

Fish production (Compared to 2013 figures) – *Decreased* - Annual domestic fish production was estimated at 413,077MT.

Meat production (Compared to 2013 figures) – ***Increased*** – 143,602MT.

Vegetable and legume production - Vegetable production increased by 101%. This is a result of the introduction of high-value vegetable crops such as butternut squash and bird's eye chilli pepper. Legume production increased by 92%.

Market expansion and market access

Fully incorporated	1
Partially incorporated	13
Not incorporated	3

Poor access to food markets - Four districts namely Lawra, Nadowli, Jirapa, and Wa West were faced with nutritional deficit because of poor access to food markets and inadequate knowledge in nutrition-based diets. Few communities in the Dangme East and Dangme West Districts continue to face difficult access to food markets due to distance and poor condition of roads to main food markets.

Increase in the number of food markets - The number of weekly /daily food distribution points in the country increased by 2% from 2504 in 2009 to 2866. Ashanti Region had the highest number (815) of food distribution points with Upper East Region recording the least number (71) of food distribution points.

Food markets - the number of weekly /daily food distribution points in the country increased by 4% from 2,866 in 2010 to 2,984 in 2011. The average number of markets per district increased from 14.7 in 2010 to 15.3 in 2011. The maximum number of food outlet per district recorded nationwide stood at 197 with the minimum number per district being two.

Market information centres - 75 market information centres existed during the year with 97% of them being operational. Total visits increased from 15,561 in 2010 to 18,812 in 2011.

Access to price information: ESOKO provided information on prices of farm input and products from different markets across the country to any registered farmer and/or marketer who texted to a given short code.

Improvements to access roads - The Inland Valleys Rice Development Project upgraded 36.2km of farm access roads within Ashanti, Brong Ahafo, Central, Eastern and Western Regions. An

The Export Marketing and Quality Awareness Project - Mango farmers in the Greater Accra Region were supported to revive their fields to meet international standards in order to create international markets.
The ban on the export of mango was lifted in 2012. In the year 2012, 15 mango farms in the Eastern, Brong Ahafo and the Volta regions were certified to export mangoes to Lebanon under the renewed bilateral agreements between Ghana and Lebanon on mango trade.

GlobalGAP and Organic standards certification - 1,030 horticultural crop farmers were sensitized and exposed to International Market Requirements in 16 districts from the Eastern, Central and Volta Regions.

Market Oriented Agricultural Programme - 24 farmers were prepared for GlobalGAP certification; Furthermore, 103 mango farmers were certified.

Promotion of pineapple on the European market - Sea-Freight Pineapple Exporters of Ghana - Sankofa short promotional video was done to promote Ghanaian pineapples on the European market.

Expansion of market for cassava - Demand for cassava has increased lately for both domestic and industrial purposes due to the development of cassava beer and other cassava products. Caltech Farms Ltd-Volta Region, DACTO- Volta Region, Ayensu Starch Factory, Guinness Ghana Limited and Accra Brewery Limited are major markets for cassava.

Establishment of information centres - Marketing services provided included information on price of inputs, produce prices, and availability sources of subsidized fertilizer.

Access to price information - Three hundred stakeholders have been trained and are now receiving ESOKO services (commodity prices, weather information, etc)

GlobalGAP and Organic standards certification – 912 mango and pineapple farmers have since 2008 received GlobalGAP certificate.

Expansion of market for cassava - New products for cassava such as cassava beer, High Quality Cassava Flour and potaghurt increased the demand for cassava for both domestic and industrial purposes.
Caltech farms Ltd and DADTCO in Volta Region, Guinness Ghana Limited and Accra Brewery Limited, and Ayensu Starch Factory in the Central Region are among the major markets for cassava. To date 12, 904 metric tonnes of cassava have been purchased, with GGL buying over 84% and ABL buying the rest.

			estimated 1,871 farmers and traders are benefitting from these roads.			
Improved processing of foods to enhance convenience in preparation Fully incorporated 1 Partially incorporated 12 Not incorporated 4	**The Japanese 2-KR Grant Assistance Program** - 10 rice mills and 35 rice threshers were bought to process rice. Fabricated proto-type rice destoner were made available at various rice-producing locations.	**Market Oriented Agriculture Program** – supported processing of mango and pineapple into juice and dry fruits and chilli into powder in the Volta and Northern Regions. **Training in processing technology** - The trainings were in rice parboiling, groundnut and palm kernel into oil and cow milk into cheese and yoghurt. **Provision of agro-processing equipment** - 58 agro-processing equipment were imported for distribution to farmers/processors to facilitate value addition for food security and increase incomes among beneficiaries. 108 agro processing and storage equipment for processing rice and maize were distributed to farmers in Ashanti, Brong Ahafo, Upper East, Northern and Volta Regions.	**Development of convenient product technologies** - Convenience products from yam, sweet potato and cocoyam were developed. The processing technologies are yet to be disseminated to farmers and processors for commercial purposes. **Training in agro-processing technology** - 236 groups 692 men and 3,370 women were reached. **Training on cassava processing** - 2,307 farmers and processors (71% females) were trained to process 109 metric tonnes of cassava into various products; gari, flour, konkonte, and dough.	**Training in agro-processing technology** - 973 farmers were reached with gari fortification technology.	**Training in agro-processing technology** - 223 groups comprising 501 men and 4,338 women were reached with processing technologies on gari, tapioca, and konkonte.

Improved storage and preservation Fully incorporated 0 Partially incorporated 12 Not incorporated 5	**Provision of preservation facilities** - Mechanical dryers were provided at Mampong and Ejura where 20 technicians and 54 operators were trained. **Provision of storage facilities** - Yam Barns were provided in in the Brong Ahafo, Volta, and Northern Regions of Ghana.	**Provision of storage facilities** – Cold seed storage was provided to seed producers at Asuoyeboah, Ho and Winneba to ensure the viability of seeds supplied to farmers and for sustainable grain production. **Distribution of grain pro-cocoons for storage of grains** --The distribution of grain pro-cocoons was also part of MOFA's initiatives to store grains as part of efforts to stabilize output prices. **Grain storage capacity development interventions emphasized on human capacity development** – 735 participants were trained in grain storage	**National Food Buffer Stock Company** – 8,750MT of white maize, and 253MT of paddy rice was purchased and stored. **Private sector operators trained in grain storage activities in 2011** – 9202 participants were trained. **Provision of commercial storage facilities** – 350 metallic silos with storage capacity of 1MT were provided **Grain storage capacity development interventions emphasized on human capacity development** – 8467 participants were trained in grain storage	**Provision of storage facilities** - 18 community warehouses have been certified and approved by the Ghana Grains Council in the three northern regions **Grain storage capacity development interventions emphasized on human capacity development** – 2262 participants were trained in grain storage. **Establishment of a facility to ensure safety** - A residue analysis laboratory has been constructed for the Ghana Standards Authority to ensure effective monitoring of residue levels in Ghanaian produce.	**Grain storage capacity development interventions emphasized on human capacity development** – 2883 participants were trained in grain storage. **Provision of warehouses under the NRGP** - Procurement process for nine warehouses and four pack houses have been completed.
Explicit nutrition goals Fully incorporated 0 Partially incorporated 1 Not incorporated 16	**The Livestock Development Project** – to improve livestock productivity, reduce poverty, and improve food security through smallholder income-generating activities. **The credit-in-kind project** was a subproject under the Livestock Development in Ghana project to increase the production of livestock.	**The Livestock Development Project** – to improve livestock productivity, reduce poverty, and improve food security through smallholder income-generating activities. **The credit-in-kind project** was a subproject under the Livestock Development in Ghana project to increase the production of livestock. **National Cockerel Project -** to increase incomes of smallholder farmers	**The Livestock Development Project** – to improve livestock productivity, reduce poverty, and improve food security through smallholder income-generating activities. **The credit-in-kind project** was a subproject under the Livestock Development in Ghana project to increase the production of livestock.	**The Livestock Development Project** – to improve livestock productivity, reduce poverty, and improve food security through smallholder income-generating activities. **The credit-in-kind project** was a subproject under the Livestock Development in Ghana project to increase the production of livestock.	**The Livestock Development Project** – to improve livestock productivity, reduce poverty, and improve food security through smallholder income-generating activities. **The credit-in-kind project** was a subproject under the Livestock Development in Ghana project to increase the production of livestock.

	National Cockerel Project - to increase the incomes of smallholder farmers.			**National Cockerel Project** - to increase the incomes of smallholder farmers. **National Livestock Policy Hub -** serves as a think tank of stakeholders in the livestock industry to draw policies for the development of the livestock industry for income.	**National Cockerel Project** - to increase the incomes of smallholder farmers.
Improved processing to retain nutritional value	**None Reported**	**None Reported**	**None Reported**	**None Reported**	**None reported**
Market access to micronutrient-rich foods	**None Reported**	**None reported**	**None Reported**	**Importation of fish to increase access in domestic markets** - In order to bridge the country's fish requirement deficit, improve upon fish availability, and meet the nutritional needs of the Ghanaian, the government permitted some importation of fish into the country. Most of the fish consignments were from Mauritania, Namibia,	**Importation of fish to increase access in domestic markets -** During the period under review, the Government continued to permit some importation of fish into the Country. Fish imports are mainly from Mauritania, Namibia, Spain and Holland. Imported species were mainly horse mackerel, mackerel, sardines and other mixed species from Africa.

Fully incorporated	0
Partially incorporated	1
Not incorporated	16

Fully incorporated	0
Partially incorporated	1
Not incorporated	16

	Spain and Holland. Species imported were mainly horse mackerel, mackerel, sardines, and other mixed African species. **Release of sweet potato varieties to increase access and improve nutrition** - a sweet potato crossing block was established with 18 superior genotypes crossed for varietal development.	**Introduction of the Green Label Scheme** - MOAP supported efforts to establish a food quality standard for horticultural crops in Ghana by introducing the Green Label Scheme. The initiative aimed to support the establishment of a local label that farmers who adhered to Good Agriculture Practices will sell their produce at selected sales points which guaranteed the quality and safety of their produce.

Bold and not italics text = **projects and/or activities carried out**
ABL - Accra Brewery Limited
AEA – Agriculture Extension Officer
AGI - Association of Ghana Industries
AMSEC - Agricultural Mechanisation Service Centres
CRS – Catholic Relief Services
CSA - National Climate-smart Agriculture and Food Security Action Plan of Ghana
CSIR – Council for Scientific and Industrial Research
CSO - Civil Society Organizations
DP - Development partners
ECOWAS – Economic Community of West African States
EMQAP - Export Marketing and Quality Awareness Project
ENVAC - Enhanced Nutrition and Value Chains
FASDEP 2 - Food and Agriculture Sector Development Policy 2
FBO – Farmer Based Organizations
FMP - Fisheries Management Plan of Ghana: A National Policy for the Management of the Marine Fisheries Sector
FP - Fertilizer Policy for Ghana
GADS 2 - Gender and Agriculture Development Strategy II
GAP – Good Agricultural Practices
GGL - Guinness Ghana Limited
GIZ - German Agency for International Cooperation
GLD - Ghana Livestock Development Policy and Strategy
GNCC-P - Ghana National Climate Change Policy
GNCC-MP - Ghana National Climate Change Master Plan: Action Programmes for Implementation
GSP - National Seed Plan
HACCP - Hazard Analysis Critical Control Point
HQCF – High-Quality Cassava Flour
IFJ - Investing for Food and Jobs: An Agenda for Transforming Ghana's Agriculture
LDG - Livestock Development in Ghana: Policies and Strategies
METASIP - Medium-Term Agriculture Sector Investment Plan
MOAP - Market-Oriented Agriculture Programme
MoFA – Ministry of Food and Agriculture
MoFAD – Ministry of Fisheries and Aquaculture Development
NGO – Non-governmental organization
NIP - National Irrigation Policy, Strategies, and Regulatory Measures
NRGP – Northern Rural Growth Programme
NSP - National Seed Policy
OFSP – Orange Fleshed Sweet Potatoes
PFJ - Planting for Food and Jobs: Strategic Plan for Implementation
RELC – Research Extension Farmer Linkage Committee
USAID - United States Agency for International Development
WIAD – Women in Agriculture Development Directorate of the Ministry of Food and Agriculture
WFP – World Food Programme of the United Nations

Supplementary Table 1b Implementation of the 'Key recommendations for improving nutrition through agriculture and food systems' in Ghana's agriculture sector between 2015 and 2019

Years	**2015**	**2016**	**2017**	**2018**	**2019**
Policy document(s)	METASIP	METASIP 2	METASIP 2	GNCC-MP	GNCC-MP
*Policies/ strategies appearing only once have no reported end date.	GADS 2*	GNCC-MP	GNCC-MP	FMP	FMP
Note: Tree Crops Policy has no specified timeframe	GSP*	FMP	FMP	CSA	CSA
	GNCC-MP	CSA	CSA	PFJ	PFJ
	FMP	GLD*	PFJ	IFJ	IFJ
Themes, category of incorporation and the corresponding number of policy documents containing the theme					
Increase food production Fully incorporated 16 Partially incorporated 1 Not incorporated 0	**The Block Farm program, The Northern Rural Growth Programme, The Dawhenya Integrated Rural Development Project, The Rice Sector Support Project, the West African Agricultural Productivity Project and the Fertilizer and Seed Subsidy programs**:	**No program mentioned**:	**The Planting for Food and Jobs Program, the Modernising Agriculture in Ghana project, and the Fertilizer Subsidy Program:**	**The Planting for Food and Jobs Program and Conservation Agriculture Practices**:	**The Planting for Food and Jobs Program, One District One Factory program, Modernising Agriculture in Ghana Programme**:
	Increased: Rice [641,000 MT], cassava [17.2 million MT], yam [7.3 million MT],	***Increased***: Maize [1.72million MT], cassava [17.8 million	***Increased***: Maize [2.01 million MT], rice [722,000 MT], sorghum [278,000 MT],	***Increased***: Maize [2.3 million MT], rice [769,000 MT], millet [182,000 MT],	***Increased***: Maize [2.9 million MT], rice [919,000 MT], millet [230,000 MT],

	Sorghum [264,000 MT], and soybean [142,000 MT] ***Decreased***: maize [1.69 million MT] ***Not reported***: Plantain, millet, groundnut, cowpea, and cocoyam were not reported.	MT], soybean [143,000 MT], yam [7.4 million MT], ***Decreased***: Rice [474,000 MT] and sorghum [229,000 MT] ***Compared to 2013 figures (Increased)***: Plantain [4 million MT], ***Compared to 2013 figures (decreased):*** millet [159,000 MT], groundnut [425,000 MT], cocoyam [1.3 million MT] ***Compared to 2013 figures (unchanged):*** cowpea [206,000 MT]	millet [164,000 MT], cassava [19 million MT] yam [7.9 million MT], cocoyam [1.38 million MT], plantain [4.3 million MT], groundnuts [434,000 MT], cowpea [212,000 MT], soybean [171,000 MT]	sorghum [316,000 MT], cassava [20.9 million MT] yam [7.8 million MT], cocoyam [1.46 million MT], plantain [4.7 million MT], groundnuts [521,000 MT], cowpea [237,000 MT], soybean [177,000 MT] ***Decreased***: yam [7.8 million MT]	sorghum [346,000MT] cassava [22 million MT] yam [8.8 million MT], plantain [4.9 million MT], groundnuts [558,000 MT], cowpea [247,000 MT], soybean [171,000 MT], and soybean [193,000 MT] ***Decreased***: cocoyam [1.41 million MT]
Protect the natural resource base Fully incorporated 13 Partially incorporated 0 Not incorporated 4	**Awareness creation and capacity development on sustainable land management technologies and climate change**: 6,139 farmers were sensitized. **Northern Rural Growth Project**: 4 Conservation Centres were established and managed by graduates. **National Climate Change Action Plan** was developed. **National Plan of Action to Combat Illegal, Unregulated and Unreported Fishing** was developed.	**Awareness creation and capacity development on sustainable land and water management and climate change:** 46 communities with 5,835 in Northern Ghana benefitted from a watershed management plan. 25 AEAs trained on using soil testing kits. Training of Trainers workshops were organized for ten (10) District Departments of Agriculture to integrate and mainstream climate change interventions. **Climate Smart Agriculture**: 5 cassava, cocoyam and sweet potato learning sites were created to educate farmers. Training activities were organized for 20 extension staff	**Awareness creation and capacity development on climate change:** Sensitization of 17 members of the Ministerial Climate Change Taskforce and 41 staff of the Department of Agriculture on National Climate-Smart Agriculture and Food Security Action Plan. 35 farmers participated in a study tour for No-Till Agriculture. 38 demonstrations and 56 farmer field schools were held to introduce climate change technologies to 2185 smallholder farmers **Support from the Modernizing Agriculture in Ghana Programme:** training	**Demonstrations on conservation agriculture practices:** 12 hectares demonstration on Conservation Agriculture practices. 1,473 demonstrations were carried out in the regions, which benefited 69,278 Farmers. **Enhancing land and environment management:** a total of 2,057 climate smart sensitization programmes were carried out in all the ten regions. Beneficiary farmers of trainings were 118,508.	**Demonstrations on conservation agriculture practices** 2,143 demonstrations were carried out, 7,712 farmers participated. 139,911 beneficiaries were trained in six (6) conservation agricultural technologies **29%, 28%, and 4% of the 761 sensitization programs organized were in the proper use of Agrochemicals, water pollution and sand winning, respectively.** **Enhancing land and environment management through**

		on climate-smart agriculture using the Participatory Scenario Planning tool. **The National Climate-Smart Agriculture and Food Security Action Plan** was launched.	manuals on approaches to reducing farmers' vulnerability to climate change and disaster risks in selected cropping systems were developed. 180 AEAs were sensitized and led farmers to serve as training of trainers to support the training of other AEAs and farmers in climate smart production. **Capacity building on Resilient Landscapes for Sustainable Livelihood**: 532 farmers benefited. **The Sustainable Land and Water Management Project**: 55 communities were assisted to develop Watershed Management Plans. 75 demonstrations on cereal-legume cropping practices were established, and 20 existing demonstrations were also maintained. The beneficiaries of the demonstrations were 4,131 farmers.		**Climate Change and Sustainable Land Management technologies**: 6,241 training sessions were carried out with 328,981 Beneficiaries.
Reduce post-harvest losses Fully incorporated 10 Partially incorporated 2	**No information on the number of beneficiaries in post-harvest training, although activities including sensitization and training workshops were conducted on post-harvest losses during the period**.	**Promotion on post-harvest management techniques such as the use of GrainPro cocoons by National Food Buffer Stock Company and super grain bags to store cereals and grains.**	**Sensitization on post-harvest management techniques such as the use of super grain bags to reduce post-harvest losses in grains and cereals.**	**Launch of the Ghana Commodity Exchange** - To reduce post-harvest losses in white and yellow maize.	**Capacity building of FBOs on post-harvest management** – members of 4,743 farmer-based organizations received training.

Not incorporated	5	**Provision of insulated ice boxes to reduce post-harvest losses in fish production**.	**GIZ introduced an improved solar bubble drying technology in the country to reduce post-harvest losses** – 14 dryers were introduced to pilot the technology. **GIZ/MOAP introduced moisture meters to traders and aggregators in the Brong Ahafo region to reduce post-harvest losses.**	**To reduce post-harvest losses, 14 agro-processing companies were technically supported to make them functional and enhance the quality of products. The companies process chilli, pineapple, moringa, and soya into different useful forms**. **Introduction of mobile mango drying technology to cut down quantity of perishable fruits that are lost in the process of transportation over long distances to factory sites.** **The Fruit Processors and Marketers Association of Ghana received continuous capacity building on fruit processing to increase their contribution to reducing post-harvest losses.**	**Establishment of the Agricultural Mechanization Centres** to reduce post-harvest losses.

Targeting the vulnerable

Fully incorporated	9
Partially incorporated	7
Not incorporated	1

Food-to-food fortification demonstrations – targeted 15, 937 female-headed households, and individuals directly involved in food choices and feeding of children to use nutrient-rich local foods, such as soybean for household consumption.

Food Security for Empowerment and Poverty Reduction Project – 542 people with disability persons and individuals from leprosarium were integrated into the communities and encouraged to produce various vegetables (i.e. tomato, onion, cabbage, pepper, Amaranthus and other leafy vegetables).

Rural Enterprise Programme - Skills training for the 990-youth trained were in various agribusinesses, including the production of poultry, mushroom, cattle, pig, fish, goat, sheep and beekeeping. None of the trainees received any start-up package after completion.

Provision of subsidized inputs for smallholder farmers: 201,620 farmers (40% women) were registered nationwide as against a target of 200,000.

Commercial farmer out-grower schemes - 10,000 youth were provided with employment opportunities.

Institutional sub-programmes - 20 Senior Technical and High Schools, the National Service Scheme, and the Prison Services were supported to cultivate their own farms.

Greenhouse Village Initiative – 170 graduates were trained in greenhouse technology to promote the production and marketing of high-quality vegetables for local and international markets and create investment opportunities for graduate youth, women and the private sector.

Establishment of Orange-Flesh Sweet Potato nurseries in two regions and equipped with solar-powered irrigation schemes, estimated to benefit at least 2,000 vulnerable persons, including women and children.

Production of nutritious food for pregnant and lactating women and children - 655.12 Mt of Specialized Nutritious Food comprising Maizoya, TomVita, and Grow Nut were procured by WFP from Yedent Premium foods and Project Peanut Butter and distributed to 18,819 children between the ages of 6-23 months in in the Northern Region of Ghana. 17,111 pregnant and lactating women received Specialized Nutritious Food

Targeting of women in extension delivery: The number of females receiving agricultural extension and advisory services also increased significantly by 69.0% in 2019 (1,165,501) compared to 2018 figure (689,757).

Targeting illegal miners, clan heads, landowners, drivers, small-holder farmers, input dealers for awareness creation and sensitization on environmental management – 102,492 beneficiaries reached.

				through 50 health facilities in the Northern Region.	
Diversification of agricultural production Fully incorporated 6 Partially incorporated 6 Not incorporated 5	**The Rural Enterprise Programme / Business Advisory Centre** – 136 farmers were trained to acquire skills and knowledge in processing cassava, soybean and plantain into various products. Other areas of training were soap and cosmetic making, and financial and business management. |	**Rural Enterprises Programme** – created 34,402 new jobs by 2016. In the Upper East Region, the main off-farm activities were on craft works (baskets and hat weaving and pottery), shea, dawadawa, rice parboiling and groundnut processing, pito brewing, and petty trading. 990 youth were trained in various agribusinesses including the production of poultry, mushroom, cattle, pig, fish, goat, sheep and beekeeping.	**None reported**	**None reported**	**None reported**
Empower women Fully incorporated 5 Partially incorporated 7 Not incorporated 5	**Leadership training -** NRGP organized leadership training for 43 women District Value Chain Committee members and 43 District Assembly gender desk officers as a way of promoting women participation in decision-making, having a voice and holding leadership positions in rural communities especially in farmer–based organizations. **Gender and Agricultural Development Strategy II finalized**.	**Capacity building among caregivers** – 128 women in Northern Ghana received training to support dietary diversification using orange fleshed sweet potatoes, soybeans, ginger, coconut, pawpaw, and garlic. **Provision of gender friendly agricultural equipment** – 224 shellers and 112 multi-crop threshers were easily operated by women farmers and improved their productivity. **Capacity building of cassava processors and bakers** – 1,124 women from Upper East and Upper West Regions benefitted.	**Performance Measurement Framework for the Gender in Agriculture Development strategy was developed.** **Capacity building of women smallholder farmers** – Community field demonstrations and technology dissemination fora, were held for 85,960 women smallholder farmers. **Capacity building on Resilient Landscapes for Sustainable Livelihood** – 368 women benefitted.	**Modernizing Agriculture in Ghana programme -** The Nyame Bekyere Women Gari Group in the Brong Ahafo Region were trained on value addition through gari fortification to address challenges they faced with marketing of gari. As a result, their incomes have increased due to the fact that their products are competitive and can sell more. The women also mentioned that they can now take good care of their children and no longer solely depend on their husbands for their living.	**Inclusion in decision-making** – 261 women (out of 1,004 participants) participated in the regional RELC planning sessions which resulted in the adoption of improved and appropriate technologies by the RELC system among female actors. **Incorporation of gender mainstreaming in extension delivery services** – 1,165,501 women were reached. **Program on Affirmative Finance Action for Women in Africa was launched in**

		Northern Rural Growth Programme - strengthened linkages with financial institutions towards improving access to financial services for smallholder farmers especially women. **Sensitization on the importance of empowering women** - Sensitization workshops were organized for farmers on Weija and Okyereko Irrigation Schemes on issues such as time constraints of women and need for women participation in leadership and decision making of Water Users Associations. **2 women plant doctors were trained in pest and disease diagnosis, management recommendations and data management.**	**Provision of inputs under the Planting for Food and Jobs program** – 248 women were provided with subsidized inputs. **Knowledge building in soil fertility management, agroforestry, and soil and water management** – 2066 women benefitted.	**Women in Driving Seat Project** – 62 women made up of tractor operators, farm managers, tractor owners, farmers and prospective farmers from five Regions were trained. 7 of the trainees were employed by major agribusinesses such as Blue Skies Ghana, Caltech Ventures Limited, Golden Exotics Limited and Milani Limited. **Training on Good Agricultural Practices** – 9208 women were trained to enhance the quality of their produce. **Inclusion in decision-making** – 185 women (out of 639 participants) participated in the regional RELC planning sessions which resulted in the adoption of improved and appropriate technologies by the RELC system among female actors.	**2019** to empower vulnerable women groups in the country's most vulnerable agricultural zone (savannah) by improving their participation in low-emission climate resilient agricultural practices. **Female participation in environmental sensitization programs** increased from 39,344 in 2018 to 41,883 in 2019.
Nutrition promotion and education Fully incorporated 5 Partially incorporated 4 Not incorporated 8	**The 'Orange Day' was launched** - Promotion of the consumption of orange-fleshed sweet potatoes to combat vitamin A deficiency by incorporating OFSP into various local foods. **Sensitization and surveillance to address the**	**Awareness creation, education, and demonstration on Food-based nutrition and food safety** – 116,536 participants attended nutrition training sessions.	**None reported**	**The E-Agriculture information centre** - The programme has 3 centres; (a) Accra in the Southern Zone; (b) Tamale in the Northern Zone and (c) Kumasi in the Middle Zone. The resource centres responded to issues upon request by	**None reported**

declining patronage of OFSP - a joint team from WIAD and the Food and Drugs Authority carried out surveillance and sensitization at all major markets by having discussions with market queens, commodity leaders, middle persons and traders.

Sensitization and surveillance to address the declining patronage of palm oil and its culinary accompaniments such as okra, kontomire, and garden eggs in response to adulteration concerns - a joint team from WIAD and the Food and Drugs Authority carried out surveillance and sensitization at all major markets.

Food-based nutrition outreach - 15,937 female-headed households, and individuals directly involved in food choices and feeding of children were trained to use nutrient-rich local foods, such as soybeans, for household consumption.

Food-based nutrition education using the three food groups chart and the calabash game and Protein Energy Malnutrition - Nutrition training sections were carried out across the country which benefitted over 100,000 people.

Sensitization on the use of OFSP as a food-based approach to addressing vitamin A deficiency – 70 members from Flour Users Associations in the Volta Region were trained on incorporating OFSP into their baked products.

Campaign on dietary diversification – Educational campaigns were carried out to support dietary diversification, which resulted in an organoleptic test for different flavours of gari with garlic, coconut, pawpaw, ginger, and soybean.

Basic nutrition education for 28 CRS nutrition champions at community level in Northern Ghana. These champions were expected to replicate the training in their various communities/zones of influence.

clients. Some issues include:
information on Planting for Food and Jobs, mode of accessing inputs, construction of poultry and livestock housing, health and nutrition and information on vegetable and horticulture production practices

Multisectoral collaboration and coordination	
Fully incorporated	4
Partially incorporated	9
Not incorporated	4

National Fish Festival – MoFA, the Greater Accra Regional Coordinating Council, National Fisheries Association of Ghana, Ministry of Tourism, Gender and Creative Arts, Ghana National Canoe Fishermen Council, Ghana Industrial Trawlers Association and MoFAD.

Developments of standards to increase the competitiveness of Ghanaian products in the international and domestic markets – MoFA and the Ghana Standards Authority.
Agricultural Sector Working Group – Dialogue platform for MoFA, DPs and Ministers to review policies and important actions on a monthly basis. The ASWG met three times in the year instead of the six, planned

Strategic Analysis and Knowledge Support Systems - private sector, CSO, and NGO actors.

Promotion of grasscutter rearing in the Upper West Region in which 45 farmers received 3 breeding stocks each – The Department of Agriculture, The Tokyo University in Japan, Japanese International Cooperation Agency, and University of Ghana.

Multisectoral platform -The Ghana National Apiculture Platform - coordinated by the Animal Production Directorate of MOFA was formed to enhance networking, advocacy and information sharing among players in the apiculture industry.

Ratification of the Seed Regulation and Plant Fertilizer Regulation 2012, (L.I.2194) with the ECOWAS Seed and Fertilizer Regulations -, Plant Protection and Regulatory Services Directorate, International Fertilizer Development Centre, and Alliance for Green Revolution.

Training of fish farmers in the production of fingerlings – MoFAD, and Water Research Institute

Establishment of the Obaasima seal to be placed on products that are fortified with 18 vitamins and minerals

A workshop to establish a national Early Warning System in Ghana -MoFA, World Food Programme and Permanent Inter-States Committee for Drought Control in the Sahel.

Researched into development of improved seeds – MoFA, Crop Research Institute and Savannah Agricultural Research Institutes.

Agricultural Sector Working Group – Dialogue platform for MoFA, DPs and Ministers to review policies and important actions on a monthly basis. The ASWG met six times in the year.

Strategic Analysis and Knowledge Support Systems - private sector, CSO, and NGO actors.

Carried out 38 demonstrations on improved rice, maize, cowpea and soybeans, cereal-legume cropping systems and integrated nutrient fertility management in 9 districts in Northern and Upper West Regions – MoFA, Ghana Agricultural Sector Investment Programme, Savannah

Inauguration of the Women in Driving Seat Project to enhance employability of women as well as enhance their agricultural productivity – MoFA and GIZ.
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Demonstration on Conservation Agriculture (CA) practices which benefitted 6,295 farmers – GASIP, Centre for No-Till Agriculture, and MoFA.

Validation of 19 out 24 technical materials produced to respond to the constraints emerging from the 2017 RELC Planning sessions – MoFA and Council for Scientific and Industrial Research

Agricultural Sector Working Group – Dialogue platform for MoFA, DPs and Ministers to review policies and important actions on a monthly basis. The ASWG met six times in the year instead of the eleven, planned

Strategic Analysis and Knowledge Support Systems - private sector, CSO, and NGO actors.

Improvements to the warehouse receipt system – Ghana Commercial Agriculture Project Ghana Commodity Exchange, and MoFA.

Establishment of community field demonstrations in the country with 11 protocols on grains, roots, tubers, and legumes – Directorate of Agricultural Extension Services, Council for Scientific and Industrial Research institutes, Regional Decentralized Departments of Agriculture and farmers

Agricultural Sector Working Group – Dialogue platform for MoFA, DPs and Ministers to review policies and important actions on a monthly basis. The ASWG met six times in the year instead of the eleven, planned

Strategic Analysis and Knowledge Support Systems - private sector, CSO, and NGO actors.

is to reduce malnutrition among women of reproductive ages and children – MoFA, Association of Ghana Industries and the Ghana Standard Authority with support from the GIZ funded Affordable Nutritious Food for Women.	Agriculture Institute of Council for Scientific and Industrial Research
Provision and rehabilitation of irrigation and related infrastructure and services to improve agricultural production in Northern Ghana -MoFA, the Ghana Irrigation Development Authority, Ghana Social Opportunities Project.	
Development of a standard certification scheme – the Green Label - that guarantees the quality and safety of produce produced under good agricultural practice - MoFA, Ghana Standards Authority, GIZ Market Oriented Agriculture Programme (MOAP).	
Raised awareness on the use of standards, weights and measures, and good warehousing practices among 46,942 grain value chain actors - Ghana Standards Authority, Food and Drugs Authority, MoFA, GIZ and the World Food Program.	

Development of an investor tracking system to track the activities of investors – MoFA, Ghana Investment Promotion Centre, the Registrar General's Department and the Ghana Revenue Authority.

A multi-stakeholder's workshop on the Veterinary Services and Animal Production Bill -MoFA, the Ministry Justice and Attorney General's Department, the Food and Agriculture Export Alliance.

Conducted A poultry survey to describe the structure and performance of Ghana's poultry industry – MoFA and United States Agency for International Development.

Agricultural Sector Working Group – Dialogue platform for MoFA, development partners, and Ministers to review policies and important actions on a monthly basis. The ASWG met two times in the year.

Strategic Analysis and Knowledge Support Systems - private sector, CSO, and NGO actors.

Context analysis

Fully incorporated	3
Partially incorporated	12
Not incorporated	2

Data on chronic and acute malnutrition were reported based on Ghana Health Service surveys. Eleven percent of all children were underweight while 2 percent were severely underweight. This also showed a decrease from the 2008 figures of 14% and 3%, respectively. Stunting among children under 5 years has reduced from 28% to 19% while severe stunted was reduced from 10% to 5% over the same period. Similarly, 5% of children were wasted and less than 1 percent were severely wasted, representing a decrease from the figures reported in 2008 (9% and 2%, respectively). MoFA played a role in ameliorating the incidence of malnutrition through its extension services delivery. Beneficiaries were given nutrition-based education on how to plan their meals for improved household health using talks, discussions, demonstrations, and visits to markets, homes, and processing sites.

No data were reported on malnutrition, however, interventions by government and its development partners geared towards addressing malnutrition included (1) Resilience in Northern Ghana project; (2) Ghana Social Opportunity Programme; (3) Savannah Accelerated Development Authority ; and some key targeted social intervention programmes, particularly the (4) Livelihood Empowerment against Poverty, (5) Ghana School Feeding Programme, and Capitation Grant.

Other activities to address malnutrition were on the promotion of micronutrient rich foods, trainings, sensitization, and research. Another key activity was the establishment of the Obaasima Seal which was placed on products that were fortified with 18 vitamins and minerals to reduce malnutrition among women of reproductive age and children.

Data on chronic and acute malnutrition were reported based on Ghana Health Service surveys indicating that the percentage of stunting among children under 5 years was reduced from 28% to 19%. Similarly, 5% of children were wasted and less than 1% were severely wasted, representing a decrease from the figures reported in 2008 (9% and 2%, respectively). Eleven percent of all children were underweight.

No specific intervention was reported. However, the report acknowledged the following interventions were carried out over the past years which may have contributed to a reduction in malnutrition: the release and promotion of Orange Fleshed Sweet Potatoes varieties to address vitamin A deficiency, West Africa Agricultural Productivity Programme, World Food Programme, Resilience in Northern Ghana, and Jump Start OFSP Initiative in parts of Volta, Northern, and Greater Accra regions.

Data on chronic and acute malnutrition were reported based on the Multiple Indicator Cluster Survey in 2018 and 2011. Stunting among children under 5 years reduced from 33% in 2011 to 18% in 2018 while underweight reduced from 20% in 2011 to 13% in 2018.

A Value Chain project on promoting local cultivation, processing, and consumption of Orange-Fleshed Sweet Potato (OFSP) in the Upper West and Northern regions was implemented to benefit 1120 people.

The “Enhanced Nutrition and Value Chains” project was implemented to support smallholder farmers and food processors and address stunting among children aged 6-23 months.

Specialized Nutritious Foods (Maizoya, TomVita, and Grow Nut) were procured and distributed to 18,819 children between the ages of 6-23 months and 17,111 pregnant and lactating women in the Northern Region.

Data on chronic and acute malnutrition were reported based on the Multiple Indicator Cluster Survey in 2018 and 2011. Stunting among children under 5 years was reduced from 33% in 2011 to 18% in 2018 while underweight was reduced from 20% in 2011 to 13% in 2018.

No report on activities to address malnutrition.

Nutrition objectives and indicators	
Fully incorporated	3
Partially incorporated	13
Not incorporated	1

Data on nutrition indicators (stunting, wasting, and underweight) were based on Demographic and Health Surveys. No indication that MoFA tracked and mitigated these indicators.

T**racking of a nutrition-sensitive indicator - agricultural commodity prices. An action was in place to mitigate high prices -** The publications of monthly bulletins through the food and nutrition monitoring system on prices of agricultural commodities by Statistics Research and Information Directorate (SRID) and ESOKO is another means tracking and mitigating any harm caused by price increments for the general public. In addition, SRID published at least three food situation reports in the year, the last of which predicted an eminent maize shortage, which resulted in high level discussion leading to the importation of maize to augment local production.

No data reported for nutrition indicators (stunting, wasting, and underweight).

Data on nutrition indicators (stunting, wasting, and underweight) was based on Demographic and Health Surveys. No indication that MoFA tracked and mitigated these indicators.

Data on nutrition indicators (stunting, wasting, and underweight) was based on Multiple Indicator Cluster Survey. No indication that MoFA tracked and mitigated these indicators.

Data on nutrition indicators (stunting, wasting, and underweight) was based on Multiple Indicator Cluster Survey. No indication that MoFA tracked and mitigated these indicators.

Increase production of micronutrient-rich foods (including efforts to increase micronutrient-rich food production)	
Fully incorporated	2
Partially incorporated	4
Not incorporated	11

Fish production (Compared to 2014 figures) – ***Increased*** - Annual domestic fish production was estimated at 443,413MT.

Meat production (Compared to 2014 figures) – ***Increased*** – 150,201MT

Fish production - *Increased* (Compared to 2015 figures)- ***Increased*** - Annual domestic fish production was estimated at 465,356MT.

Meat production (Compared to 2015 figures) – ***Increased*** **-**157,810MT

Guinea Fowl Project - 20 farmers were provided with solar panels to enhance the electricity supply to the hatcheries to incubate guinea fowl eggs to increase production.

Grass cutter rearing - 45 farmers in the Upper West Region received three (3) breeding stocks each.

The Cowpea Improvement Programme – 476.5kg of four improved varieties were given out for multiplication in 2015 and 2016.

Sweet potato planting material – 3 hectares of sweet potato planting material multiplication field was established in the Transitional and Guinea Savannah agro-ecological zones. Consequently, an output of 149,985 vine cuttings were distributed to farmers in the Central and Upper West Regions.

Fish production (Compared to 2016 figures) – ***Increased*** - Annual domestic fish production was estimated at 534,526MT.

Meat production (Compared to 2016 figures) – ***Increased*** **-** 164,125MT

Fish production (Compared to 2017 figures) – Decrease*d* **-** Annual domestic fish production was estimated at 452,649MT.

Meat production (Compared to 2017 figures) – ***Increased*** - 168,291MT

Value Chain project on promoting local cultivation, processing and consumption of Orange-Fleshed Sweet Potato in the Upper West and Northern regions - 1,120 beneficiaries were trained on OFSP production systems.

Promotion of the production of vitamin A yellow/orange maize varieties - setting up demonstration fields in 35 communities involving 754 farmers across Ashanti and Brong-Ahafo regions.

Production of vegetables, fruits, and legume - Yield of vegetables, legumes, and fruits reduced by 8.31%, 74.36%, and 96.69%, respectively

Fish production (Compared to 2018 figures) – ***Decreased*** - Annual domestic fish production was estimated at 449,700MT

Meat production (Compared to 2018 figures) – ***Increased*** - 175,769MT

Rearing for Food and Jobs program - 30,000 cockerels were distributed to 3,000 farmers in 12 selected regions in 2019 for crossing with local hens to improve the live weight from 1.2kg to 1.5kg and eggs laying rate from 70 to 110 egg per year. Also, 7,500 small ruminants were distributed to 750 farmers in six regions. 7,500 Djallonke sheep were procured and distributed to 750 farmers in the Upper East, Upper West, and Northern regions.

The Greenhouse module - three greenhouse training centres with commercial components have been established on five hectares land.

Production of vegetables, fruits, and legume - vegetables Decreased by 31.20%. Legumes and fruits increased

		Vegetable production - vegetable production increased by 196%.			by 18.80% and 209.70%, respectively.
Market expansion and market access Fully incorporated 1 Partially incorporated 13 Not incorporated 3	**European Union import ban on pepper species (Capsicum sp., Luffa sp., Momordica sp., Lagenaria sp. and Solanum sp.) from Ghana.** **GlobalGAP and Organic standards certification -** Thirty-six pineapple producers from the Eastern, Central and, Greater Accra Regions have also been bio-certified. **Expansion of markets for locally produced rice** - 9,300 MT of local rice was purchased under the Ghana School Feeding Programme. **Expansion of market for cassava -** Guinness Ghana Breweries Limited and Accra Brewery Limited have continued to show interest in the processing of local materials into finished products. The introduction of beer and malt made from cassava, rice, maize and sorghum is providing ready market for these crops especially cassava and sorghum. For example, in 2015,	**Improvements of feeder roads -** 3,717.62 kilometres of feeder roads were improved between 2011 and 2016. Regarding routine maintenance, 16,182.68 kilometres was covered. **Expansion of markets for guinea fowl meat** – To facilitate the acceptance of guinea fowl meat in the international market, the hot wood smoking technology was introduced by the Animal Research Institute, which removes carcinogens. **Expansion of maize markets** - a Public Private Partnership arrangement between the Techiman Municipal Assembly and traders at the maize market was established to build 238 new market sheds and construct a bridge to ease the traffic in the market. About 1,100 traders benefited from this PPP facilitation. **Market Oriented Agricultural Programme** – 850 farmers (21% women) gained access to market with women mainly being represented in processing and trading whereas their	**The European Union import ban on export of pepper species (Capsicum sp., Luffa sp., Momordica sp., Lagenaria sp. and Solanum sp.) was lifted.** **Expansion of markets for horticultural products** - selected members of the Federation of Associations of Ghanaian Exporters and other individual entities were supported to exhibit non-traditional export products from Ghana at the Fruitlogistica and Biofach fairs in Germany. **Demand for staple food** - Guinness Ghana Limited and Accra Brewery Limited have contributed in promoting staple crops in the past years. Their demand for rice, maize, sorghum and cassava have provided ready markets for these crops	**None reported.**	**Linking farmers to output markets** - 69,047 farmers, processors and aggregators (25% females) from seven regions were linked to output markets. The Greater Accra Region recorded the highest volume (229,650Mt.) of produce sold through the linkages followed by Central Region (114,057Mt). **Establishment of the Ghana Commodity Exchange Platform** – offered project supported warehouse owners to improved access to markets. **Market Oriented Agricultural Programme –** 37 citrus out-growers and 67 pineapple farmers received certification for organic standards and GlobalGAP certification. **Inadequate access to markets for rice** – inadequate rice milling facilities were a challenge and large portions of paddy rice were not milled on time. This resulted in inadequate access to markets for rice in the

	584MT of red sorghum was purchased locally by Accra Brewery Limited.	representation in production remained low. **Expansion of market for cassava** - Guinness Ghana Breweries Limited and Accra Brewery Limited have continued to show interest in the processing of local materials into finished products. The introduction of beer and malt made from cassava, rice, maize and sorghum is providing ready market for these crops especially cassava and sorghum.			Zabzugu, Saboba, Yendi and Tatale districts in Northern Region.
Improved processing of foods to enhance convenience in preparation Fully incorporated 1 Partially incorporated 12 Not incorporated 4	**Improved processing** - There has been the development of the instant "gari fortor" where gari mixed with stew (shito) is being marketed at various supermarkets across the country. **Cassava Adding Value for Africa Project** - 70,833MT of fresh cassava from the Brong Ahafo and Volta Regions was purchased between 2008 and 2013 for processing into High Quality Cassava Flour, Industrial Grade Cassava Flour, High Quality Cassava Chips and gari.	**Market Oriented Agriculture Programme** – Capacities of 81 representatives of processing companies were built in ISO 22000, ISO 9001:2008 standards, Hazard Analysis Critical Control Point for pack houses, sanitation and hygiene for citrus & pineapple processors. **Training for cassava processors** – 61 cassava processors were trained on processing of cassava into High Quality Cassava Flour in the Volta Region. **Development of manuals for processing of composite flour** – four manuals were developed on the processing of composite flours and their utilization in pastry products which were distributed to 3,500	**Support for agro-processing companies** - 14 agro-processing companies (chilli, pineapple, moringa, and soya processing) were technically supported to make them functional, enhance quality of products, attract adequate investments, and increase their capacities.	**Provision of processing equipment** - West African Food Markets provided funding to establish a maize processing plant, which could process 30MT of maize per day. It produces maize grits, flour, and bran. Maize grits was supplied to Guinness Ghana Ltd and some also exported to Burkina Faso.	**Limited number of rice milling facilities** -Production of rice and maize in the reporting period received considerable attention especially in the three regions in Northern Ghana. This contributed to bumper harvest of maize and paddy rice. However, inadequate rice milling facilities was a challenge and large portions of paddy were not milled on time.

		beneficiaries in the Ashanti, Brong Ahafo, Upper East, Upper West and Greater Accra Regions. **Provision of processing equipment** - 10 sets of bakery equipment consisting of a mixer, roller, oven, and their accessories were distributed to 10 trained bakery and pastry groups in the Ashanti, Brong Ahafo and Eastern Regions. Glucose syrup and ethanol processing equipment have been acquired and installed at the Agribusiness Incubation Centre at Pokuase in the Greater Accra Region. **Training in processing technology** - Some producers from Brong-Ahafo Region acquired skills to process mango into juice for domestic use as a way of improving nutrition.			
Improved storage and preservation Fully incorporated 0 Partially incorporated 12 Not incorporated 5	**Warehouse Receipt System** – allows members to deposit their grains in a certified warehouse and use it as collateral for borrowing money from a member bank or other member lending institutions. So far 90,745MT of maize have been stored under the Program.	**Provision of storage facilities** – A 2 tonne warehouse has been constructed. Rice and maize warehouse storage facilities were built at Tumu, Tamale, Ejura, Techiman, Accra, Tamale, Worawora and Asutsuare. Eleven warehouses had been certified with grain storage capacity of 54,600 metric tonnes and 21 community-based warehouses with a grain storage	**Provision of a preservation facility -** A mobile mango drying technology concept was designed for Ghana's mango industry. **Sensitisation on the use of storage technologies** - the use of super grain bags for storage of grains and cereals were promoted.	**Provision of storage facilities** - construction of 30 new warehouses across six regions which were on the average about 35% complete. Under the government Special Initiative Programme, 50 warehouses were awarded for construction	**Provision of storage facilities** – 1650MT of maize, 210MT of rice, 58MT of groundnut, 18MT of sorghum, 60MT of soybeans and 35MT of cowpea certified seeds were stored in cold storage at Grains and Legumes Development Board storage centres in the Ashanti Region. Ten out of the 30 warehouses that were earmarked to

		capacity of 2,280 metric tonnes were provided. Three warehouses and one pack house in the Upper West Region. 2,500MT capacity warehouses were being constructed at Wa Municipal (2000mt) and Tumu District (500mt) with support from Ghana Commercial Agriculture Project. In the Upper East Region, two pack houses with capacity of 1,600MT were completed with support from NRGP. Additionally, with combined supports from Ghana Commercial Agriculture Project and NRGP, construction of six warehouses with a total capacity of 3,800 metric tonnes were completed in the Upper East Region. **National Food Buffer Stock Company -** 2,820MT of yellow maize was purchased and stored. **Private sector operators trained in grain storage activities-** 981 beneficiaries were trained on maize standards, quality improvement, weights and measures.	**Smallholder Agriculture and Market Support initiative** - 300MT capacity warehouse was constructed.	be constructed by MoFA in 2018 were completed in 2019 in six Regions. **Provision of storage facilities -** In addition, 13,000MT storage capacity warehouses have been released by MoFA to the company. .
Explicit nutrition goals Fully incorporated 0 Partially incorporated 1	**The Livestock Development Project** – to improve livestock productivity, reduce poverty, and improve food security through smallholder income-generating activities.	**The Livestock development policy and strategy was launched.** **The Livestock Development Project** – to improve livestock	**The Livestock Development Project** – to improve livestock productivity, reduce poverty, and improve food security through smallholder income-generating activities.	**Rearing for Food and Jobs program** was initiated to increase domestic meat production and to reverse the trend of meat imports. .	**Rearing for Food and Jobs program** was initiated to increase domestic meat production and to reverse the trend of meat imports.

Not incorporated	16	**The credit-in-kind project** was a subproject under the Livestock Development in Ghana project to increase the production of livestock.	productivity, reduce poverty, and improve food security through smallholder income-generating activities. **The credit-in-kind project** was a subproject under the Livestock Development in Ghana project to increase the production of livestock.	**The credit-in-kind project** was a subproject under the Livestock Development in Ghana project to increase the production of livestock.		
Improved processing to retain nutritional value		**None reported**	**Processing for improved nutrition** - On a small-scale level, some producers from Brong-Ahafo Region acquired skills to process mango into juice for domestic use.	**None reported**	**Provision of financial support the processing of nutritious foods** - 2 local industrial food processors (Yedent Agro Foods Processing Limited and Premium Foods Limited) were given financial support to process and distribute specialized nutritious foods that meet international food safety and quality standards.	**None reported**
Fully incorporated	0					
Partially incorporated	1					
Not incorporated	16					
Market access to micronutrient-rich foods		**None reported**	**Launch of the Obaasima Seal** to be placed on processed foods fortified with 18 vitamins and minerals to reduce malnutrition among women of reproductive ages and children. **Launch of the Green Label Scheme** - an intervention that aimed at enhancing quality, safe and sustainable fruits and vegetable production for increased growth in incomes. This	**Registration of the Green Label Scheme as a company limited called the Ghana Green Label Foundation in 2017 –** To market the concept and establish linkages to farmers and markets, awareness creation was carried out through television programmes, Fruit and Vegetable Fairs and "round table" meetings.	**Fortification for improved nutrition** - The women processing group - Nyame Bekyere Women Gari Group in the Dormaa East District were introduced to fortification of gari with other agricultural products to improve nutrition. **The Greenhouse Village Initiative** – This initiative was to promote the	**None reported**
Fully incorporated	0					
Partially incorporated	1					
Not incorporated	16					

	will promote the development of the local market, increase the income of smallholders and ensure quality control and food safety. **Establishment of SmartCert** to support local horticultural crop producers such as mango and pineapple to sell their products in niche markets locally and internationally.	production and marketing of high-quality vegetables for local and international markets, create investment opportunities for graduate youth, women and the private sector. **The Green Label Scheme** is yet to be rolled out through the Ghana Green Label Secretariat.

Bold and not italics text = **projects and/or activities carried out**
ABL - Accra Brewery Limited
AEA – Agriculture Extension Officer
AGI - Association of Ghana Industries
AMSEC - Agricultural Mechanisation Service Centres
CRS – Catholic Relief Services
CSA - National Climate-smart Agriculture and Food Security Action Plan of Ghana
CSIR – Council for Scientific and Industrial Research
CSO - Civil Society Organizations
DP - Development partners
ECOWAS – Economic Community of West African States
EMQAP - Export Marketing and Quality Awareness Project
ENVAC - Enhanced Nutrition and Value Chains
FASDEP 2 - Food and Agriculture Sector Development Policy 2
FBO – Farmer Based Organizations
FMP - Fisheries Management Plan of Ghana: A National Policy for the Management of the Marine Fisheries Sector
FP - Fertilizer Policy for Ghana
GADS 2 - Gender and Agriculture Development Strategy II
GAP – Good Agricultural Practices
GGL - Guinness Ghana Limited
GIZ - German Agency for International Cooperation
GLD - Ghana Livestock Development Policy and Strategy
GNCC-P - Ghana National Climate Change Policy
GNCC-MP - Ghana National Climate Change Master Plan: Action Programmes for Implementation
GSP - National Seed Plan
HACCP - Hazard Analysis Critical Control Point
HQCF – High-Quality Cassava Flour
IFJ - Investing for Food and Jobs: An Agenda for Transforming Ghana's Agriculture
LDG - Livestock Development in Ghana: Policies and Strategies
METASIP - Medium-Term Agriculture Sector Investment Plan
MOAP - Market-Oriented Agriculture Programme
MoFA – Ministry of Food and Agriculture
MoFAD – Ministry of Fisheries and Aquaculture Development
NGO – Non-governmental organization
NIP - National Irrigation Policy, Strategies, and Regulatory Measures
NRGP – Northern Rural Growth Programme
NSP - National Seed Policy
OFSP – Orange Fleshed Sweet Potatoes
PFJ - Planting for Food and Jobs: Strategic Plan for Implementation
RELC – Research Extension Farmer Linkage Committee
USAID - United States Agency for International Development
WIAD – Women in Agriculture Development Directorate of the Ministry of Food and Agriculture
WFP – World Food Programme of the United Nations

Bridge 2

The preceding chapter (Manuscript 1) assessed the nutrition sensitivity of agriculture policies and strategies in Ghana. The findings indicated that policies and strategies in Ghana's agriculture sector have primarily focused on producing staple foods, with limited attention given to micronutrient-rich foods. However, the analysis of national annual reports highlighted some donor-funded efforts to prioritize nutrition-related activities within Ghana's agriculture sector. Moreover, the Ghanaian Government has demonstrated its commitment to making the agriculture sector nutrition-sensitive by establishing a Women in Agriculture Development Directorate. This directorate is responsible for integrating nutrition into agriculture policies, strategies, and programs.

To further enhance nutrition-sensitive agriculture efforts in Ghana, conducting a stakeholder analysis is essential to deepen the understanding of the nutrition sensitivity of agricultural policies and strategies in Ghana. Understanding the perspectives, interests, relationships, influence, and power dynamics among various stakeholders engaged in the nutrition-sensitive agriculture policy landscape is essential for developing effective and sustainable agricultural policies and initiatives in Ghana. Thus, the next chapter (Manuscript 2) employed stakeholder analysis to identify the individuals, groups, and organizations directly or indirectly involved in formulating agriculture-for-nutrition policies at the national level in Ghana. The national stakeholders' interconnections and influence in the agriculture-for-nutrition policymaking were examined.

Chapter 4. Manuscript 2

A Net-Map analysis of stakeholder connections and influence in agriculture-for-nutrition policymaking in Ghana

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Published: African Journal of Food, Agriculture, Nutrition, and Development. 2023; 23(1)22172 – 22199. https://doi.org/10.18697/ajfand.116.22665

Supported by: The Canadian Queen Elizabeth II Diamond Jubilee Scholarships (QES) is managed through a unique partnership of Universities Canada, Rideau Hall Foundation (RHF), Community Foundations of Canada (CFC), and Canadian universities. The Queen Elizabeth Scholarship-Advanced Scholars (QES-AS) is made possible with financial support from International Development Research Center (IDRC) and Social Sciences and Humanities Research Council (SSHRC).

4.1 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 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 recognized 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 a 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.

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

4.2 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 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.

4.3 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 combines stakeholder mapping, power and influence mapping, and social network analysis and has been successfully used to identify stakeholders involved in infant and young child nutrition programs in multiple countries [11-13]. 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.

4.3.1 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.

4.3.2 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 4.1) 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 4.1) about their existing network of stakeholders, and their responses were documented on a Microsoft PowerPoint slide (Figure 4.1). Participants were first asked the broad question, "Who influences agriculture-for-nutrition policymaking at the national level in Ghana's agriculture sector?" 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, NGOs and CSOs, 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, funding, advocacy, dissemination, and technical assistance (Figure 4.1). 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 4.1). 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 4.1 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).

4.3.3 Data analysis

The data from the virtual Net-Map (Figure 4.1), 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 4.2).

4.4 Results and discussion

4.4.1 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 Agriculture Sector Investment Plan (METASIP) to align it with the food security and nutrition components of the Comprehensive African Agriculture Development Programme. 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 (FASDEP) 2, 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 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].

4.4.2 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 4.2, Tables 4.3-4.5). The national network of stakeholders had a high level of centralization (degree centralization = 93%) around one core: the Technical Committee led by MoFA (Figure 4.2). 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 4.2).

4.4.3 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 4.2 represents the perceived influence score assigned to stakeholders in the virtual Net-Map exercise by the participants (Table 4.5). Out of sixty stakeholders identified, fourteen stakeholders, twelve from government organizations (Table 4.5) 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.

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 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.

4.4.4 Degree centrality for the complete national level Net-Map

The number of links or connections associated with a single stakeholder represents 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 4.5). 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.

4.4.5 Formal command network

The formal command network (Figure 4.3) 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.

4.4.6 Funding network

The funding network (Figure 4.4) 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 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.

4.4.7 Advocacy network

A number of stakeholders, from the government, NGOs, CSOs, the private sector, and the media, played advocacy roles in the TC (Figure 4.5). 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.

4.4.8 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 4.6). 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.

4.4.9 Technical assistance network

All stakeholder categories except the media provided technical assistance to the TC led by MoFA (Figure 4.7). 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.

4.4.10 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 participants' responses in the Net-Map were highly subjective and may lead to perception gaps about the influence levels and connections among stakeholders [21, 22].

4.4.11 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 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 4.2 – 4.7) 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 4.2 –4.7) 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.

4.5 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.

4.6 Acknowledgements

This paper was made possible with the support of the Canadian Queen Elizabeth II Diamond Jubilee Scholarships: Advanced Scholars (QES-AS) program. "The Canadian Queen Elizabeth II Diamond Jubilee Scholarships (QES) is managed through a unique partnership of Universities Canada, the Rideau Hall Foundation (RHF), Community Foundations of Canada (CFC) and Canadian universities. The QES-AS is made possible with financial support from IDRC and SSHRC". We acknowledge all participants from governmental and non-governmental institutions who made time to participate and contribute to this study.

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Figure 4.1 Participants' 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

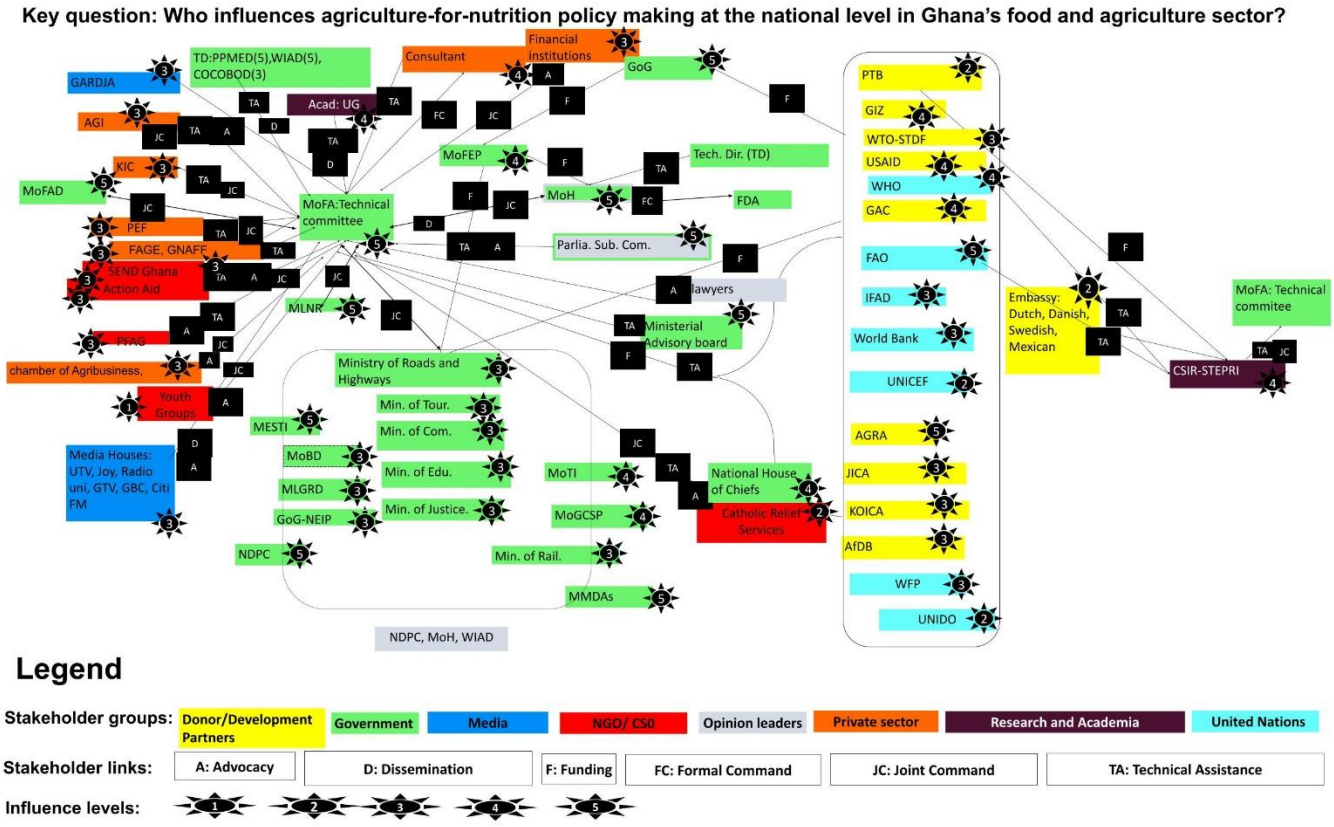
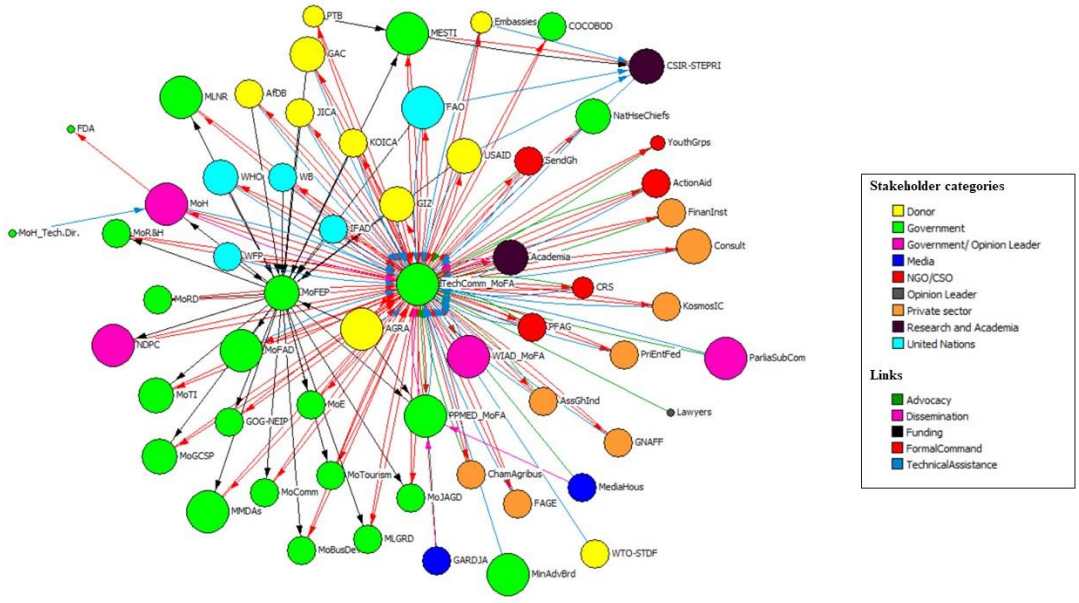
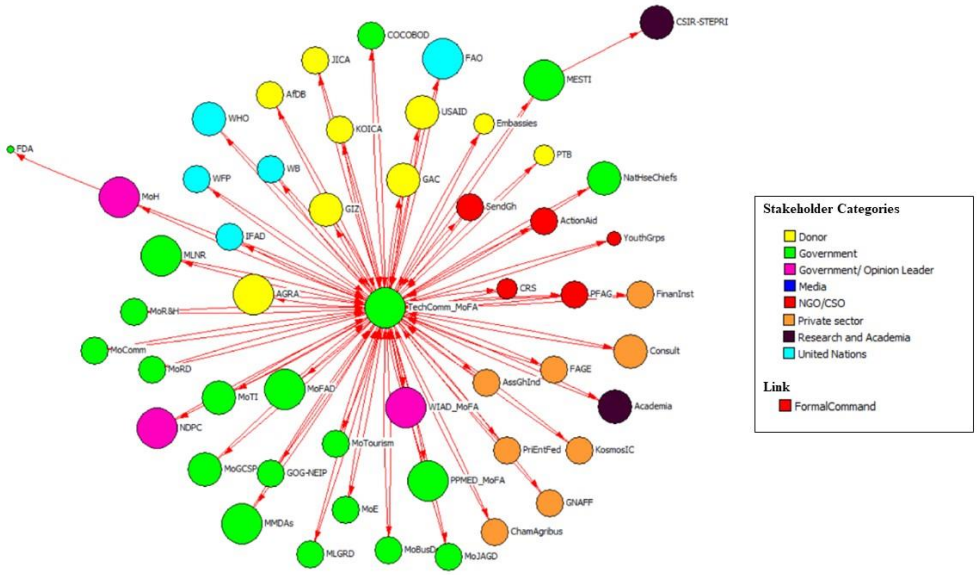


Figure 4.2 Complete national network, stakeholders sized by influence scores



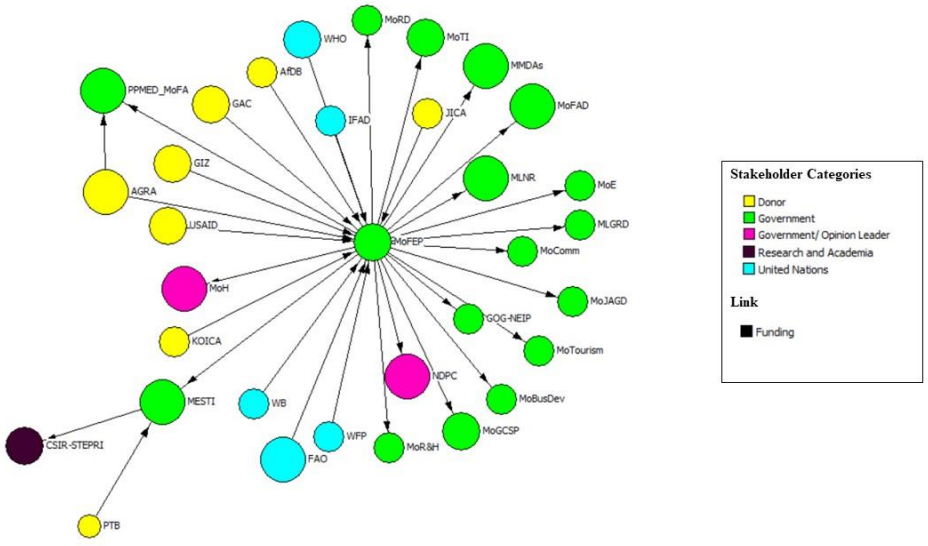
Stakeholders' full names found in Table 4.5

Figure 4.3 National formal command network, stakeholders sized by influence scores



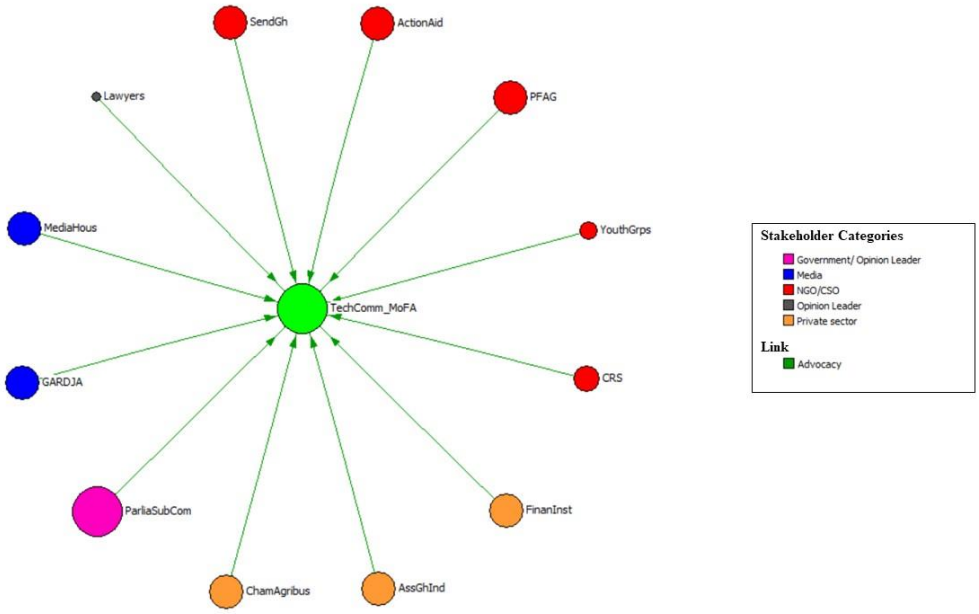
Stakeholders' full names found in Table 4.5

Figure 4.4 National funding network, stakeholders sized by influence scores



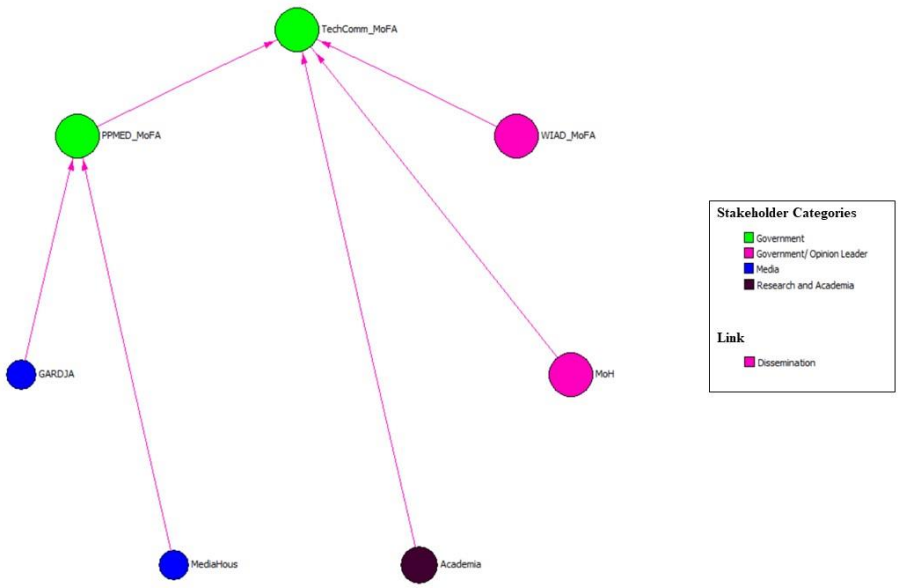
Stakeholders' full names found in Table 4.5

Figure 4.5 National advocacy network, stakeholders sized by influence scores



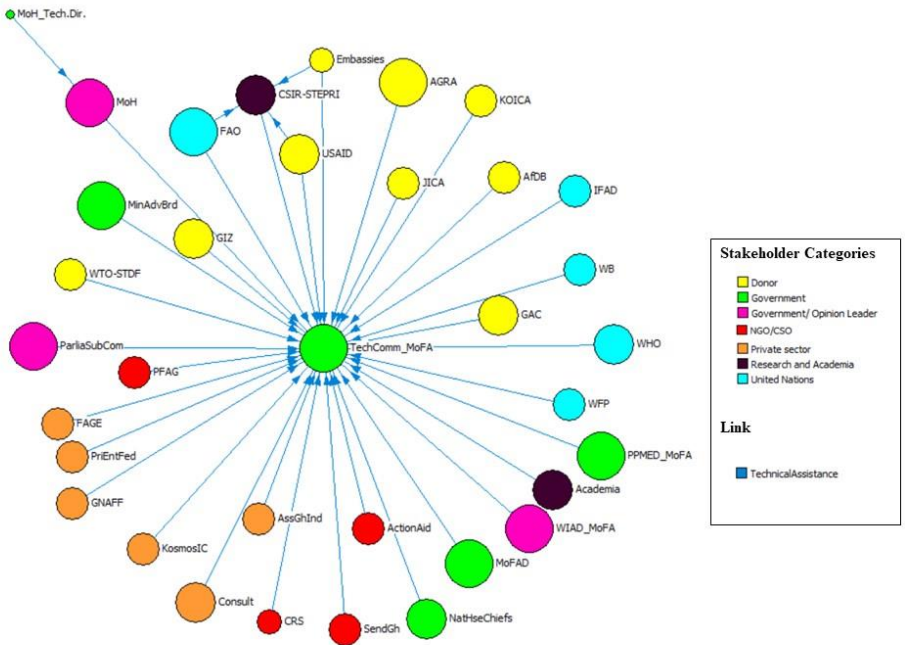
Stakeholders' full names found in Table 4.5

Figure 4.6 National dissemination network, stakeholders sized by influence scores



Stakeholders' full names found in Table 4.5

Figure 4.7 National technical assistance network, stakeholders sized by influence scores



Stakeholders' full names found in Table 4.5

Table 4.1 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 4.2 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)

Table 4.3 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%

NGO – Non-governmental Organizations
CSO – Civil Society Organizations

Table 4.4 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%

Table 4.5 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	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
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
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
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
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
NGO – Non-governmental organization
CSO – Civil Society Organization
UN – United Nations Organizations

Bridge 3

The preceding chapter (Manuscript 2) highlighted the stakeholders involved in shaping agricultural policies for nutrition at the national level in Ghana, including their connections and perceived influence in the nutrition-sensitive agriculture policy landscape. During the national-level stakeholder study, participants collectively emphasized that identifying implementation stakeholders was vital, as it would provide insights into who was responsible for carrying out the nutrition-sensitive agriculture policies and initiatives they developed. Moreover, participants emphasized that identifying implementation stakeholders can aid in recognizing potential barriers to nutrition-sensitive agriculture policy implementation.

In response to the participants' interest, the next chapter (Manuscript 3) adopted a case study approach to identify the stakeholders engaged in nutrition-sensitive agriculture implementation in the Eastern Region of Ghana. The roles of the stakeholders, their relationships with other stakeholders, and their perceived influence on nutrition-sensitive agriculture program implementation in the Eastern Region were examined.

Chapter 5. Manuscript 3

Nutrition implementation in Ghana's agriculture sector: a net-map analysis of stakeholder connections and influence in the Eastern region of Ghana

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Supported by: The Canadian Queen Elizabeth II Diamond Jubilee Scholarships (QES) is managed through a unique partnership of Universities Canada, Rideau Hall Foundation (RHF), Community Foundations of Canada (CFC), and Canadian universities. The Queen Elizabeth Scholarship-Advanced Scholars (QES-AS) is made possible with financial support from International Development Research Center (IDRC) and Social Sciences and Humanities Research Council (SSHRC).

5.1 Abstract

The construction of nutrition-sensitive agriculture policies and investments requires a clear understanding of the roles and level of influence of diverse stakeholders. This study employed a case study design and applied it to the Eastern Region of Ghana. Fifteen out of thirty eligible districts were randomly selected for inclusion. Sixteen participants representing fourteen Department of Agriculture directors, one Women in Agriculture Development Directorate (WIAD) regional officer, and one WIAD district officer were purposefully selected based on their knowledge of the nutrition-sensitive agriculture programs and projects within their jurisdiction between 2007 and 2022. The Net-Map method identified the stakeholders and their institutional connections and influence on nutrition-sensitive agriculture. Sixty-five stakeholders with 198 connections were recognized for their involvement in nutrition-sensitive agriculture implementation in the Eastern Region. Nine stakeholders (five from government organizations, three from development partner and donor organizations, and one from a civil society organization) were identified as the most influential. The Ministry of Food and Agriculture played a critical role in developing national policies and setting priorities that guided regional and district implementation of nutrition-related activities in the decentralized agriculture sector. Insufficient and untimely release of funds was identified as the primary barrier to nutrition-sensitive agriculture implementation. Moreover, weak cross-sectoral coordination and collaboration hampered nutrition mainstreaming into stakeholders' respective activities, often duplicating efforts or sending conflicting messages to recipients. Using stakeholder Net-Mapping as an initial step in designing nutrition-sensitive agriculture interventions can establish clear processes, reduce conflicts, and improve stakeholder engagement, thus strengthening the implementation of nutrition-related activities in Ghana's agriculture sector.

Keywords: Nutrition-sensitive agriculture, Net-Map, Agriculture, Nutrition, stakeholder, Eastern Region, Ghana

5.2 Introduction

The agriculture sector plays a critical role in improving nutritional outcomes and reducing malnutrition globally through improved farming household incomes and food security[1-3]. Adopting a nutrition-sensitive approach to agriculture puts a nutrition lens on the policies and investments without detracting from the sector's traditional goal of increased food production [4]. Nutrition-sensitive agriculture (NSA) interventions can influence nutrition through several pathways. In the Philippines, an NSA intervention resulted in reduced anemia (from 57% to 34%, $p < 0.01$) and stunting (from 44% to 26%, $p < 0.01$) among children under the age of five years through pathways related to food production, income, and nutrition knowledge and attitudes [5]. Another NSA intervention in Malawi focused on strengthening local institutions and showed a reduction in stunting levels (DID: -17 pp, $p < 0.05$) among children below the age of five years [6]. Finally, an NSA study conducted in Burkina Faso revealed that focusing on women's empowerment resulted in a decrease in maternal underweight (DID: -8.7 pp, $p < 0.01$) and an increase in body mass index for underweight mothers ($b = 0.70 \pm 0.31$) [7]. Therefore, NSA interventions have the potential to address malnutrition and inadequate diets in low- and middle-income countries [1, 2, 8].

Stakeholder mapping is a valuable tool for engaging stakeholders in designing NSA interventions with food diversification strategies to increase the production of micronutrient-rich foods [9,10]. The Net-Map method is a visual participatory approach that combines stakeholder mapping, power and influence mapping, and social network analysis to identify stakeholders involved in a particular phenomenon, examine existing connections between stakeholders, and define their roles and influence levels. [11, 12]. The Net-Map method has been successfully applied in identifying stakeholders involved in infant and young child nutrition programs in various countries as well as to identify stakeholders involved in child stunting and anemia programming in Ghana [13,14]. It was also used in Ghana's agriculture

sector to understand the diffusion of smallholder irrigation technology [15]. More recently, the Net-Map method was applied to understand how to leverage small- and medium-scale agriculture enterprises to improve nutrition in Ghana [16]. However, there remains a gap among stakeholders in understanding their roles in NSA intervention implementation, their relationships, and their influence, as this aspect has not been extensively researched and reported. Therefore, this study aimed to apply the Net-Map method to shed light on the roles, relationships, and influence of stakeholders involved in NSA intervention implementation at the decentralized levels of government, focusing on the Eastern Region of Ghana as a case study.

5.3 Methods

5.3.1 Study site

The study was carried out in the Eastern Region of Ghana, which has an estimated 61,717 institutions[12], of which 6,006 (9.7%) were involved in agriculture-related activities[13] [17]. The Eastern Region was selected for the study due to two reasons. Firstly, the region had the country's highest number of institutions involved in agricultural activities, with 821 engaged in processing agricultural produce and 2206 involved in marketing agricultural produce. Secondly, the region was part of the most recent NSA initiative called 'Support to reduction in malnutrition in women and in vulnerable populations through food-based approaches,' led by the Food and Agriculture Organization of the United Nations (FAO) and the Ministry of Food and Agriculture (MoFA). This initiative was launched in 2019 to address the high prevalence

[12] An institutions is an establishment (as opposed to households) engaged in any income-generating activities.
[13] Agriculture activities include: arable crop farming, tree cultivation, poultry and livestock rearing, forest tree cultivation, aquaculture and beekeeping.

of child underweight in five districts[14] of the region. This NSA initiative was consistent with country-level commitments such as the 'Country Programming Framework Priority area 1.3' which emphasized that *'government and non-state actors have greater capabilities to improve sustainable production and consumption of safe and nutritious foods'* and the 'Sustainable Development Goal 2' which aims to *'end hunger, achieve food security and improved nutrition and promote sustainable agriculture'* [18].

5.3.2 Selection of interview participants and location of the interview

The Eastern Region of Ghana comprises thirty-three districts (Figure 5.1), but three were excluded due to accessibility issues. Fifteen[15] of the remaining thirty districts were randomly selected for inclusion in the study. The study focused on the Department of Agriculture (DoA) staff since they oversee the implementation of NSA activities in the region. To ensure a representative sample, sixteen DoA participants were purposefully selected based on their staff position and knowledge of the NSA programs and projects within their respective jurisdictions between 2007 and 2022. The sixteen participants included 14 Eastern region district DoA directors, one Eastern regional and one district-level Women in Agriculture Development (WIAD) officer. The district-level WIAD officer was delegated by a DoA director who could not attend the meeting. All 16 participants were invited to participate in an in-person Net-Mapping group meeting held at the Eastern Regional office of the Department of Agriculture on the 19th of April, 2022.

[14] The following districts were selected in the Eastern Region based on the ranking of the severity of underweight situation: 1) Kwahu South (4%), 2) Kwahu Afram Plains South (1.4%), 3) Upper West Akim (1.3%), 4) Birim North (1.3%) 5) Akuapem South (1.1%).

[15] The 15 districts included in the Net-map activity were 1) New Juaben South, 2) Kwahu West, 3) Upper Manya Krobo, 4) Akuapim South, 5) Kwahu South, 6) Upper West Akim, 7) Suhum, 8) Akuapim North, 9) Birim North, 10) Abuakwa South, 11) Nsawam, 12) Lower Manya Krobo, 13) Yilo Krobo, 14) New Juaben North, 15) Abuakwa North

5.3.3 The Net-Map process

5.3.3.1 Defining links, stakeholder categories, and influence

Net-map is a four-step process [16]. The first step was to identify stakeholders based on *a priori* categories: government, donor organizations and development partners, United Nations organizations, non-governmental organizations and civil society organizations, private sector, research and academia, media, and opinion leaders. Next, the linkages among stakeholders were identified using *a priori* categories: formal command, funding, advocacy, dissemination, and technical assistance. Formal command referred to linkages describing formal oversight of the work or actions of another stakeholder in the network. Funding linkages describe 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. Dissemination was when a stakeholder circulated or distributed information to other stakeholders about nutrition and nutrition-related issues and their links to agriculture. Technical assistance occurred when a stakeholder provides technical support, guidance, or advice to another stakeholder in the policy implementation process. There was an opportunity to add other stakeholder and linkage categories during the meeting.

The third step involved participants assigning a level of perceived influence to each stakeholder. The influence was defined as the extent to which a stakeholder contributed to or determined objectives, programs, interventions and projects in the planning and implementation of nutrition-related activities within the agriculture sector. Influence may reflect control over funding flows, responsibility for implementing key programs and projects, having authority over programs, or making relevant NSA decisions. The focus was on a stakeholder's ability to influence important decisions on nutrition-related activities and not about formal hierarchies. The fourth and final step was identifying opinion leaders,

bottlenecks, and opportunities in NSA implementation. In this study, an opinion leader was defined as an individual or organization that exerts substantial influence within their network and can affect the opinions of other connected stakeholders.

5.3.3.2 The group discussion

The mode of engagement in the Net-Map exercise was an in-person round table group discussion. The sixteen participants were guided through the questions (Table 5.1) about their existing network of stakeholders, and their responses were documented on a large cardboard sheet capturing stakeholder categories (using different coloured post-its), stakeholder linkages (using coloured pens), and stakeholders' perceived influence (using pieces of wood to build towers) (Figure 5.2). Participants were first asked the broad question, " Who participates in planning and implementing nutrition-sensitive agriculture programs, projects, and interventions developed in line with the Food and Agriculture Sector Development Policy 2 and its corresponding medium-term investment plans at the regional level?". Secondly, participants were guided to list stakeholders based on the described stakeholder categories. Different colours were assigned when stakeholders fell under multiple categories. Thirdly, the participants were further asked to determine how these stakeholders were connected using the earlier-mentioned linkages. Next, the perceived influence levels of the stakeholders were estimated using a scale of zero (no influence) to five (the most influential stakeholders). While discussing the identified stakeholder's roles, participants also reflected on the map they had developed and discussed their opinions regarding the stakeholders they had listed, their linkages, and their perceived influence levels in NSA implementation. As a final activity, participants also discussed ways to strengthen nutrition in the Eastern Regional agriculture sector while reflecting on their developed map. Group consensus was sought after each stage of the discussion.

5.3.4 Ethics

The study was approved by the University of Ghana Ethics Committee for the Humanities (ECH 122/ 20-21) and McGill University Research Ethics Board (# 21-07-001). The Net-Map exercise began with a brief explanation of informed consent for the study. After an explanation of the study, all participants provided written informed consent. All participants provided voluntary consent to record the in-person Net-Map group meeting.

5.3.5 Data analysis

The data from the Net-Map (Figure 5.3), field staff notes, and discussion transcripts were entered into Microsoft Excel as one file with six different worksheets: (1) attributes (stakeholder name and perceived influence level), (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, a social network analysis software [19]. 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. Descriptive statistical analysis was performed using three measures of social networks: degree centrality, network density, and network diameter within VisuaLyzer 2.2. Degree centrality of a stakeholder network represents the number of linkages associated with a single stakeholder (for example, the stakeholders with the most connections). There are two types of degree centrality: 1) in-degree (representing the number of incoming linkages) and 2) out-degree (representing the number of outgoing linkages). In-degree indicates how other stakeholders in a network influenced a particular stakeholder, while out-degree suggests that a particular stakeholder influenced other stakeholders in the same network. Network density refers to the proportion of actual linkages or connections in a network. A network density of 1 means all stakeholders are connected in the network. A

network density lower than one signals sparse connections across stakeholders in the network. Network diameter is the length of the longest graphical distance between any two stakeholders in the network (i.e., the distance between the two most distant stakeholders) (Table 5.2).

5.4 Results

5.4.1 Nutrition-sensitive agriculture implementation in the Eastern Region

The 16 participants worked in Ghana's agriculture sector for 15.6 ± 8.7 years; only five were female. The participants identified 65 stakeholders as participating in the implementation of nutrition-related activities within the agriculture landscape in the Eastern Region (Figure 5.3, Tables 5.3 -5.5). The Eastern Regional network of stakeholders had a high level of centralization (93%) around three core stakeholders: 1) MoFA, 2) DoA, and 3) farmer-based organizations. The longest graphical distance within the network (network diameter) was seven, indicating how far apart the two farthest stakeholders were. The proportion of connections or links in the network (network density) was 0.1, suggesting sparse connections among stakeholders (Table 5.4).

5.4.2 Stakeholder influence in nutrition-sensitive agriculture implementation

Out of the sixty-five identified stakeholders, nine (five government organizations, three from development partner and donor organizations, and one from a civil society organization) were identified as having the greatest influence (score=5) (Table 5.5). Participants noted that MoFA at the national level played a critical role in developing policies and setting priorities that guided implementation at the regional and district levels. The WIAD of the MoFA, the Nutrition Department of the Ghana Health Service, and the Plant Protection and Regulatory Services were identified as stakeholders with in-depth knowledge and capacity to influence

NSA implementation in the Eastern Region. The Ministry of Lands and Natural Resources was also ranked high for its influence on land provision for growing food.

The provision of funds was critical in the policy implementation process. Global Affairs Canada and the World Bank were ranked high as donor and development partner organizations that funded agriculture-for-nutrition-related projects in the region. For instance, the FAO proposed the 'Support to Reduction in Malnutrition in Women and in Vulnerable Populations through Food-based Approaches' project in the Eastern Region; the World Bank funded it. The DoA considered farmer-based organizations as partners in NSA implementation as they had the ability to accept or refuse to participate in NSA programs. Yet, the DoA recognized that there were often insufficient funds to engage with farmers in drafting district development plans or to communicate the plans with them.

Participants noted that the DoA did not consider itself very influential in NSA implementation (score=4) because they were now under the authority of the Ministry of Local Government and Rural Development (MLGRD). Participants further explained that the DoA could not exercise autonomy over their expenditures due to the composite funding system[16] the MLGRD uses, which allowed them to prioritize expenditures of other departments over DoA's expenditures. This phenomenon often led to delays in the implementation plans of the DoA.

5.4.3 Degree centrality for the complete regional level Net-Map

The DoA recorded the highest degree centrality (38 connections), signalling their importance in the NSA implementation process in the Eastern Region (Table 5.5). Most connections to the DoA were incoming (89%), including links from stakeholders from all the stakeholder

[16] The composite funding system of the Ministry of Local Government and Rural Development pools all budgets and funding for all the departments that are under the local government system.

categories in the study seeking to influence the NSA implementation process. Outgoing links (4) from the DoA reflected their primary function to provide technical support to farmer-based organizations, processors, and market queens and provide nutrition education to consumers via food demonstrations in the implementation process.

5.4.4 Formal command linkages among nutrition-sensitive agriculture stakeholders

The formal command network showed six different fragments, indicating that different stakeholders had formal oversight roles over the work or activities of other stakeholders in the implementation process (Figure 5.4). For instance, the MLGRD and MoFA had formal oversight over the activities of the DoA. Even though the DoA was officially under the authority of the MLGRD, the DoA still reported to the MoFA on national programs such as the 'Special Rice Initiative' and the 'Planting for Food and Jobs' program implemented in the region. All other reports on the DoA's routine activities were submitted to the MLGRD and MoFA.

Development partners had formal oversight responsibilities over the work of the DoA when they proposed and funded certain activities within the agriculture sector. For instance, through the 'Modernizing Agriculture in Ghana project,' Global Affairs Canada ensured that its recommendation of allocating 10 – 15% of funds to food and nutrition activities and supporting women was adhered to through periodic reporting by the DoA. Since national programs like the 'Special Rice Initiative' and the 'Planting for Food and Jobs program, which had a crop diversification strategy, were implemented at the district level, MoFA had formal command over the participating farmer-based organizations, input dealers, and processors through the actions of the DoA.

The Food and Drugs Authority and the Ghana Standards Authority could sanction producers (independent farmers, individual members of farmer-based

organizations with group production) and processors who did not adhere to their certification and safety protocols. The Ministry of Environment, Science, Technology and Innovation had formal command over all institutions[17] conducting research on resilient micronutrition-rich cultivars and livestock varieties.

5.4.5 Funding linkages among nutrition-sensitive agriculture stakeholders

The funding network (Figure 5.5) comprised stakeholders from the government, donors, development partners, United Nations organizations, non-governmental organizations, civil society organizations, the private sector, and research institutions and academia. Global Affair Canada was the primary funder of implementation activities in Ghana's agriculture sector, with funds targeting the 'Modernizing Agriculture in Ghana' project. Development partners, donors, and non-governmental organizations often approached districts with nutrition-sensitive projects and either collaborated with the DoA or worked independently to target beneficiary farmers. For instance, the United Nations Industrial Development Organization was directly working with pineapple producers in the Nsawam Adoagyiri district to help them meet standards for international markets. The organization provided funding through certification assistance and the provision of cultivars and equipment directly to beneficiary farmers. Another mechanism of funding was through the Ministry of Finance and Economic Planning. It received funding from development partners, non-governmental organizations, and donors to be channelled to the DoA through MoFA in national programs, such as the 'Planting for Food and Jobs' program. However, participants noted that resources for routine NSA implementation at the district level no longer came directly from MoFA but predominantly flowed from the Ministry of Finance and Economic Planning via the MLGRD

[17]The research institutions are Plant Genetic Resources Research Institute, Cocoa Research Institute of Ghana, Crops Research Institute, Oil Palm Research Institute, Food Research Institute, Animal Research Institute, Water Research Institute, and the Institute for Scientific and Technological Information.

through a counterpart funding system. The composite budget allowed for the funds for routine service delivery within the agriculture sector to go directly to the MLGRD from the Ministry of Finance and Economic Planning while funding to carry out national programs such as the 'Planting for Food and Jobs' program flowed through MoFA directly to the DoA.

In World Health Organization-funded nutrition projects that required collaboration between the Ghana Health Service and the DoA, the Ghana Health Service usually determined for which parts of the project to include the DoA and released associated funds directly to the DoA during implementation. In some context-specific projects, like the *'LinkINg Up*' project in three districts in the Eastern Region[18], the International Development Research Centre, a donor, provided funding to the University of Ghana (an academic institution) and Heifer International (a non-governmental organization) to carry out nutrition-sensitive agriculture activities. Newmont Ghana performed its corporate social responsibility by funding farmer-based organizations and DoAs in their respective operational areas to promote activities supporting farmers (e.g., National Farmer's Day Celebration) and increasing access to potable water and sanitation facilities to improve health and nutrition.

5.4.6 Advocacy linkages among nutrition-sensitive agriculture stakeholders

A number of stakeholders from the government, non-governmental organizations, civil society organizations, the private sector, and the media played advocacy roles in the NSA implementation network (Figure 5.6). Advocacy was noted at the national and decentralized levels (regional and district levels). Among the stakeholders identified for advocacy at the national level, MoFA-WIAD played a critical role in advocating for nutrition in agriculture to donors and development partners by using national and international platforms like the

[18] The 3 districts are the Upper Manya Krobo district, Yilo Krobo Municipal, and the Lower Manya Krobo Municipal

United Nations Food Systems Summit in 2021. At the local level, market queens, chiefs, and queen mothers advocated to all stakeholders on the map involved in NSA implementation by using platforms such as festivals, durbars, and Farmer's Day celebrations. Members of farmer-based organizations advocated to other farmers about particular micronutrient-rich cultivars (such as orange-fleshed sweet potato) they had adopted.

5.4.7 Dissemination linkages among nutrition-sensitive agriculture stakeholders

Five stakeholder categories (government, development partners and donors, non-governmental organizations/ civil society organizations, private sector, and research institutions and academia) were identified as key players in disseminating nutrition and nutrition-related information in the NSA implementation network (Figure 5.7). Research organizations and academic institutions were critical in disseminating evidence-based information for NSA implementation. The Council for Scientific and Industrial Research - Institute for Scientific and Technological Information (CSIR-ISTI) was accessible to all stakeholders identified on the map. The CSIR-ISTI did not actively disseminate nutrition information. However, when part of an NSA project such as the 'Modernizing Agriculture in Ghana' project, the CSIR-ISTI played a crucial role in disseminating agriculture-nutrition information during NSA implementation. The Ghana Health Service disseminated nutrition information to MoFA, the Ghana Education Service, and the DoA when they jointly supported nutrition-sensitive programs, such as the 'School Feeding Program,' to optimize the nutritional quality of school meals.

5.4.8 Technical assistance among nutrition-sensitive agriculture stakeholders

All stakeholder categories except the media provided technical assistance in the technical command network (Figure 5.8). During project implementation, the DoA and farmer-based organizations received technical support from development partners and non-governmental

organizations. The Ghana Standards Authority, the Food and Drugs Authority, DoA, and Business Advisory Centers provided technical support to farmer-based organizations and processors through capacity building and assistance during certification, as well as meeting safety standards. The MoFA-WIAD trained regional-level WIAD officers on specific nutrition education topics during NSA implementation. Regional WIAD officers trained the district-level WIAD officers, who also relayed the training to other staff in their respective DoA offices (especially to agriculture extension agents who directly trained farmers in the field). The DoA also partnered with market queens to train them on food safety, which the market queens taught their group members during meetings.

5.4.9 Challenges and solutions in implementing nutrition in the Eastern Region's agriculture sector

The participants of the regional-level Net-Mapping meeting highlighted challenges in implementing nutrition in the agriculture sector. Participants identified a major challenge with the inadequate provision and untimely release of funds to carry out projects. Funding issues posed delays in carrying out agriculture activities and reduced their efforts to incorporate nutrition-related activities into their work plans. Moreover, NSA interventions planned at the decentralized levels were abandoned due to a lack of funding. For instance, participants noted that in 2019, a plan was developed for implementing nutrition-related activities within the agriculture sector in the Eastern Region but had not commenced due to a lack of funding. Participants also proposed that decentralization efforts needed to be enhanced by encouraging participation among locals to engage in and take ownership of projects and programs that concerned them.

Most participants expressed a low sense of belonging to the local government service and emphasized the importance of embracing their dual identities as both sectoral (MoFA) and

local government representatives. They encouraged leveraging this dual identity to enhance their involvement in local government affairs. Participants mentioned that recognizing the DoA as an active participant in local government activities will help prioritize agriculture-related initiatives and ensure the timely and increased flow of funds, as highlighted in the following quote:

> "*As DoA staff, we should see ourselves as part of the local government and be abreast with the protocols and operations at the local level so that we can get some priority when it comes to releasing funds for our implementation. And if possible, look at ways in which we can try to lobby and then get some sort of funding aside from the normal flow to actually implement some of these activities.*" – [Net-Map meeting participant]

A second challenge was the limited prioritization of nutrition-related activities in agriculture budgets. The 'Modernizing Agriculture in Ghana' project, which funded most agriculture activities, only stipulated that 10 – 15% of their funds should be allocated to nutrition-related activities within the agriculture sector. The participants suggested a solution: advocating for strengthening the inclusion of nutrition-related activities within their respective agriculture budgets.

Participants recognized that the project 'Support to Reduction in Malnutrition in Women and in Vulnerable Populations Through Food-based Approaches' was an important move towards achieving multisectoral collaboration for nutrition implementation and a vital element in addressing malnutrition issues within the agriculture sector at the country level. However, participants pointed out weak coordination and collaboration on other nutrition-related projects in the Eastern Region. For instance, participants reported that the 'Ghana School Feeding' program's monitoring team, which comprised the DoA, Ghana Education Service, and the Ministry of Gender, Children and Social Protection, was occasionally functioning in monitoring. Moreover, participants proposed that strengthening collaboration on projects that

will enhance nutrition should be promoted to avoid duplication of efforts, as captured in the quote below:

> *"Sometimes we think we are in our corner, we don't belong to the assembly, we are MoFA. You know, sometimes, that kind of thing, they must call us before we come. Sometimes, we should also be nosey and be involved in activities. I know the health people are doing a lot regarding gender and nutrition-related projects. Let's get involved."* – [Net-Map meeting participant]

Participants also noted that most private-entity-led projects within their jurisdictions commenced and ended without the knowledge of the DoA, often leading to duplication of efforts and projects encountering failure. The participants proposed encouraging independent bodies carrying out nutrition-related projects within their jurisdiction to inform them properly before they commence such projects. In so doing, the DoA could mainstream such projects into their activities once they have ended and channel limited financial resources to projects that would have an impact and eliminate duplication of efforts within their respective jurisdictions. For instance, the 'Farmer Field School' project funded by Deutsche Gesellschaft für Internationale Zusammenarbeit was mainstreamed into the DoA's activities after it had ended to build the capacity of farmers to increase food production and helped farmers treat their farming activity as a business.

During the meeting, participants brought up the issue of limited nutrition education in their respective jurisdictions, which they believed was leading to reduced consumption of indigenous foods and an increase in the consumption of processed foods, as highlighted in the quote below:

"But the problem is that most people are not patronizing what we have. I mean, they're not eating indigenous food but prefer processed foods". – [Net-Map meeting Participant]

Participants proposed the identification of nutrition gaps within a specific jurisdiction to inform sensitization messages used in the district as a solution captured in the quote below:

"We need serious sensitization and promotion of the backyard garden to improve nutrition. Let's do the promotion and sensitization on the consumption of local foods because they are abundant here and they are cheap". - [Net-Map meeting Participant]

Finally, participants remarked that to promote the implementation of nutrition within the agriculture sector, MoFA needed to consider past policies like the 'Operation Feed Yourself' policy to encourage the production of micronutrient-rich foods through backyard gardening, especially in peri-urban areas.

5.5 Discussion

5.5.1 Net-Map for improving multi-sectoral collaboration within nutrition-sensitive agriculture interventions

This study aimed to identify stakeholders involved in NSA implementation at the regional and district levels. To the authors' knowledge, this is the first sub-national level stakeholder mapping for NSA implementation within Ghana's agriculture sector. The findings of this study complement the national-level stakeholder analysis of agriculture-for-nutrition policymaking [20] and inform strategies for nutrition policymaking and implementation within Ghana's agriculture sector to tackle malnutrition.

The maps produced in this study for formal command, funding, dissemination, advocacy, and technical assistance indicated the various types of stakeholder engagements, influence, and

their roles in NSA implementation. The maps showed that diverse stakeholders collaborated in developing and implementing interventions in the Eastern Region. These stakeholders had diverse roles, mandates, strategic orientations, influence, and linkages. The maps developed in this study indicate that collaboration among stakeholders in the agriculture sector is necessary.

Previous studies have highlighted that limited coordination capacity often hinders collaboration on NSA interventions [21 -27]. Even though WIAD was responsible for mainstreaming nutrition into agriculture, all other stakeholders must contribute by also mainstreaming nutrition into the agricultural activities they implemented. Yet, weak cross-sectoral coordination and collaboration hampered this kind of mainstreaming, often resulting in duplication of efforts or giving conflicting messages to recipients. For instance, a review of village and commercial-based poultry in Ghana showed that agriculture extension agents promoted the selling of produce for income. At the same time, health workers encouraged farmers to use their products for food [28]. This discrepancy can be attributed in part to government institutions being designed to work in silos [29]. Moreover, the agriculture sector had limited capacity to reach out and participate effectively in collaborative interventions across all levels [30]. Levison and MacLachlan [31] further explained that effective collaboration on nutrition-related activities within institutions and across sectors at both the national and community levels in lower- and middle-income countries remained elusive. Moreover, several country-specific studies reported the inability of the agriculture sector to collaborate with other sectors at the local level due to a lack of coordination capacity, a lack of trust or communication barriers between sectors, limited resources, competing priorities, and inadequate political will to support cross-sectoral collaboration [28, 29, 32 - 40]. For effective collaboration and coordination in Ghana's agriculture sector, the Net-Map method could be used as a first step to identify the different types of stakeholders, their engagements,

functions, and their technical and core competencies at the institutional level to leverage opportunities and synergies across these institutions to promote nutrition-sensitive agriculture intervention implementation for desired outcomes.

5.5.2 Implications of decentralization for nutrition-sensitive agriculture implementation within Ghana's agriculture sector

This study identified a major funding barrier with decentralization within Ghana's agriculture sector, adversely affecting the implementation of agriculture activities. Ghana's 1993 Local Government Act provides the legal framework for implementing effective decentralization. The central government (comprised of national governmental ministries) oversaw policy planning, and the local government pursued implementation [41]. The agriculture sector was one of the first sectors to experience strengthened decentralization in 2012. This resulted in the Department of Food and Agriculture at the regional and district levels (now known as the DoA) being devolved from the central government to the Metropolitan, Municipal, and District Assemblies under the MLGRD. Hence, agricultural staff were transferred from the national civil service to the local government service. This major institutional shift made provision for agriculture implementers to make decisions over development priorities in consultation with locals and with a large degree of independence from the central government [42-44].

The study identified that the result of strengthened decentralization within Ghana's agriculture sector raised a funding concern for implementation and service delivery on planned agriculture activities. This finding was confirmed by Resnick [43], who also reported that funding delays and insufficiency from the Ministry of Finance and Economic Planning and the Metropolitan, Municipal, and District Assemblies (internally generated revenue accounting for 3.7% of expenditures in the agriculture sector) were major challenges for agricultural policy implementation. The Local Government Instrument (LI 1961) introduced

a composite budget system, which integrated the budgets of all the separate departments of the Metropolitan, Municipal, and District Assemblies into an overall budget [45]. Several bureaucratic processes hindered the timely release of funds at the local government level as the Executive Committee (chaired by the District Chief Executive) finalized the composite budgets, which were then presented at a regional hearing. After the regional hearing, the composite budget went to the General Assembly[19] for approval and then sent to the Regional Coordinating Councils, which collate and coordinate the composite budgets from the respective regions for final submission to the Ministry of Finance and Economic Planning [44]. Analysis of Metropolitan, Municipal, and District Assemblies budgets since the decentralization process in 2012 showed that agriculture indeed received fewer resources (an average of 7.7% of the total budget share between 2012 and 2016) [43]. Consequently, nutrition-related activities were less likely to be prioritized when resources were limited [27, 33].

Moreover, staff recruitment, fund mobilization, data collection, and reporting for the DoA occurred through the local government service, while agricultural policymaking and planning were led by the MoFA [20]. Even though the regional and district level DoA were no longer under MoFA, MoFA was still responsible for providing technical backstopping, coordination, high-level technical support, capacity building, leading policymaking, and providing funding to the DoA for specific national projects that were intended to be implemented at the district level. Most DoA staff in our study did not see themselves as part of the local government service. This finding was attributed to the minimal importance the local government service placed on agriculture due to agriculture's service delivery function, which often took money away from the local government service instead of proposing physical projects that would

[19] Includes all members from the political branch of the MMDAs (that is 70% MMDA members elected by the citizens and 30% MMDA members appointed by the president)

generate funds [44]. Despite the less importance placed on agriculture within the local government service, Resnick [43] reported that 70% of DoA staff in their study saw themselves as integral to the district's development and engaged regularly with other departments in the local government service, while 79% claimed that their relationship with other departments in the local government service had improved.

As described above, the institutional arrangements accompanying decentralization within the agriculture sector may be flawed because implementation activities in the district were based on the local government's discretion and interest in allocating funds for agriculture implementation. Moreover, DoA officials under the local government system stated they had less decision-making autonomy than they previously enjoyed under the central government system and that the DoA could also not fund most of their planned activities [43]. Even though the DoA saw farmers as major partners in implementation, insufficient funding contributed to the inadequate involvement of farmers in drafting district development plans or communicating with them about what was contained in the plans. Given that nutrition outcomes are more visible at the individual level, it is important to integrate local nutrition priorities, particularly those of farming households, into agricultural planning, as nutrition initiatives are incorporated into the work plans of the DoA. Moreover, this study revealed no direct link between the local government service and MoFA except through the DoA. This institutional structure may compromise sub-national level coordination and sectoral accountability and may affect the implementation of nutrition-related activities within Ghana's agriculture sector.

5.5.3 Strengths and limitations of the study

Our research study is the first to apply the Net-Map method to understand NSA implementation in the agriculture sector in the Eastern Region of Ghana. This study focused on the agriculture sector in the Eastern Region of Ghana, which was purposively selected for

exploration. Therefore, it would be difficult to generalize the findings of this study to the entire country. However, applying the Net-Map method to NSA implementation enabled this paper to describe the connections and influence of stakeholders from a social network perspective to allow policymakers to visualize their networks. The Net-Map method may guide the identification and analysis of stakeholders in a similar context. Since the Net-Mapping method was based on participants' perspectives, there is a possibility of subjectivity in their responses based on their individual experiences and interactions with other stakeholders in their network. Thus, subjectivity may lead to perception gaps[20] [46, 47]. For instance, a perception gap was identified with influence scoring when participants did not give equal scores to stakeholders performing similar roles (for example, provision of funds). Moreover, not all stakeholders were assigned influence scores (for example, the Consumer Rights Protection Agency) despite their existence in the network. Due to the influence of perception gaps, the current influence levels set in this study cannot be proven stable because participants may have overrated or underrated the stakeholders identified in this network.

5.6 Conclusion

The study showed that the Net-Map method was useful in identifying the most influential stakeholders and their connections for NSA implementation within the agriculture sector in the Eastern Region of Ghana. Implementing and sustaining NSA interventions needs careful analysis of all stakeholders' roles, influence, and capacities. Thus, NSA interventions could benefit from the maps developed in this study by leveraging the diverse roles and perceived influence of the stakeholders identified in the agriculture sector in the Eastern Region of Ghana. To improve collaboration, stakeholder engagements must be improved by increasing

[20] Perception gaps arise from the participants' intensity or frequency of interactions with certain stakeholders and sources of information

participation at the decentralized levels and strengthening collaboration and coordination mechanisms to support multisectoral actions that foster agriculture's ability to deliver nutrition more effectively.

Notwithstanding the need for high-level political will and highly motivated champions, advocacy for strengthening nutrition must be a vital concern of all stakeholders in the agriculture sector. Moreover, the relationships among stakeholders (as revealed by the Net-Maps in this study) must be given attention to promote collaboration in NSA interventions. With stakeholder Net-Mapping as an initial step in NSA intervention design, it is possible to establish clear operational processes on cross-sectoral interventions to reduce conflicts and power struggles during NSA intervention implementation. Finally, donors should incentivize collaboration efforts to encourage the right behaviour toward the implementation of nutrition-related activities in Ghana's agriculture sector, such as acknowledging stakeholders who incorporate adequate nutrition actions into their plans.

5.7 Acknowledgements

This paper was made possible with the support of the Canadian Queen Elizabeth II Diamond Jubilee Scholarships: Advanced Scholars (QES-AS) program. "The Canadian Queen Elizabeth II Diamond Jubilee Scholarships (QES) is managed through a unique partnership of Universities Canada, the Rideau Hall Foundation (RHF), Community Foundations of Canada (CFC) and Canadian universities. The QES-AS is made possible with financial support from IDRC and SSHRC". We acknowledge all Eastern Regional and district Department of Agriculture office participants who made time to participate and contribute to this study.

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Figure 5.1 Map of the Eastern Region of Ghana with the randomly selected districts for the Net-map exercise

Multiple stars in an area = Some districts/ municipalities were officially divided into two districts/ municipalities by the Government of Ghana (e.g. New Juaben has been divided into New Juabeng North and New Juabeng South)

Image adapted from Wikimedia Commons at https://commons.wikimedia.org/wiki/File:Districts_of_the_Eastern_Region_(2012).svg#file [accessed 2 August 2023].

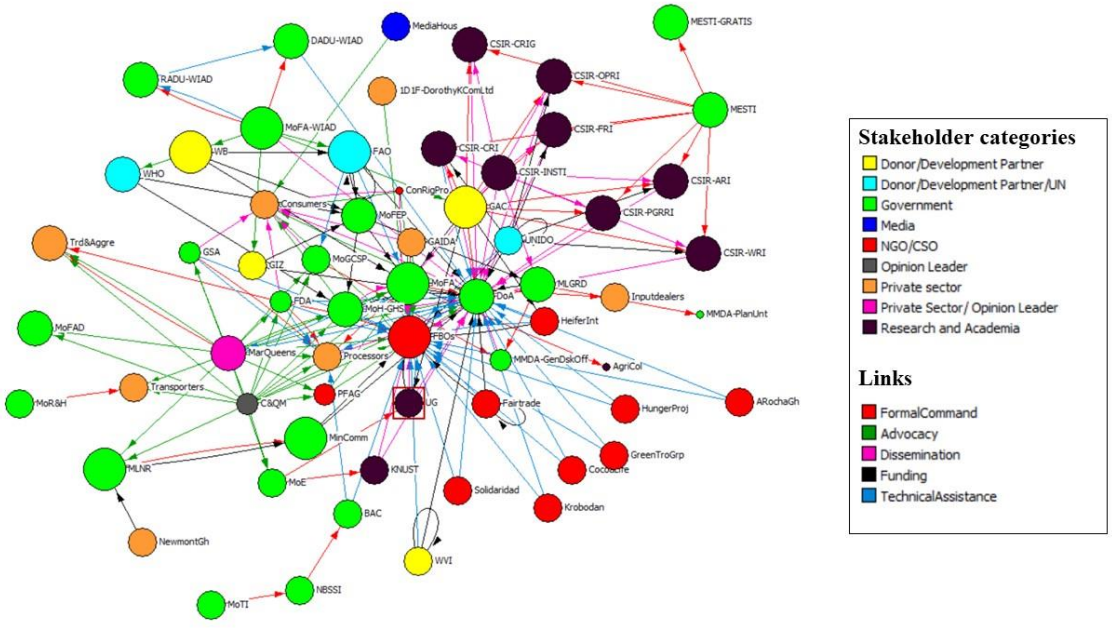
Figure 5.2 Participants' responses from the stakeholder in-person Net-Map group meeting at the regional level showing the materials used in the Net-Mapping activity.

Post-its

Coloured pens

Pieces of wood

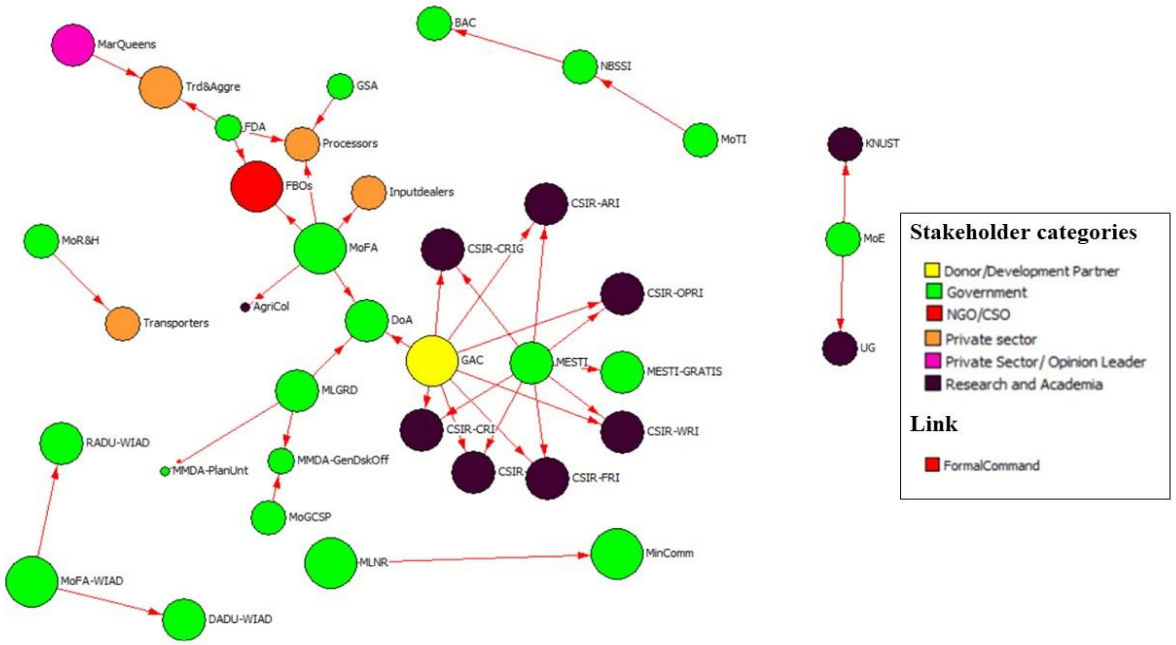
Figure 5.3 The Eastern Regional network of stakeholders engaged in the planning and implementation of NSA programs and interventions



The size of the circles represents stakeholders' influence scores. Bigger circles = high perceived influence

Stakeholders' full names are found in Table 5.5

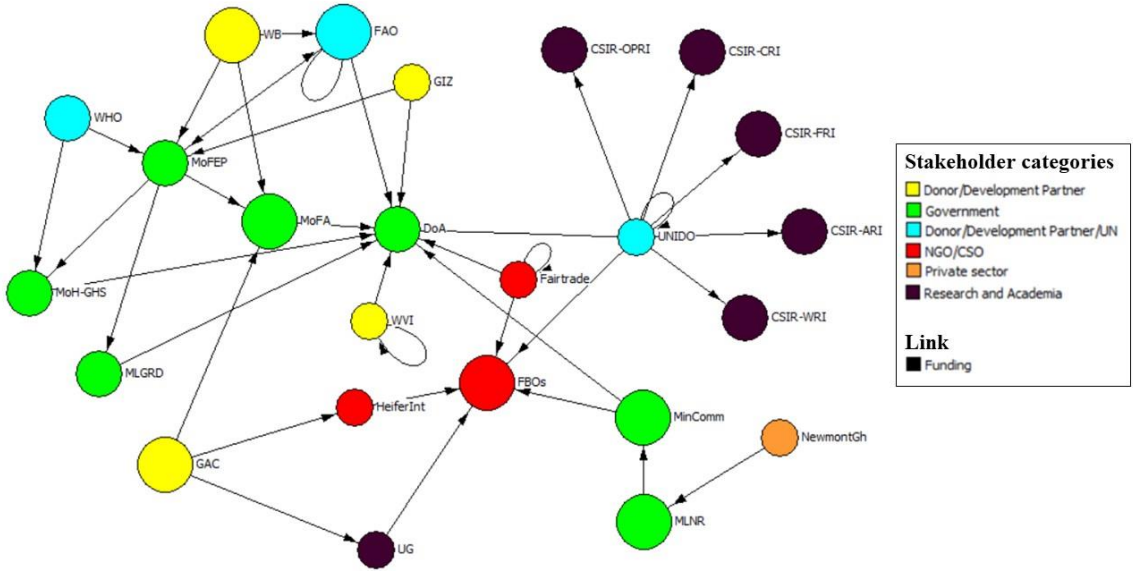
Figure 5.4 The Eastern Regional stakeholder network showing linkages for formal command among stakeholders in the implementation of NSA interventions and programs



The size of the circles represents stakeholders' influence scores. Bigger circles = high perceived influence

Stakeholders' full names are found in Table 5.5

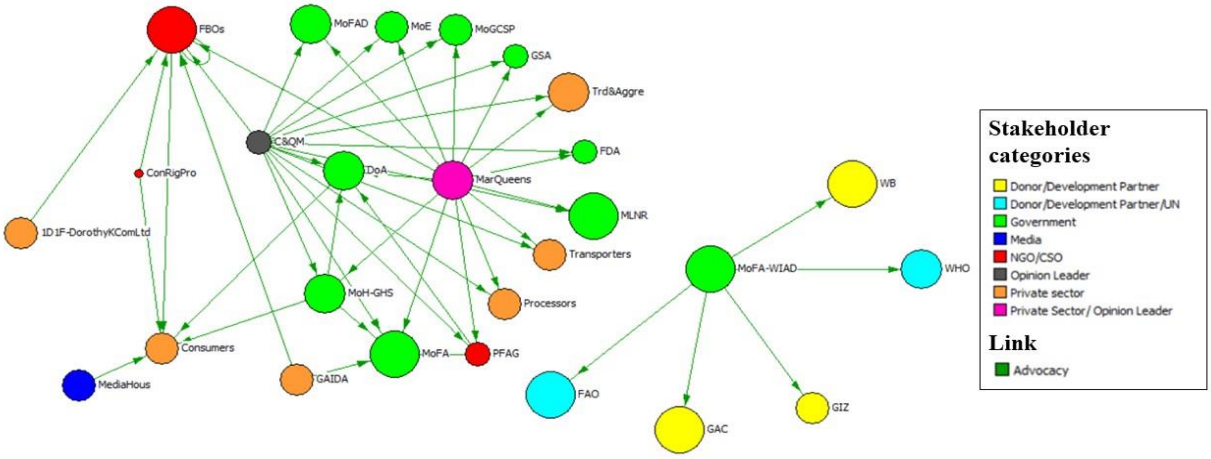
Figure 5.5 The Eastern Regional stakeholder network showing funding linkages among stakeholders in the implementation of NSA programs and interventions



The size of the circles represents stakeholders' influence scores. Bigger circles = high perceived influence

Stakeholders' full names are found in Table 5.5

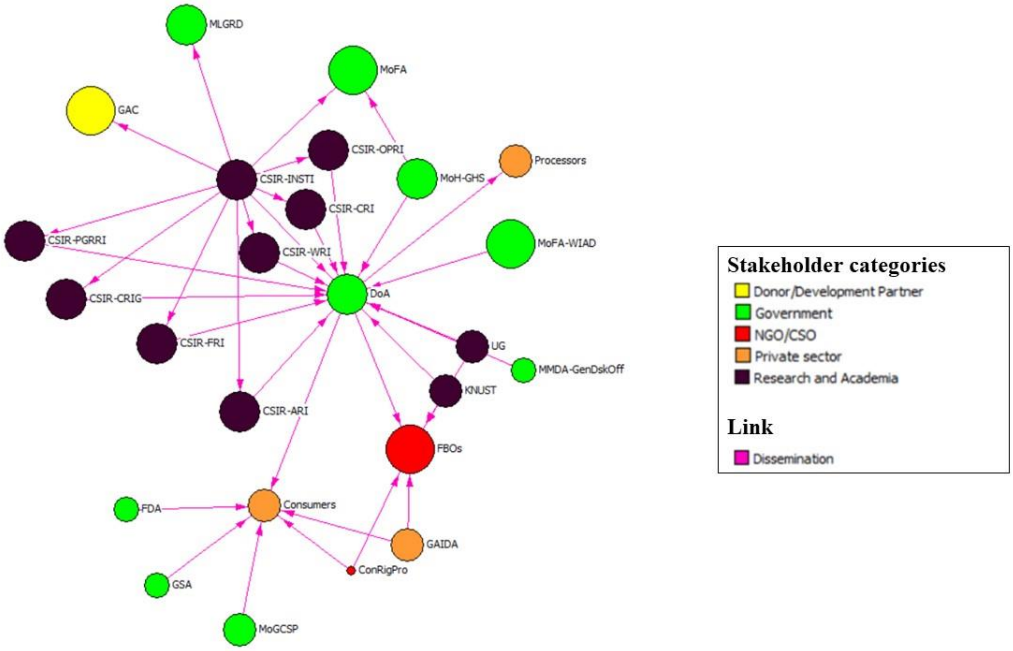
Figure 5.6 The Eastern Regional advocacy network showing stakeholders engaged in the implementation of NSA interventions and programs



The size of the circles represents stakeholders' influence scores. Bigger circles = high perceived influence.

Stakeholders' full names are found in Table 5.5

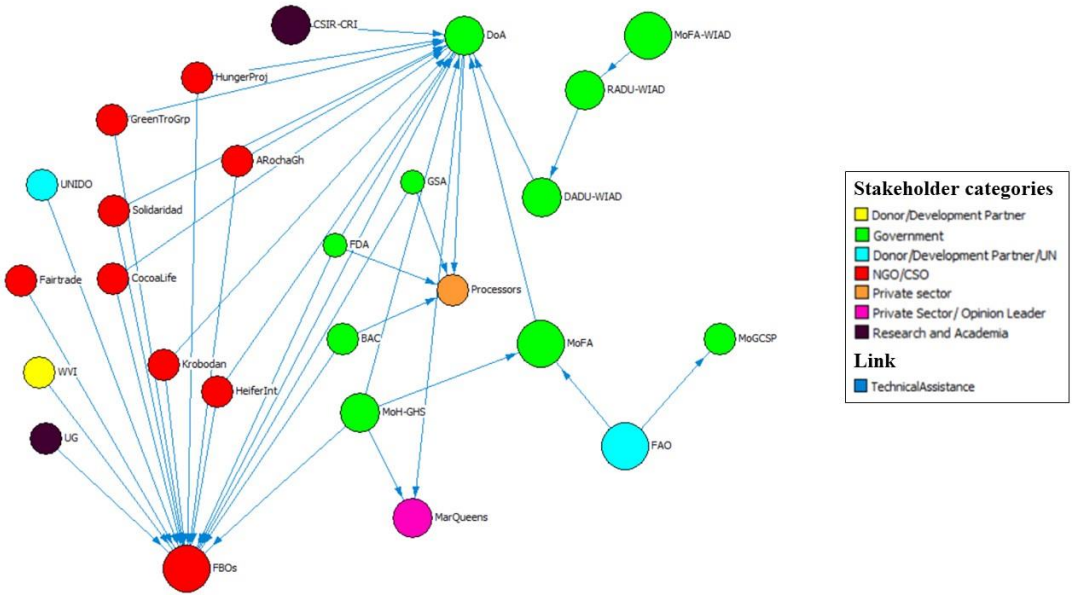
Figure 5.7 The Eastern Regional stakeholder network showing stakeholders engaged in the dissemination of nutrition information among stakeholders in the implementation of NSA programs and interventions



The size of the circles represents stakeholders' influence scores. Bigger circles = high perceived influence

Stakeholders' full names are found in Table 5.5

Figure 5.8 The Eastern Regional stakeholder network showing technical assistance linkages among stakeholders engaged in the implementation of NSA programs and interventions.



The size of the circles represents stakeholders' influence scores. Bigger circles = high perceived influence

Stakeholders' full names are found in Table 5.5

Table 5.1 Questions used in the regional-level in-person stakeholder Net-Map exercise

Theme explored	Question
Stakeholder identification	• Who participates in planning and implementing nutrition-sensitive agriculture programs, projects, and interventions developed in line with the Food and Agriculture Sector Development Policy 2 and its corresponding medium-term investment plans at the regional level?
Connections/links	• Who gives formal command to who? • Who gives funding to who? • Who gives technical assistance to who? • Who provides advocacy to who? • Who disseminates nutrition or nutrition-related information to who?
Opinion leaders	• Are there any individuals you would describe as opinion leaders in the planning and implementation process? ○ Probe: Are there any champions in the planning and implementation process that influenced the development of these programs? (NB: they may not necessarily be in the field of agriculture)
Influence levels	• How influential is each actor in the policy formulation process in Ghana's 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 5.2 Definition of network descriptions from statistical analysis output

Network property	Definitions
Degree centrality	Degree centrality of a stakeholder network represents the number of linkages associated with a single stakeholder (for example, the stakeholders with the most connections). There are two types of degree centrality: 1) in-degree (representing the number of incoming linkages) and 2) out-degree (representing the number of outgoing linkages). In-degree indicates how other stakeholders in a network influenced a particular stakeholder, while out-degree suggests that a particular stakeholder influenced other stakeholders in the same network.
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 one signals sparse connections across stakeholders in the network.
Network diameter	The longest graph distance between any two stakeholders in the network (i.e., the distance between the two most distant stakeholders)

Table 5.3 Number of stakeholders identified in the in-person Net-Map exercise

Stakeholder category	Number of stakeholders	Percent of total stakeholder
Government	25	38
Donor/ Development Partner/ UN	7	11
Private sector	8	12
NGO/CSO	11	17
Private sector/ Opinion Leader	1	2
Research and Academia	11	17
Media	1	2
Opinion Leader	1	2

NGO – Non-governmental organization
CSO – Civil Society Organization
UN – United Nations Organizations

Table 5.4 Number of stakeholder links identified in the in-person Net-Map exercise

Link type	Number of links	Percent of total links
Formal Command	38	19%
Technical Assistance	39	20%
Funding	38	19%
Advocacy	47	24%
Dissemination	36	18%

Table 5.5 List of stakeholder acronym, influence level, stakeholder category, and full names identified in the in-person Net-Map exercise

Stakeholder abbreviation	Full name	Category	Influence score	Degree[a]	In-Degree[b]	Out-Degree[c]
MoFA	Ministry of Food and Agriculture	Government	5	15	10	5
MoFA-WIAD	Women in Agricultural Development Directorate of the Ministry of Food and Agriculture	Government	5	8	0	8
MoFA-PPRSD	Plant Protection and Regulatory Services Directorate of the Ministry of Food and Agriculture	Government	5	0	0	0
MLNR	Ministry of Lands and Natural Resources	Government	5	4	3	1
MinComm	Minerals Commission	Government	5	3	1	2
FAO	Food and Agriculture Organization of the United Nations	Donor/Development Partner/UN	5	8	3	5
GAC	Global Affairs Canada	Donor/Development Partner	5	13	2	11
WB	World Bank	Donor/Development Partner	5	4	1	3
FBO	Farmer Based Organizations	NGO/CSO	5	27	25	2
RADU-WIAD	Regional Agricultural Development Unit - Women in Agricultural Development Directorate	Government	4	2	1	1
DADU-WIAD	District Agricultural Development Unit - Women in	Government	4	3	2	1

	Agricultural Development Directorate					
MoH-GHS	Ministry of Health of Ghana - Ghana Health Service	Government	4	9	4	5
MLGRD	Ministry of Local Government, Decentralization & Rural Development	Government	4	5	2	3
DoA	Department of Agriculture - Ministry of Local Government, Decentralization & Rural Development	Government	4	38	34	4
MoFAD	Ministry of Fisheries and Aquaculture Development	Government	4	2	2	0
MESTI	Ministry of Environment, Science, Technology and Innovation	Government	4	8	0	8
MESTI-GRATIS	Ministry of Environment, Science, Technology and Innovation - GRATIS Foundation	Government	4	1	1	0
MoFEP	Ministry of Finance and Economic Planning	Government	4	7	4	3
WHO	World Health Organization	Donor/Development Partner/UN	4	3	1	2
Trd&Aggre	Traders and Aggregators	Private sector	4	3	3	0
CSIR-PGRRI	Council for Scientific and Industrial Research - Plant Genetic Resources Research Institute	Research and Academia	4	4	3	1
CSIR-CRIG	Council for Scientific and Industrial Research - Cocoa Research Institute of Ghana	Research and Academia	4	4	3	1

CSIR-CRI	Council for Scientific and Industrial Research - Crops Research Institute	Research and Academia	4	5	4	1
CSIR-OPRI	Council for Scientific and Industrial Research - Oil Palm Research Institute	Research and Academia	4	5	4	1
CSIR-FRI	Council for Scientific and Industrial Research - Food Research Institute	Research and Academia	4	5	4	1
CSIR-ARI	Council for Scientific and Industrial Research - Animal Research Institute	Research and Academia	4	5	4	1
CSIR-WRI	Council for Scientific and Industrial Research - Water Research Institute	Research and Academia	4	5	4	1
CSIR-INSTI	Council for Scientific and Industrial Research - Institute for Scientific and Technological Information	Research and Academia	4	11	0	11
MarQueens	Market Queens	Private Sector/ Opinion Leader	4	16	2	14
MoGCSP	Ministry of Gender, Children and Social Protection of Ghana	Government	3	5	3	2
MoR&H	Ministry of Roads and Highways	Government	3	1	0	1
MoTI	Ministry of Trade and Industry	Government	3	1	0	1
NBSSI	National Board for Small Scale Industries	Government	3	2	1	1
BAC	Business Advisory Centers	Government	3	3	1	2
GEPC	Ghana Export Promotion Council	Government	3	0	0	0
MoE	Ministry of Education	Government	3	4	2	2

WVI	World Vision International	Donor/Development Partner	3	4	1	3
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit	Donor/Development Partner	3	3	1	2
Fairtrade	Fairtrade Africa	NGO/CSO	3	4	1	3
UNIDO	United Nations Industrial Development Organization	Donor/Development Partner/UN	3	9	1	8
Krobodan	Krobo Danish Association	NGO/CSO	3	2	0	2
CocoaLife	Mondelez International - Cocoa Life	NGO/CSO	3	2	0	2
Solidaridad	The Solidaridad Network	NGO/CSO	3	2	0	2
HungerProj	The Hunger Project	NGO/CSO	3	2	0	2
GreenTroGrp	Green Tropics Group	NGO/CSO	3	2	0	2
ARochaGh	A Rocha Ghana	NGO/CSO	3	2	0	2
HeiferInt	Heifer International	NGO/CSO	3	3	1	2
NewmontGh	Newmont Corporation	Private sector	3	1	0	1
Inputdealers	Input Dealers	Private sector	3	1	1	0
GAIDA	Ghana Agri-Input Dealers Association	Private sector	3	3	0	3
1D1F-DorothyKComLtd	Dorothy Kam Company Limited under One District One Factory Ghana	Private sector	3	1	0	1
Consumers	Consumers	Private sector	3	9	9	0
Processors	Processors	Private sector	3	7	7	0
Transporters	Transporters	Private sector	3	3	3	0
MediaHous	Media Houses	Media	3	1	0	1
KNUST	Kwame Nkrumah University of Science and Technology	Research and Academia	3	3	1	2
UG	University of Ghana	Research and Academia	3	4	2	2

MMDA-GenDskOff	Metropolitan, Municipal and District Assemblies - Gender Desk Offices	Government	2	3	2	1
FDA	Food and Drug Administration	Government	2	7	2	5
GSA	Ghana Standards Authority	Government	2	5	2	3
PFAG	Peasant Farmers Association of Ghana	NGO/CSO	2	4	2	2
C&QM	Chiefs and Queen Mothers	Opinion Leader	2	14	0	14
MMDA-PlanUnt	Metropolitan, Municipal and District Assemblies - Planning Unit	Government	0	1	1	0
ConRigPro	Consumer Rights Protection	NGO/CSO	0	2	0	2
AgriCol	Agricultural Colleges	Research and Academia	0	1	1	0

[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
NGO – Non-governmental organization
CSO – Civil Society Organization
UN – United Nations Organizations

Bridge 4

The preceding chapter (Manuscript 3) examined the stakeholders involved in nutrition-sensitive agriculture program implementation, their connections, and perceived influence. Sixty-five stakeholders were identified to have a role in nutrition-sensitive agriculture program implementation in the Eastern Region of Ghana. Previous studies have highlighted the importance of assessing the capacities of stakeholders involved in implementing programs for several reasons. Firstly, evaluating stakeholders' capacity helps understand each stakeholder's resources, expertise, and capabilities, ensuring that the right stakeholders are involved in activities that align with their strengths. Secondly, assessing their capacities allows for identifying potential limitations that may hinder the successful implementation of programs. Furthermore, assessing stakeholders' capacities helps develop tailored strategies for engagement and support, including identifying training needs, technical assistance requirements, and other forms of support that can empower stakeholders to contribute to the implementation of programs effectively. Based on these reasons, the next chapter (Manuscript 4) used qualitative methods to assess the capacity of district-level agriculture staff to implement nutrition-sensitive agriculture programs in the Eastern Region of Ghana.

Chapter 6. Manuscript 4

Nutrition capacity assessment of Ghana's agricultural sector reveals the impacts of decentralization on nutrition-sensitive agriculture program delivery

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Supported by: The Canadian Queen Elizabeth II Diamond Jubilee Scholarships (QES) is managed through a unique partnership of Universities Canada, Rideau Hall Foundation (RHF), Community Foundations of Canada (CFC), and Canadian universities. The Queen Elizabeth Scholarship-Advanced Scholars (QES-AS) is made possible with financial support from International Development Research Center (IDRC) and Social Sciences and Humanities Research Council (SSHRC).

6.1 Abstract

Food systems determine the quantity, quality, diversity, and nutritional content of the foods available for human consumption. Shaping food systems to improve nutritional outcomes requires understanding the different elements, such as agriculture extension, that influence nutrition-sensitive agriculture policy formulation and implementation. To strengthen nutrition capacity development efforts within the agricultural sector, there is a need to better understand the nutrition-related programming needs and challenges among agricultural extension staff. Using the Eastern Region of Ghana as a case study, the analysis assessed the capacity of district-level staff to implement nutrition-related activities within Ghana's agricultural sector. The Organizational Capacity Assessment module of the Global Capacity Needs Assessment methodology was adapted to conduct focus group discussions among 6 - 10 district-level staff in each of 11 randomly selected districts in the Eastern Region. Seventy-three local government staff (27% female) working in agriculture, health, finance, planning, gender, and business participated in the focus group discussions. Data were analyzed using inductive and deductive thematic analysis approaches, with the final stages of the analysis focusing on developing a framework that explained the connections between the identified themes to reflect the capacity of agricultural staff to carry out nutrition-sensitive agriculture programs in Ghana's agricultural sector. Agricultural staff's capacity to implement nutrition-sensitive agriculture programs depended on many interrelated factors, including structural issues, financial investments, operational support, and human resources. Partnerships for nutrition-sensitive agriculture at the district level usually involved actors who were development partners (e.g., Food and Agriculture Organization of the United Nations), non-governmental organizations (e.g., World Vision International), other local governmental sectors (e.g., Ghana Health Services), and institutions from local communities (e.g., churches and schools). However, improvements in factors such as financial investments

in nutrition-sensitive agriculture programming were considered necessary to effectively use the agricultural extension delivery system to deliver nutrition-sensitive programs within Ghana's agriculture sector. There is a need to address these factors and strengthen collaboration with other departments in the local government system to successfully implement nutrition-sensitive agriculture programs, thereby contributing to the development of sustainable food systems.

Keywords: Nutrition-sensitive agriculture, Nutrition capacity, Decentralization, Ghana

6.1 Introduction

Food systems[21] provide an opportunity to produce diverse food of adequate nutritional value in an environmentally sustainable manner, providing healthy diets for all within a population [1]. Smallholder farmers who are critical players in a food system face a high risk of food insecurity that reduces productivity [2]. In recognizing the role food systems play in reducing malnutrition, it is critical that efforts to address malnutrition within a food system target all stages: food production, processing, transporting, marketing, consumption and disposal. These efforts to address malnutrition must stress the need for good nutrition and the importance of the agricultural sector in supporting the livelihoods of smallholder farmers [3]. The agricultural sector plays a role in ensuring positive nutrition outcomes due to its food production ability in terms of quantity and quality [4]. Incorporating 'nutrition sensitivity' within a food system allows food systems to deliver healthy diets to achieve better nutrition outcomes [5].

An estimated 3.6 million people in Ghana were food insecure in 2020, with the majority (78%) in rural areas [6]. While undernutrition persists in Ghana, obesity and diet-related non-communicable diseases are also rising rapidly [7]. The 2022 Ghana Demographic and Health Survey revealed rates of stunting (18%), wasting (6%), and underweight (12%), suggesting that stunting prevalence improved only marginally and that the prevalence of child wasting and underweight children has worsened since the 2014 survey. [8]. Other nutrition concerns include a continued high prevalence of anemia among children 6-59 months (49%), pregnant women (51%), and non-pregnant women of reproductive age (40%) [8] and a significant increase in adult obesity (i.e. from 10% in 1993 to 40% in 2015) [9]. The nutrition problems

[21] Food systems encompass all activities, stakeholders, and infrastructure involved in the production, processing, transporting, marketing, consumption, and disposal of food [10].

described suggest the urgent need for food systems to ensure food security for all and to promote sustainable development.

Curbing malnutrition in Ghana requires a multisectoral approach due to nutrition's multidisciplinary and cross-sectoral nature. Good nutrition results from a healthy diet, adequate health care, and proper sanitation [10]. Healthy diets, proper sanitation, and healthcare depend on institutional factors such as providing potable water, quality health services, and transportation within a food system. Hence, efforts to improve nutrition require people and institutions within a food system who can initiate change in the nutrition-sensitive agriculture (NSA) policy formulation and implementation. Fanzo et al. [11] identified agricultural extension workers as a vehicle to improve the nutrition of rural communities due to their close interactions with farmers in different settings. Agricultural extension workers have an established infrastructure through which they provide crop and livestock production services to farmers and offer a unique opportunity for nutrition-related activities to be implemented within the agricultural sector [11, 12]. Hence, equipping agricultural extension workers with knowledge, skills, and competencies in nutrition is essential to mainstreaming nutrition into agriculture and promoting nutrition-sensitive agriculture. A better understanding of the needs, challenges, and interactions among agricultural extension staff at the organizational level will strengthen nutrition capacity development efforts within the agricultural sector. Using the Eastern Region of Ghana as a case study, the study assessed the capacity of district-level staff to implement NSA programs within Ghana's agricultural sector.

6.2 Methods

6.2.1 Study Approach

A case study approach was used to understand the capacity of agricultural staff within Ghana's agriculture sector to implement NSA programs. The focus group discussion (FGD) guide (Table 6.1), adapted from the Organizational Capacity Assessment module of the Global Capacity Needs Assessment methodology [13], was used to understand the organizational mandate with respect to NSA programs, financial investments for NSA programs, human resources deployed in NSA programming, constraints in delivering NSA interventions, operational support for implementing NSA programs, and building effective partnerships for NSA programming.

6.2.2 Description of the study area

The study was carried out in the Eastern Region of Ghana, which spans a total land area of 19,323 square kilometres [14]. According to the Ghana Population Census, 2,633,154 people live in the region, with about 72% living in rural communities. [14, 15]. The region's main economic activity is agriculture, which employs about 67% of the population [14, 15]. The region is made up of 33 Municipal and District Assemblies (MMDAs) comprising 13 municipalities and 20 district assemblies. The Ministry of Food and Agriculture works with offices (known as the DoA) located within the District Assembly under the local government system in all the districts and municipalities and are headed by district or municipality directors [16]. The majority of agricultural staff (395) in the region are extension workers, of which only 10% are females [16].

6.2.3 Sampling technique and data collection

Fifteen districts/ municipalities[22] (Figure 6.1) were randomly selected from the thirty included in the study (three districts were excluded due to accessibility issues). Seventy-three participants were purposefully selected from the DoA based on 1) staff position and 2) knowledge of the NSA programs and projects within their respective jurisdictions between 2007 and 2022.

Data were collected using FGDs following a semi-structured guide (Table 6.1). The FGD guide was pilot-tested with eight participants from one DoA office. Eleven FGDs were conducted in 11 DoA offices between April and May 2022. To ensure that the views of all selected districts/municipalities were represented, we aimed to include approximately 6 -10 participants per group. All FGDs were conducted in English and were 1.5 to 2 hours long. The FGDs were transcribed verbatim and reviewed after each FGD session to determine whether saturation was reached.

6.2.4 Data analysis

Eleven transcripts were imported into MaxQDA Analytics Pro 2022 software. Data were analyzed using thematic analysis [17]. The first stage of the analysis involved deductive coding with seven pre-determined themes based on the Global Capacity Needs Assessment methodology. The second stage of analysis involved inductive coding, which identified two additional themes from the transcripts- gender and structural issues- which played critical

[22]The 15 districts/municipalities included were 1) New Juaben South Municipal, 2) Kwahu West Municipal, 3) Upper Manya Krobo District, 4) Akuapim South District, 5) Kwahu South District, 6) Upper West Akim District, 7) Suhum Municipal, 8) Akuapim North Municipal, 9) Birim North District, 10) Abuakwa South Municipal, 11) Nsawam Municipal, 12) Lower Manya Krobo Municipal, 13) Yilo Krobo Municipal, 14) New Juaben North Municipal, and 15) Abuakwa North Municipal

roles in agricultural staff's capacity to implement NSA programs. The final stage of the analysis involved the development of a framework explaining the connections between the identified themes to reflect the capacity of agricultural staff to carry out NSA programs in Ghana's agricultural sector.

6.2.5 Ethical clearance

The ethical clearance for this study was obtained from the McGill University Research Ethics Board Office (# 21-07-001) and the University of Ghana Ethical Committee for Humanities (# ECH 122/ 20-21. Prior to conducting the FGDs, informed written consent was obtained from all participants.

6.3 Results

6.3.1 Participants' characteristics

The FGDs included 73 local government staff, of whom 73% (n=53) were men and 27% (n=20) were women. Female participants were 40.1 ± 9.3 years old, while men were 41.5 ± 8.4 years old. Most participants (52%, n=38) were agricultural officers in crop and livestock production, extension, and engineering, while the rest were Directors of Agriculture (n=7), Women in Agriculture Directorate (WIAD) Officers (n=8), Senior Technical Officers (n=2), Nutrition Officers (n=2), Management Information Systems (MIS) Officers (n=8), a Gender Desk Officer (n=1), a Business Advisory Center Head (n=1), and an Agricultural Accountant (n=1). Additionally, some participants (n=5) had multiple roles (such as Agriculture Extension Officers, Market Enumerators, WIAD Officers, Monitoring and Evaluation Officers, or MIS officers). Male participants had spent 10.9 ± 7.7 years in service, while female participants had 11.4 ± 10.1 years in service. About 66% (n=34 men and 14 women) of the participants had a Bachelor's degree (in agriculture, management studies, sustainable agriculture, agriculture education, nutrition, marketing, banking and finance, or

administration), while the remaining participants had a master's degree (n=13, in postharvest technology, crop science, agronomy, public health, business administration, or agriculture extension), Diploma (n=7, in agricultural extension or marketing), or Certificate in Agriculture (n=5).

6.3.2 Framework describing agricultural staff's capacity to implement nutrition-sensitive agriculture programs

The capacity of agricultural staff to implement NSA programs depended on many interrelated factors. As shown in Figure 6.2, structural issues arising from the decentralization of agriculture were found to have the greatest negative impacts on staff capacity to implement NSA programs. Structural issues had cascading effects on many other areas, starting with financial investments in NSA. Decentralization in Ghana's agricultural sector contributed to insufficient agricultural funds, which were delayed in their release. Insufficient funds for vehicles, fuel and maintenance budgets, and staff training affected operational support and NSA program delivery. These deficiencies affected the scope and quality of NSA programs. As explained by one FGD participant,

> "*It all boils down to money. So, if money is there, I think our programs will be implemented successfully.*" – Male FGD participant

Not all linkages (arrows and lines in Figure 6.2) could be directly traced back to the decentralization of agriculture. Program delivery constraints were also affected by inadequacies in gender and human resources, as insufficient staff numbers often prevented agricultural staff from delivering NSA programs at the desired scale in their districts. Moreover, the underrepresentation of female staff affected their ability to deliver gender-targeted programs such as cooking demonstrations. Gender and NSA programs were also closely related, as many programs targeted women in communities due to their roles in food

preparation. Additionally, gender and financial support for NSA were often linked, as some donors had fixed amounts set aside for programs targeting women. For instance, the Modernizing Agriculture in Ghana project (funded by the Canadian government) stipulated that 10 -15% of the total DoA budget must be allocated to supporting women's activities.

Partnerships for NSA programs at the district level were linked to financial investments in NSA programs, as some partners brought their funding to projects being implemented at the district level, while others contributed funds directly to the DoA's activities. Certain partners, such as World Vision, sometimes assisted in building staff capacity with accompanying training. A participant further expressed concern about the limited capacity building the DoA received from their partners, explaining that:

> "*With regards to a particular project, … They [the partners] hardly come to train our staff for us to go and do a [nutrition] sensitive program for them [the partners] because they also have their own staff that they will rather train and rely more on them than those they are partnering with.*" – Male FGD participant

Moreover, while the DoA's organizational mandate did not explicitly prioritize NSA, many districts reported that NSA was reflected in their activities, such as food demonstrations. Finally, insufficient quantities and inadequate access to educational materials negatively affected program delivery by decreasing the effectiveness of staff and farmer training. The following sections explain in-depth the factors affecting staff capacity to deliver NSA programs at the district level in Ghana.

6.3.2.1 Structural issues affecting agricultural staff's capacity to implement nutrition-sensitive agriculture programs

Participants reported that decentralization was strengthened in Ghana’s agriculture sector in 2012 and, as a result, budgets for the DoA's routine activities were no longer controlled at the

national level but instead became part of the District Assembly, which is under the Ministry of Local Government and Rural Development. Agricultural funds for routine activities no longer came directly from Ghana's Ministry of Food and Agriculture but instead went through the District Assembly's composite budget system in which all local government department funds were pooled. However, funds for specific donor-funded projects still passed through the Ministry of Food and Agriculture to the DoA for project-specific implementation. Most participants reported that their District Assembly failed to prioritize agriculture, resulting in inadequate funds for agricultural activities, including NSA programs. As explained by one agricultural staff member:

> "*For me, decentralization though a good policy is not working in the agriculture department… The Department of Agriculture is treated as an orphan when it comes to support and planning by the District Assemblies*." – Male FGD participant

To compound this issue of inadequate funding, bureaucratic processes in District Assemblies caused these limited funds to experience extreme delays.

Decentralization in Ghana's agricultural sector has also resulted in a disconnect between the policymaking and implementation bodies. Agriculture and nutrition-related policies are enacted at the national level by the Ministry of Food and Agriculture and its partners, while funding and implementation for agriculture-nutrition programs are controlled at the district level under the local government system. One FGD participant summed up this issue:

> "[they had] *a policymaking body on its own and an implementing body too under another jurisdiction. Until they are able to streamline both the policymaking and implementation linkage, our problems with implementation will continue. That is where the problem actually is*." – Male FGD participant

6.3.2.2 Financial investments in nutrition-sensitive agriculture programs

Participants cited insufficient financial investments as the greatest obstacle to NSA program delivery. Inadequate funds affected the number and scope of NSA program delivery, preventing agricultural staff from carrying out all their planned programs in a year and reducing the number of communities reached by these programs partly due to insufficient vehicle fuel and maintenance funds. Inadequate funds also limited supplies of basic materials such as utensils and food products for cooking demonstrations, which agricultural staff regarded as some of their most important nutrition-sensitive programs. Shortages in materials and equipment often resulted in the cancellation of these demonstrations in favour of nutrition education via radio or television programs, which participants reported were beneficial but not as effective as hands-on demonstrations. As explained by one FGD participant:

> "*We have the officers to train, but because we don't have adequate funds, we can't train more people, and we can't do more demonstrations because each of the demonstrations needs more utensils to carry out the demonstrations, so I will say all challenges are limited to the funds situation*." – Female FGD participant.

Delayed funds also limited staff's capacity to deliver agricultural programs by forcing them to simultaneously implement first and second-quarter programs and cancel other important activities during the calendar year. Another FGD participant explained how delays in the release of agricultural funds affected staff training:

> "*Delays of funds make our work more difficult for us on the field. At times, if you don't have your own way [funds] to support, you will have to organize your training, …all you will do at that forum is to talk, but if the funds should come at the right time, we will also prepare well and deliver fully*" – Female FGD participant

The Modernizing Agriculture in Ghana (MAG) project, a Canadian initiative seeking to strengthen and modernize Ghana's agricultural sector with funding from 2017 to 2023, funded most of the DoA's activities through the Ministry of Food and Agriculture. Participants reported that MAG funds tended to be more on-time than the government of Ghana funds. While expressing gratitude for MAG's financial support, participants also noted that fixed fuel allowances were inadequate in cases of abrupt increases in fuel prices. Additionally, MAG was a temporary source of financial aid, and participants expressed extreme concern about their capacity to sustain NSA programs after MAG funding ended. When describing the state of agricultural programs without MAG, one respondent explained that:

> "*Before MAG… we had a no money syndrome, we were not able to organize these trainings and activities… The WIAD [officer] was basically financing her own programs in training… she will do the training alright but doesn't give them [farmers] anything, so it becomes a dry training… now that MAG is going, we will go back to our old system*." – Male FGD participant

Future continuation of NSA programs in Ghana requires adequate government funding, as called for by one respondent who claimed:

> "*The government have left agriculture in the hands of donor organizations, and now MAG, who was sponsoring virtually everything, is going. What then happens? So I think the government should walk the talk and invest in nutrition. They should put the right systems in place so that without these donors, the program can still run. Our main challenge is the funding, and if the government can fund, we will be able to do more and more*." – Male FGD participant

6.3.2.3 Gender and nutrition-sensitive agriculture program implementation

Participants in multiple districts reported that female agriculture extension agents were more effective at delivering cooking demonstration programs. However, all districts had more male than female staff, with one district not having a single female staff member. One FGD participant explained that:

> "*We have two female AEAs, and most of the time when we talk about nutrition, we normally limit it to a woman thing. We are only two women, and it's not enough, as we have huge tasks to perform. The male AEA involvement is not as effective as working with a female AEA. So, we don't have enough females to help out, and we will need more female staff on board to have a gender balance*." – Female FGD participant

While MAG currently requires 10 -15% of its funds to be allocated to WIAD's activities, this restriction will end with the program, leaving no concretely allocated funds for women's programs. Many NSA programs targeted women in the majority of the districts. For instance, the One District One Factory initiative targeted bakeries, usually female-owned and operated, with its training on making bread with orange-fleshed sweet potato.

6.3.2.4 Human resources for implementing nutrition-sensitive agriculture programs

Agricultural staff in each district consisted of a WIAD Officer, a Director, agriculture extension agents, Veterinary Officers, Zonal Officers[23], supervisors, and supporting staff (e.g., secretaries and drivers). The staff implementing NSA programs were 1) the WIAD Officers, who were in charge of planning, organizing, and supervising nutrition-related field programs and staff training, and 2) agriculture extension agents, who travelled to communities to work with farmers to implement NSA programs. Personnel size varied across

[23] Officers in charge of supervising agricultural activities in operational zones for municipalities.

districts, from 8 to 35 staff members, with most districts self-identifying as understaffed and several staff members being forced to support additional roles. Inadequate staffing numbers, particularly agriculture extension agents, affected the scope of program delivery, limiting the number of communities that could be served in their districts. According to one FGD participant:

> "*Additional human resource is very important, and we need that to enable us to reach out to as many farmers as we can effectively*." – Male FGD participant

One district partly alleviated the staffing shortage by employing Women Extension Volunteers (women leaders in the community), who assisted with the delivery of NSA programs. As these women were not agricultural staff, they required minimal resources but helped increase NSA programs' reach.

6.3.2.5 Operational support for nutrition-sensitive agriculture programs

Agricultural staff required two main forms of operational support to implement NSA programs effectively: 1) vehicles and 2) educational materials. All districts reported that MAG provided the director with a full-sized vehicle (usually a pickup truck), all other agricultural staff members with motorcycles, and all staff with fuel allowances. Despite these vehicles, DoA staff often had conflicting assignments stemming from the need to transport bulky utensils for food demonstrations, which resulted in prioritizing one activity over the other. For instance, when the director and WIAD Officer needed to use the vehicle for their various activities on the same day, the WIAD Officer was often forced to either reschedule or find another means of transit (e.g., public transport). One FGD participant explained that taking public transportation, in addition to being costly and inconvenience in transporting necessary demonstration materials (which are usually bulky), affected the reputation of the DoA and agriculture as a whole, explaining:

"*A whole department taking public transport to a demonstration [site], I think it doesn't speak well of us, and it's like the organization is not in full capacity*." – Male FGD participant

Additionally, the motorcycles often presented safety issues, with participants mentioning that the model of the motorbikes was not suitable for the DoA's job demands and terrain and that:

"*When they give the motorbikes, they don't give training, [and] we have lost countless people from the agriculture [sector] through accidents*." – Male FGD participant

Most districts reported receiving educational materials in the form of pamphlets and brochures from MoFA at the national level. Some districts received additional materials such as fliers, flipcharts, PowerPoints, and handbooks from the regional level and/or donor and development partner organizations. Participants overall reported that more materials were necessary to improve the quality of their programs, with one FGD participant explaining that:

"*We get some [educational materials] from the national [Ministry of Food and Agriculture], but it's not enough, and we need more*." – Female FGD Participant

These materials were used for staff and farmer training and demonstrations, with participants reporting that they often broke down materials to farmers' levels to increase understanding. Storage and accessibility of educational materials varied by district. Some districts stored extra pamphlets and brochures in special libraries or other easily accessible places, while other districts kept these materials in the director's office. Consequently, staff could not access materials to review or bring to the field when the director was away. Participants also noted that insufficient technology impacted their capacity, explaining that:

"*We keep talking about materials, but sometimes the government doesn't think about us, especially the extension officers. We are still using our phones for data entry, and these phones sometimes have problems with network connections in some of the*

zones. Even the [mobile] data we are using, we buy them ourselves. They should support us with laptops, tablets, and even computers to help us in our reporting" – Male FGD participant

6.3.2.6 Building partnerships for sustainable nutrition-sensitive agriculture programs

All districts reported collaborative programs with a variety of partners, including international non-governmental organizations (e.g., World Vision International), development partners (e.g., the Food and Agriculture Organization of the United Nations), local institutions (e.g., Pentecostal Church), other governmental departments (e.g., Ghana Health Services), and universities (e.g., the University of Ghana). Programs conducted with these partners varied in type and scope, including programs on women's empowerment, backyard/school/church gardens, nutrition education, cooking demonstrations, and alternative livelihood options. For example, several districts implemented school backyard garden programs to educate children on growing micronutrient-rich crops at home and the benefits of a nutritious diet. Additionally, many districts reported participating in a recent FAO-funded project on orange-fleshed sweet potato cultivation, its nutritional benefits, and its preparation. These partnerships enabled districts to increase the number of NSA programs they offered by using their partners' financial resources and networks. This approach provided a cost-effective way of enhancing NSA program scope and impact, particularly in resource-constrained districts. Participants overall reported that such partnerships were valuable while also asserting that:

"*We need to strengthen the relationship that we have with our partners and also increase the number [of] partners… so that they can help us to achieve what we are pursuing in nutrition*." – Male FGD participant

While partnerships were commonly accepted to benefit districts, participants reported that specific collaborative programs had more lasting impacts, while others had unintended side effects. In one district, participants reported that a World Vision International program on exclusive breastfeeding and complementary feeding included staff capacity building. After the program ended, the content about breastfeeding and complementary feeding was integrated into the DoA's regular activities. However, in another district, the HUNGER project, an international NGO, failed to collaborate with the district's agricultural department, resulting in an ineffective program and no markets for sunflower products. As explained by one FGD participant:

> "*This HUNGER project is in some of the operational areas. Their activities does not pass through the agriculture office or department, so they just get their approvals and start doing their own thing. If we happened to meet them on the field, we have to work with them. At times, we go and the farmers will be asking us questions. But actually, we don't know what was discussed, so we can't answer them because we were not there. There was a sunflower project. I learnt it was a church who did it. The elders just got up, took them to the schools, and planted it everywhere. You will see the sunflower, meanwhile, they don't know that it has some negative effects. ...some harvested about 100 bags, and as at now, they are lying there. Because they did not pass through the [DoA] office, we can't also help them.*" – Male FGD participant

6.3.2.7 Constraints associated with staff knowledge and skills affecting nutrition-sensitive agriculture program delivery

Overall, participants reported that staff knowledge and skills were adequate to deliver NSA programs but were constrained by inadequate funding, insufficient staff numbers, and limited

resources, such as transportation and technology. When asked about agricultural staff's capacity, one FGD participant explained that:

> "*The main challenge is not that the AEAs does not want to work, but it's rather, they don't have the needed resources to work effectively with. If you put the right resources at the right place and at the right time, you will get good results*." – Male FGD participant

Agricultural staff capacity was primarily built through orientation for new recruits and regular training for all staff. Orientation programs varied by district but were generally informal and on-the-job, without specific nutritional components. Although many staff members from agricultural colleges reported having a background in nutrition education, university graduates often reported having little to no pre-existing nutritional knowledge when starting their jobs.

Staff training in delivering NSA programs happened 1-5 times each year, with their frequency depending primarily on the availability of funds. Such training was usually led by the WIAD Officer, who would receive relevant information at the regional or national level before training staff at the district level. The WIAD Officer would then accompany staff to the field to support them. While participants reported feeling comfortable delivering NSA programs in the field after such training, the sessions were occasionally rushed or limited by inadequate funds. Some districts reported receiving additional capacity building from outside resource people, including partnership-based initiatives, such as the World Vision International program on breastfeeding and complementary feeding.

6.3.2.8 Organizational mandate for implementing nutrition-sensitive agriculture programs

While six of the eleven districts claimed that nutrition was embedded in their core organizational mandate, none of them could provide a specific department-level mission or vision statement where nutrition was explicitly mentioned. One participant also noted that although NSA has been a part of national agricultural policy since 2011, the DoA's work was sometimes more focused on staple food production. Nevertheless, all districts reported that nutrition was reflected in their programs and activities, such as food demonstrations and backyard gardens. Several districts explicitly linked these nutritional programs to their WIAD Officers.

6.3.2.9 Nutrition-sensitive agriculture programs

All districts had a variety of NSA programs, with the effectiveness and scope of such programs varying by district and program. Standard NSA programs occurring in multiple districts included, but were not limited to, food demonstrations, promotion of specific fortified and/or micronutrient-rich foods (e.g. orange-fleshed sweet potato and yellow maize), in-person and on-air nutrition education programs, backyard/school/church garden initiatives, training on indigenous vegetable cultivation, food safety training, and training with women, in particular mothers, on balanced diets.

Despite this wide array of programs, many districts mentioned that past programs had been discontinued and/or planned programs could not be implemented because of insufficient funding and materials. One FGD participant, when asked what kind of NSA programs their district was carrying out, reported that:

> "*they do soya beans milk for the children whose nutrition are not good. That was last year. But this year, nothing of that sort has happened*." – Female FGD Participant.

6.4 Discussion

The study found that agricultural staff's capacity to implement NSA programs was constrained by inadequacies in many areas, including operational support, human resources, staff training, and inadequate funding, primarily stemming from issues related to the decentralization of agriculture. A study on the impacts of decentralization on Ghana's agricultural sector found that while decentralization benefitted areas such as employment mobility and opportunities to work with local citizens to design agricultural projects, it negatively impacted agricultural finances, as district assemblies tended to prioritize other sectors with more visible outcomes [18]. Decentralization's role in limiting government funding for agriculture can be seen as a key factor limiting agricultural staff's capacity to implement NSA programs in the Eastern Region of Ghana, as insufficient funds negatively impact staff capacity by limiting program materials, operational support and staff training. Overall, these issues were perceived to limit the scope and effectiveness of NSA programs, decreasing their intended impact on communities in the Eastern Region of Ghana.

A study on the impacts of fiscal restructuring on nutritional spending in India reinforces these findings about the effects of decentralization. Although India did not undergo an explicit decentralization process like Ghana, their recent Fourteenth Finance Commission's recommendations created a similar new nutritional fund allocation system [19]. These recommendations increased total national funding allocated to states but reduced central funding for specific state initiatives, including nutrition-sensitive and nutrition-specific programs, giving states greater budgets and budgetary decision-making power [19]. Despite India's prevalence of child malnutrition[24], the funding for nutritional programs decreased, as state governments largely failed to compensate for the decrease in nationally allocated

[24] Between 2015 and 2016 38.4% of children under five years old were stunted.

nutritional funds [19]. Although this Indian study did not explicitly address decentralization, its findings that financial autonomy may lead to reductions in nutritional spending, even where such expenditure is most needed, help to corroborate this study's findings on the potential negative impacts of decentralization on nutritional funding. Such results emphasize the need for increased funding for nutritional programs in a decentralized setting.

Additionally, decentralization can potentially increase collaborations at the district level, such as between Ghana Health Services and the Department of Agriculture, as both organizations have their offices at the District Assembly and often conduct nutrition-related programs. Although more research is needed in this area, increasing interdepartmental collaborations within the local government involving agriculture could help to increase the prioritization of agricultural activities in the District Assembly. Multisectoral collaborations have been shown to improve NSA program implementation and duration by case studies in Southern Bangladesh, Ethiopia, Kenya, Uganda, Senegal, Afghanistan, India, Pakistan, the Philippines, Cambodia, and Malawi as a part of a systematic review of NSA programs [20, 21]. The case studies found that multisectoral collaborations facilitated continuous engagements among project stakeholders from the agricultural and health sectors [20]. Moreover, multisectoral collaboration reduced duplication of planned NSA activities, enhancing resource efficiency [21]. An assessment of collaborative programs in Guatemala, Bangladesh, and Rwanda also showed how collaboration among stakeholders from different sectors could lead to better implementation of NSA programs by reducing activity duplication, improving program resource allocation, and taking advantage of multiple sectors' combined resources, knowledge, and skills [22]. However, multisectoral collaborations are affected by a variety of factors. For instance, the Interministerial Agriculture Working Group, a collaborative organization created to improve nutritional outcomes, research, and prioritization in Nigeria, was limited by infrequent meetings, unclear goals, lack of leadership, and limited impact of

individual members, highlighting the difficulty of effectively implementing collaborative solutions to improve NSA programming [23]. Additionally, while multisectoral collaborations may be an effective avenue to increase staff capacity to implement NSA programs, it is imperative to acknowledge the role of community participation in developing solutions to nutritional issues [24]. Therefore, multisectoral collaborations require more research and community input before implementation.

Issues affecting agricultural staff's capacity to deliver NSA are not unique to Ghana. A study in Nigeria found that staff shortages, lack of nutrition and program delivery training, insufficient operational support, and reliance on insufficient donor funds all resulted in inadequate AEA capacity to deliver agricultural programs [25]. Another study on 13 West African countries[25] found that most countries' ability to act on nutrition was constrained by dependence on inadequate short-term donor funds, low numbers of insufficiently trained staff, and an overall lack of coordination between different actors [24]. Interestingly, despite the issues affecting NSA program implementation noted in this study, Ghana was reported to be one of the countries in West Africa with a greater capacity to act on nutrition due to its better intra-level coordination and financing compared to the other West African countries studied [24]. In Bangladesh, a randomized control trial also found that insufficient human resources, donor dependency for funds, and inadequate local-national linkages constrained NSA program implementation and scale-up [20]. Finally, a large-scale review of NSA programs emphasized how insufficient and delayed funding, insufficient human resources, weak local-national linkages, gaps between policymaking and implementation, and insufficient training materials all decreased the effectiveness of NSA programs [21]. These

[25] Ghana, Liberia, Nigeria, Sierra Leone, Benin, Burkina Faso, Cote d'Ivoire, Guinea, Mali, Mauritania, Niger, Senegal, and Togo

studies corroborate this study's findings on the issues affecting staff capacity to implement NSA programs and their potential impacts on nutrition-related activities delivery in agriculture.

One area where this study's findings differed from some existing literature was the impacts of gender on NSA program delivery. While FGD participants in our study stressed the importance of female AEAs in delivering gender-targeted programs, like cooking demonstrations, a randomized control trial in Bangladesh found that the sex of AEAs in such training did not affect learning outcomes or actual changes in practice [26]. Like other reviews, this Bangladesh study mentioned that gender roles were context- and culture-specific, making it hard to generalize their effects [5, 27].

Women's involvement in NSA program delivery in Ghana was necessary, as women tended to be responsible for cooking [28], often making female AEAs more suitable for cooking and food preparation programs. As a result, a greater priority should be placed on increasing female staff representation in Ghana's agricultural sector to enable the successful delivery of gender-targeted NSA programs. Overall, the relationship between gender and NSA programs in Ghana is an area for possible future research, as other studies have shown that programs targeting women and women's empowerment have positive impacts on nutritional outcomes but may also have adverse effects due to the time burden imposed on women by such programs [5, 27].

6.4.1 Strengths and limitations

The study presents several strengths. To the researchers' best knowledge, this study is the first to apply the Organizational Capacity Assessment module of the Global Capacity Needs Assessment methodology to generate valuable information about agricultural staff capacity to implement nutrition in Ghana's agricultural sector, which can inform donors and development

partners interested in strengthening NSA in Ghana. Previous studies on NSA implementation and capacity have identified the role that limited finances could play in impeding effective program delivery [21 - 24] but have not explicitly linked funding issues to problems in other areas, such as human resources, operational support, and staff training. This study has contributed to filling this gap by relating the identified issues of staff capacity to one another to understand better the DoA's capacity to deliver nutrition-related activities in the agriculture sector and improve the delivery of NSA programs, as evidenced in the framework (Figure 6.2). In particular, the framework showed how inadequacies in one area negatively affected other areas of staff capacity.

Moreover, even though the study focused on DoA staff, some districts invited some of their partners (e.g., Ghana Health Services staff, Gender Desk Officers, and Business Advisory Center Heads) with whom they collaborated on NSA programming, increasing the ability of the study to identify comprehensive views of perceptions on capacity to deliver on NSA programs. Despite the study's strengths, data were collected from eleven randomly selected districts in only one region (i.e., the Eastern Region) out of sixteen regions in Ghana. Hence, the findings about the participants' perceptions in this study cannot be generalized to other DoA offices in Ghana and other study settings. Moreover, the perceptions of the participants of this study were subjective. Hence, their views may reflect their own experiences of the agricultural system in Ghana rather than the agricultural system as a whole. For instance, Fanzo et al. [11] reported that the University of Ghana had an extension program focusing on nutrition education and alternative livelihood activities, while participants in our study reported that the tertiary agricultural programs lacked nutrition components.

6.5 Conclusions

The structure of agricultural extension provides a unique opportunity to deliver nutrition-sensitive programs across all stages of the food system. However, the capacity of agricultural staff to deliver NSA programs was limited by insufficient funds that were also delayed in release, arising from the decentralization of agriculture. Moreover, the low priority given to agriculture in the District Assembly's composite budget system resulted in insufficient funds allocated to NSA programming. On the other hand, existing nutrition-sensitive agriculture programs included food demonstrations, promotion of specific fortified and/or nutrient-rich foods (e.g. orange-fleshed sweet potato and yellow maize), in-person and on-air nutrition education programs, backyard/school/church garden initiatives, training on indigenous vegetable cultivation, food safety training, and training on balanced diets. Apart from the structural issues affecting the capacity to deliver on NSA in the agricultural sector, challenges with insufficient staff numbers, underrepresentation of female staff, and insufficient operational and logistical support limited the effectiveness of agricultural extension in Ghana and, consequently, the ability of the extension system to deliver nutrition-sensitive actions. Thus, it is worth investing in strengthening agricultural staff capacity to deliver NSA programs by providing them with essential NSA competencies, funding, and logistical and operational support. Additionally, promoting multisectoral collaborations at the district level may provide a key pathway to improving funding and prioritization of agriculture at the district level, which is essential to expand NSA interventions, curb malnutrition, and improve nutrition, thereby creating sustainable food systems for all Ghanaians.

6.6 Declaration of competing interest

The author(s) declare no conflicts of interest for this article's research, authorship, and/or publication.

6.7 Acknowledgement

This paper was made possible with the support of the Canadian Queen Elizabeth II Diamond Jubilee Scholarships: Advanced Scholars (QES-AS) program. "The Canadian Queen Elizabeth II Diamond Jubilee Scholarships (QES) is managed through a unique partnership of Universities Canada, the Rideau Hall Foundation (RHF), Community Foundations of Canada (CFC) and Canadian universities. The QES-AS is made possible with financial support from IDRC and SSHRC". We acknowledge all Department of Agriculture staff and their partners from the district assemblies who made time to participate and contribute to this study.

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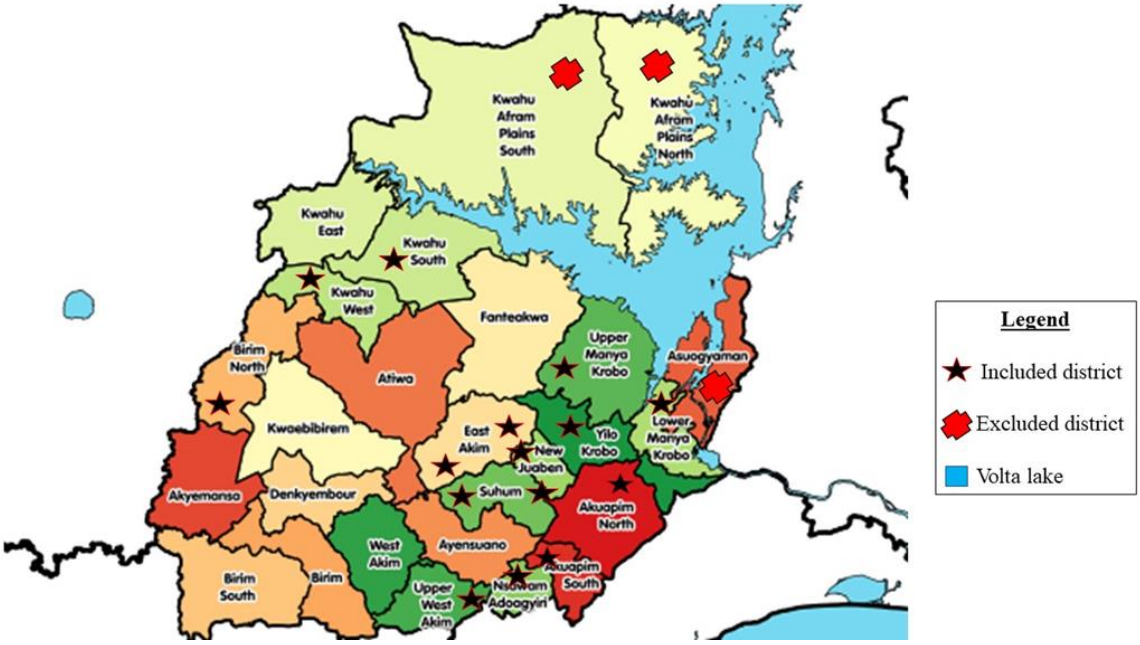
Figure 6.1 Map of the Eastern Region of Ghana with randomly selected districts for the study



Multiple stars in an area = Some districts/ municipalities were officially divided into two districts/ municipalities by the Government of Ghana (e.g. New Juaben has been divided into New Juabeng North and New Juabeng South)

Image adapted from Wikimedia Commons at https://commons.wikimedia.org/wiki/File:Districts_of_the_Eastern_Region_(2012).svg#file [accessed 2 August 2023].

Figure 6.2 Framework to explain agricultural staff's capacity to implement NSA programs

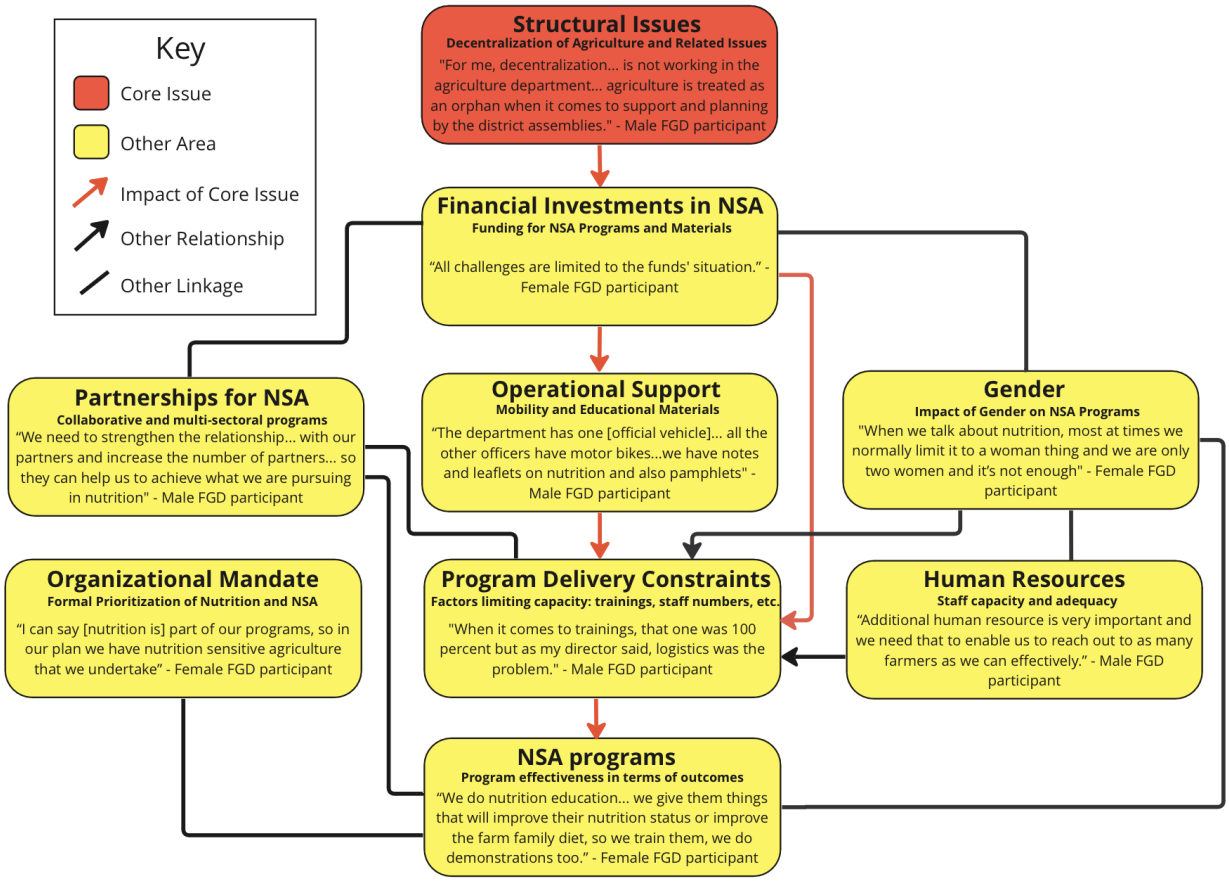


Table 6.1 The semi-structured questionnaire adapted from the Organizational Capacity Assessment module of the Global Capacity Needs Assessment methodology [13]

Theme	Questions
Organizational mandate	1. Is nutrition/ NSA part of your core mandate? a. Is this reflected in the vision, mission, objectives or functions of your organization? b. If yes, at what level is it stated and how?
NSA programs	1. What programme(s) do you implement that promote nutrition/ NSA? 2. Do you have adequate capacity development activities to enable the extension and advisory services (EAS) actors to implement these programmes successfully? Do the capacity development programmes give the EAS actors the skills they need to implement the programmes they are tasked to implement?
Financial investments in NSA	1. What is the NSA programming allocation as a percentage of the organization's total budget? 2. Are the resources adequate to meet your NSA mandate? 3. What resources are needed to further strengthen your nutrition/ NSA interventions, and what activities could these additional resources be spent on?
Human resources in NSA	1. Type/category of staff/level 2. Role 3. Number of staff 4. Percentage of female staff 5. Jurisdiction/ area of coverage
Constraints in program delivery	1. Staff adequacy: a. Do you have enough staff to effectively design/implement/supervise your nutrition/NSA interventions? b. If not, what additional staff does your organization need, and at which level? 2. Staff capacity development: a. Who trains the staff on addressing nutrition/NSA? b. How often are they trained, and how many are trained? c. Do the staff have adequate technical and functional capacities to carry out/ deliver the NSA programmes? (eg. Soft skills such as facilitation and negotiation skills)? d. Do you conduct induction training (orientation) for your staff, and is nutrition/ NSA included in induction training (orientation)? Is there a training module on nutrition/NSA used for staff training? e. Are the staff satisfied with the training on nutrition/NSA? What are the limitations, if any? 3. Do you think the training institutions have enough resource persons to organize quality nutrition/ NSA training?

Operational support for NSA	1. Mobility a. Does the organization have enough vehicles for staff to travel to organize programmes? b. Is there a mechanism for hiring vehicles for travel? c. Do field staff have motorcycles, and are fuel allowances paid to cover their field travel costs? 2. Information, communication and education materials a. Has the organization developed learning materials that could be used to implement the nutrition/NSA programmes? b. If yes, what information, communication and education (ICE) materials exist and are used by the staff? – brochures, pamphlets, documentaries, etc. c. How does the organization provide ICE materials to support staff for use in the field?
Building effective partnerships	1. Is the organization working with other organizations in promoting nutrition/NSA? 2. If so, which organizations and what is the purpose of collaboration? If not, why not? 3. What needs to change to develop new partners/improve existing partnerships?

EAS – Extension and advisory services
ICE – Information, communication and education
NSA – Nutrition-sensitive agriculture

Chapter 7. General discussion, conclusion, and recommendations

In this final chapter, the results from the preceding chapters (3 - 6) are synthesized to comprehensively understand the nutrition sensitivity of agriculture policies, strategies, and programs in Ghana's agriculture sector. Additionally, the implications of the main research findings from the individual studies in this thesis are synthesized to provide a holistic view of the research outcomes. The first study used quantitative and qualitative content analysis to examine the nutrition-sensitive characteristics of agriculture policies published between 2004 and 2020 and determine if and how nutrition-related activities were implemented in Ghana's agricultural sector between 2010 and 2019. The second and third studies used stakeholder mapping and analysis to describe relevant national and sub-national level stakeholders' interconnections and influence in Ghana's agriculture-for-nutrition policymaking and implementation. The final study used qualitative methods to assess the capacity of district-level agriculture staff to implement nutrition-sensitive agriculture (NSA) programs in the Eastern Region of Ghana. The strengths and limitations of this thesis, as well as the policy implications of the findings of the studies, are discussed in the final sections of this chapter.

7.1 Overall discussion

7.1.1 Nutrition-sensitive agriculture programming in Ghana

The four studies shed light on the different aspects of NSA programming in Ghana. Manuscript 1, which used the 'Key recommendations for improving nutrition through agriculture and food systems' (Food and Agriculture Organization of the United Nations, 2015) as an evaluation guide, found that most policies and strategies in Ghana focused on increasing the production of staple crops and protecting natural resources, with little emphasis on the processing and marketing of micronutrient-rich foods. Similarly, Asirvatham

et al. (2023) reported that the Food and Agriculture Sector Development Policy 2 in Ghana focused on diversifying crop production to boost agricultural commercialization, rather than enhancing nutrition. These findings also align with the research conducted by Thow et al. (2021), which found that there was a limited integration of nutrition in food policy, particularly in the agriculture sector, despite increased political priority for nutrition in Ghana. Thow et al. (2021) explained further that food policy agendas in Ghana prioritized production, employment, and economic returns over nutrition-sensitive food supply, supported by the findings from Manuscript 1. It is important to note that not all of the key recommendations were relevant to all of the reviewed agriculture sector policies that were identified as related to nutrition. For example, the Fertilizer Policy of Ghana only incorporated 3 out of 17 key recommendations. Nonetheless, the key recommendations document was a good starting point for evaluating Ghana's efforts towards NSA programming.

Manuscript 1 also showed that the agricultural policies and strategies that were reviewed had limited integration of nutrition-specific objectives[26]. According to recent research by Thow et al. (2021) and Sackar et al. (2023), the limited integration of nutrition into broader food policies in other sectors was because Ghana's Ministry of Health was primarily responsible for carrying out nutrition-specific objectives even though the agriculture and trade sectors had formal responsibilities relevant to nutrition and food. Although Manuscripts 2 and 3 revealed that the Ministry of Food and Agriculture played a crucial role in formulating policies and setting priorities for implementing nutrition-sensitive activities within Ghana's agricultural sector, Manuscript 1 suggested that nutrition continued to be marginalized in the country's

[26] Nutrition-specific objectives target the immediate causes of malnutrition, such as food intake and childcare practices (Ruel & Alderman, 2013)

agricultural policies and strategies. This finding can be attributed to the fact that Ghana's agriculture sector, as outlined in the Food and Agriculture Sector Development Policy 2, primarily addressed undernutrition from a food security and emergency preparedness perspective rather than emphasizing nutrition (Ministry of Food and Agriculture, 2007). Moreover, according to the 'Ghana Zero Hunger Strategic Review' in 2016, the emphasis on food security at the national level suggested that the nutrition problems in Ghana were primarily perceived as related to hunger and undernutrition rather than limited access to micronutrient-rich foods (World Food Programme et al., 2016). In their research, Sackar et al. (2023) discovered a misconception held among agricultural staff in Ghana that increasing the production of a variety of foods without necessarily considering their nutritional value would guarantee satisfaction of the nutrition requirements of the population.

Furthermore, Manuscript 1 revealed that various donor-funded projects, such as the Cowpea Improvement Program, Guinea Fowl Project, and Green House Model, were implemented in Ghana between 2010 and 2019 to promote the production of nutritious foods like cowpea, guinea fowl, vitamin A yellow/orange maize, cockerels, pigs, and fruits and vegetables. Although these projects were not included in the policies and strategies, they were mentioned in the national annual reports reviewed in Manuscript 1. Moreover, evidence from Helen Keller International's two-year enhanced homestead production program[27] in Burkina Faso showed that increasing the production of vitamin A-rich fruits and vegetables (DID: 60.5 kg, P=0.002) decreased the prevalence of wasting and anemia among children aged 3 to 13 months in the treatment group compared with those in the control group by 8.8 percentage points (P =0.08) and 14.6 percentage points (P=0.02), respectively (Olney et al., 2015). These

[27] The goal of the project was to decrease vitamin A deficiency among women and children through increasing the production of provitamin A-rich orange-fleshed sweet potato (OFSP).

findings indicated that donor-funded projects focused on increasing the production of micronutrient-rich foods can enhance nutrition outcomes.

In Manuscript 1, additional areas for improvement in Ghana's agricultural policies and strategies were highlighted. These included: 1) empowerment of women through creating employment opportunities and the provision of productive resources, 2) nutrition promotion and education, 3) diversification of agricultural produce, 4) reduction of postharvest losses, 5) improvement of storage facilities, and 6) expansion of markets. Several studies have suggested that the interplay of these recommendations can lead to better nutrition outcomes. For instance, a cluster randomized control trial among women of reproductive age in Burkina Faso showed that empowering women through the provision of productive resources such as land increased their purchasing decisions (DID: 0.86±0.30, P=0.01) and dietary diversity (DID: 0.3±0.18, P=0.08) which lead to a reduction of underweight among the women (DID = -8.7 pp; P<0.01) and increased the body mass index of women who were underweight at baseline (coefficient ± standard error: b = 0.70 ±0.31) (Olney et al., 2016). Similarly, another study in Zambia among women of reproductive age showed that providing women with productive resources, such as agricultural tools and inputs for home gardening, as well as nutrition education on infant and young child feeding practices, increased the weight-for-height z-scores of children aged 24 – 48 months in the intervention compared to the control group (DID: 0.38 pp, P<0.05) (Kumar et al., 2018). Moreover, reducing postharvest losses and improving storage facilities can help preserve the nutritional value of food, while expanding markets can create more opportunities for farmers to sell their produce and earn more income (Bechoff et al., 2022; Villar et al., 2023).

Manuscript 2, built on the knowledge base of the policy documents that was established in Manuscript 1. National-level stakeholders were invited to participate in the research process to better understand the policy processes involved in NSA policy development in Ghana. The

Net-Map approach helped to identify key stakeholders involved in advancing action on NSA policy development and provided insights into the collective effort needed to address nutrition problems in Ghana. Pham & Pelletier (2015) emphasized that greater interaction among stakeholders was crucial for advancing and applying policies, programs, and interventions for nutrition. In line with this, Manuscript 2 employed the Net-Map approach to facilitate interactions among national-level stakeholders, resulting in a more informed and collaborative approach to policy analysis. The participatory and collaborative nature of the Net-Map approach can be useful in engaging stakeholders during the early stages of an NSA project. By involving all stakeholders in defining their roles, responsibilities, and expectations, the Net-Map approach could help ensure that everyone clearly understands their respective contributions towards achieving the shared goals of an NSA project.

Manuscript 3 highlighted results from a study conducted at the regional level, which revealed that stakeholders who participated in a Net-Mapping exercise reported inadequate provisions for nutrition in their work plans and budgets at the implementation level within Ghana's agriculture sector. These findings, as explained by existing literature, could be due to the absence of targeted communication and advocacy campaigns, identified as barriers to NSA implementation (Bryce et al., 2008; Haddad et al., 2014; Morris, 2008; Pelletier et al., 2011). Without targeted communication and advocacy efforts, raising awareness among relevant stakeholders about the importance of NSA programming becomes challenging, which can result in inadequate funding and resources, thereby affecting the delivery of NSA programs. Therefore, prioritizing targeted communication and advocacy for nutrition is essential to increase awareness and support for NSA programming among stakeholders.

Structural issues[28] associated with decentralization in Ghana's agriculture sector have been highlighted as a challenge in implementing NSA interventions. Manuscript 4 pointed out structural issues arising from the disconnection between the policymaking body (residing at the Ministry of Food and Agriculture at the national level) and the implementation bodies (residing at the Ministry of Local Government and Rural Development at the regional and district levels), resulting in the insufficient and delayed release of funds for agricultural activities. Moreover, positioning nutrition within this complex governance structure exacerbates the issue of limited integration of nutrition and agriculture. Nisbett et al. (2014) argued that these politically complex arrangements could result in inequalities due to competition among different stakeholders with direct and indirect interests in nutrition. This can result in conflicts of interest, leading to challenges in achieving a shared goal of improved nutrition outcomes.

7.1.2 Stakeholder influence and intersectoral collaboration in nutrition-sensitive agriculture programming

The thesis provided an insightful analysis of the power dynamics and challenges among multiple stakeholders involved in advancing NSA governance at the national and local levels. Through Manuscripts 2, 3, and 4, the complex connections, roles, influences, and challenges facing NSA stakeholders were revealed. In Manuscripts 2 and 3, the elaborate network of power dynamics that influenced NSA policy development and program implementation at the national and local levels were visually presented. These manuscripts demonstrated that different stakeholders had varying levels of influence in policy development and implementation. For example, in Manuscript 2, farmer-based organizations

[28] Described under Chapter 6, Section 6.2.1

had minimal influence during national policy development, but in Manuscript 3, they were considered influential during program implementation at the local level.

Additionally, Manuscript 4 highlighted the insights of stakeholders at the implementation level, revealing issues that affected NSA program implementation. The participants' reflections on the challenges also led to the realization that national decision-makers were out of touch with the local reality at the implementation level. Manuscript 4 provided an example where a decision regarding the means of transportation for local field activities was made at the national level. Unfortunately, this decision led to the purchase of motorcycles that were not suitable for the local terrain, which resulted in accidents and the loss of staff lives. This example emphasized the need for careful consideration of decisions made at higher authoritative levels that affected the implementation of NSA programs at the local level, as the consequences could be severe.

The stakeholder analysis studies (Manuscripts 2 and 3) revealed that development partners and donors played an important role in shaping agriculture policy development and implementation in Ghana via the provision of program funding. Similarly, Sackar et al. (2023) identified international organizations such as the Alliance for Green Revolution in Africa and the World Food Programme as influencing government ministries and agencies in agenda setting and policy formulation in Ghana. However, concerns have been raised by Thow et al., 2021 about the selectiveness of donor funding and the tendency of the Ghanaian government to align their programs with donor priorities in order to secure funding. These donors may pay little attention to nutrition, as shown in the example of the Modernizing Agriculture in Ghana (MAG) project. This project, funded by Global Affairs Canada, was primarily focused on enhancing the production and productivity of farmers by adopting a market-oriented approach to farming. However, the MAG project stipulated that only a small portion of the budget (10-15%) presented by the district Department of Agriculture must be

allocated to nutrition activities (Ministry of Food and Agriculture, 2022). Shekar et al. (2017) contended that prioritizing investments in nutrition can be one of the most cost-effective ways to drive economic growth and development. They suggest that for every $1 invested in nutrition, there can be a return of $16. Furthermore, reducing malnutrition in Africa could increase a country's overall economic productivity by up to 11 percent (Shekar et al., 2017). Therefore, it is crucial for development partners and donors to prioritize nutrition in their funding.

The maps included in Manuscripts 2 and 3 showed that relationships and some sharing of expertise already existed between stakeholders from different sectors and institutions. However, further analysis revealed no clear and cohesive approach, such as a dedicated consultative platform or structure, for NSA stakeholders to interact and comprehensively develop NSA policies and programs at the national and subnational levels in Ghana, which is consistent with previous research. For instance, a report by the Food and Agriculture Organization of the United Nations (2013) revealed that despite the increasing recognition of the importance of NSA, there is limited institutional coordination and collaboration in policy development and implementation. Other studies have also highlighted the need for increased coordination among sectors to prioritize nutrition in the agricultural sector (Herforth et al., 2012; Gillespie et al., 2013). Furthermore, Manuscripts 2 and 3 showed that stakeholder relationships primarily focused on engaging in technical assistance activities rather than disseminating agriculture-nutrition information in NSA policy development and implementation. Ruel and Alderman (2013) argued that while technical assistance was necessary, it was insufficient to address the complex challenges of improving nutrition through agriculture. Therefore, stakeholders need to collaborate and communicate effectively to ensure that NSA policies and programs are developed and implemented successfully.

The Nutrition Governance Framework proposed by the Institute of Development Studies (2012) and also presented in Chapter 2, Section 2.6.2, emphasized the importance of improved inter-sectoral cooperation, vertical coordination, funding allocations, monitoring mechanisms, and advocacy to improve nutrition outcomes. However, the results presented in Manuscripts 2 and 3 suggested that the framework underemphasized the significance of the "people" element in nutrition governance. The thesis argues that stakeholder identification, analysis, and engagement are demanding processes that require time, effort, and resources to nurture people, relationships, and partnerships. Various studies have highlighted the importance of stakeholder engagement in policy formulation and implementation. For instance, in their research on the role of stakeholders in human genomics policy development, Lemke & Harris-Wai (2015) emphasized the importance of stakeholder engagement through various stages of policy formulation and identified that evidence-based practices to inform genomics policy development were lacking. Similarly, in their study on stakeholder inclusion in healthcare policies in low-income countries, Masefield et al. (2021) highlighted the importance of stakeholder engagement in building trust, understanding, and collaboration among stakeholders to improve performance and service delivery in the healthcare system. The stakeholder mapping processes presented in Manuscripts 2 and 3 can help recognize the importance of stakeholder engagement in nutrition governance by allowing stakeholders to identify their collective capacity, build relationships and partnerships, and create a shared understanding of the issues and challenges involved in NSA programming.

In addition, to further enhance the Nutrition Governance Framework, it is important to consider several other factors that could provide a more holistic view of the challenges and opportunities in nutrition governance. These factors could include: 1) Emphasizing the importance of collaboration across different sectors such as agriculture and health to improve service delivery and thereby improving access to services, 2) aligning with different

international initiatives emphasizing improved nutrition, such as the Scaling Up Nutrition Movement, to nurture and foster political will, 3) emphasizing diversified sources of funding for carrying out nutrition-related activities to ensure sustainability, and 4) empowering women, as they play a crucial role in ensuring better nutrition outcomes for families and communities. Including these additional factors in the Nutrition Governance Framework would provide a more comprehensive understanding of the influences on nutrition outcomes and highlight the need for integrated approaches.

7.1.3 The importance of strategic capacity development to advance action for nutrition-sensitive agriculture programming

NSA programs are critical to improving the nutritional status of vulnerable populations, particularly in lower- and middle-income countries (Ruel et al., 2018). However, implementing such programs requires strategic capacity development to ensure that they are effectively designed, implemented, and evaluated. In line with other studies (Danso-Abbeam et al., 2018; Donkor et al., 2016), Manuscript 4 identified an existing agriculture extension services system in Ghana which could be beneficial in disseminating information and providing technical assistance to farmers during the implementation of NSA programs. However, in Manuscript 4, it was found that the effectiveness of agriculture extension services in promoting NSA programming in Ghana was limited by various factors, including insufficient staffing, inadequate and untimely release of funds, inadequate technical knowledge, and poor coordination among stakeholders. Additionally, Antwi-Agyei & Stringer (2021) also found that agricultural extension services in Ghana were not adequately tailored to the specific needs of smallholder farmers, particularly those involved in subsistence farming. Similarly, a study by Gelli et al. (2015) in Eastern and Southern Africa found that agricultural services were not adequately addressing the gender-specific needs of women farmers, considering the critical role that women play in the household and agricultural value

chains. To overcome these challenges and improve the effectiveness of agriculture extension services in enhancing the nutrition status of vulnerable populations, Anderson & Leach (2019) proposed that strategic efforts are needed to build the capacities of relevant stakeholders in the co-creation of interventions. Gillespie et al. (2013) suggested that capacity development efforts could include improving the skills and knowledge of extension staff, developing effective communication and coordination mechanisms among stakeholders, and increasing the availability of financial resources for NSA programming. Increasing the availability of financial resources may be challenging due to structural issues identified in Manuscript 4, revealing a disconnect between policymaking and implementation bodies that adversely impacts financial support for NSA programs. Addressing this challenge would require streamlining communication channels between national and district-level agricultural offices to establish clear protocols for fund allocation and disbursement, as well as implementing mechanisms to reduce bureaucratic delays in the release of funds. Additionally, a comprehensive approach that considers the specific needs and challenges of agricultural workers in Ghana, as highlighted in Manuscript 4, is essential for efficient resource mobilization and the successful implementation of NSA programs.

7.2 Strengths and limitations

Through four complementary studies, the dissertation contributed to our understanding of the nutrition sensitivity of policies and investments in Ghana's agricultural sector, as well as the organizational capacity required for agricultural staff to implement nutrition-sensitive programs. The thesis had several strengths. One of which was its adoption of a mixed-methods approach, which involved quantitative and qualitative content analysis to examine the nutrition sensitivity of 17 policy documents published between 2004 and 2020. In addition, the thesis used national annual reports to assess how nutrition was integrated into

Ghana's agricultural sector between 2010 and 2019. To the best of my knowledge, this thesis is the first to apply the Food and Agriculture Organization of the United Nations' 'key recommendations for improving nutrition through agriculture and food systems' document to evaluate the nutrition-sensitivity of agricultural policies and investments in Ghana (Food and Agriculture Organization of the United Nations, 2015). By integrating the results from the content analysis, this thesis provided a comprehensive overview of the intentions of NSA policies and how they have been translated into practice.

Moreover, using qualitative methods, particularly the Net-Map method, this study engaged various stakeholders in in-person and virtual group discussions to uncover their roles, linkages, and influence in the NSA policy development and implementation in Ghana's agriculture sector. The Net-Map method helped identify potential conflicts and areas of agreement between stakeholders, which has the potential to facilitate collaborations and communication among them, which in turn, could lead to more effective decision-making. This is the first study to apply the Net-Map method to gain a comprehensive understanding of the issues and concerns important to the different stakeholders in Ghana's NSA policy landscape. Furthermore, involving a wide range of stakeholders in both the policymaking (15 stakeholders) and implementation (89 stakeholders) discussions ensured that various perspectives were considered in the analysis process. This inclusive approach strengthened the validity of the findings by providing a holistic view of Ghana's NSA policymaking and implementation landscape.

Additionally, the study employed focus group discussions to engage agricultural staff in a collective conversation that revealed their organizational capacities to implement NSA programs in Ghana. The data on agricultural staff organizational capacity were collected using the innovative Global Capacity Needs Assessment Methodology, which focuses on examining the capacity gaps at the organizational level within the agricultural extension

advisory system to strengthen capacities to integrate nutrition outcomes into agricultural sector work plans (Food and Agriculture Organization of the United Nations, 2021).

While the study provided valuable insights, it is important to acknowledge its limitations. Despite the systematic methods used to engage and analyze stakeholder-generated data, the information collected may have been influenced by stakeholders' experiences and what they are willing to disclose to the researcher, which could result in information gaps. These information gaps may lead to erroneous interpretations and conclusions (Schmeer, 1999). Additionally, the Net-Map method used to conduct stakeholder analysis was time-consuming and may have contributed to participant fatigue and response bias (Schiffer, 2007). While this method was appropriate for a research study, it may not be practical for a practice model. It is worth mentioning that the Net-Map meetings took an average of 3.5 hours. Furthermore, it is important to note that although the study engaged high-level stakeholders in Ghana's NSA policy landscape, it did not incorporate inputs from crucial players such as farmers. As a result, their perspectives on policymaking and community-level implementation were not fully captured in the study.

Additionally, focus group discussions used to explore the organizational capacity of stakeholders engaged in NSA program implementation may have provided limited information regarding and, thus, my comprehensive understanding of the monetary aspects of the challenges described in Manuscript 4. Therefore, including quantitative analysis could provide a more robust picture of the financial investments needed for NSA policy development and implementation. It is worth noting that the policy document content analysis did not include internet-based sources or food-related documents from other sectors, such as health, water, and education. Including these sources could have provided a more comprehensive picture of the nutrition sensitivity of policies, strategies, and programs within

the Ghanaian food system. These limitations should be considered when interpreting the findings and recommendations of the study.

7.3 Policy implications and future directions

The thesis highlighted four important lessons to inform a more integrated nutrition-sensitive policy development and implementation approach in Ghana's agriculture sector. Firstly, the agriculture sector needs to be more strategic in engaging stakeholders from other sectors to address the nutrition challenges in Ghana. According to Gillespie (2013), addressing malnutrition is a complex challenge that requires the involvement of seemingly disparate sectors, such as agriculture and education. Gillespie (2013) further explained that these sectors may require financial incentives to carry out nutrition activities since nutrition may not be their primary focus. In this regard, governments, donors and development partners can support these sectors financially to encourage their involvement in nutrition-related activities.

Secondly, the thesis revealed that there is limited academic training for agricultural workers to plan and support the implementation of NSA (Manuscript 4). Therefore, there may be an opportunity for the health and agriculture sectors to work together to train existing and future agricultural extension staff on nutrition-related issues. Additionally, it is crucial to adopt more comprehensive and integrated approaches and make strategic investments to equip future NSA stakeholders with sufficient capacities. For example, standardized orientation manuals could be created for new agricultural workers that outline the principles of NSA and tailor them to address specific agricultural conditions and needs within the local context. Moreover, enhancing access to educational resources such as the Food and Agriculture Organization of the United Nations E-learning courses on nutrition-sensitive agriculture for current and future agricultural workers could be beneficial to improving staff knowledge on NSA. Additionally, fostering partnerships and collaborations through the creation of budget lines for coordination

and collaboration activities, especially with universities and research institutions to offer certificate programs on NSA, including the development of a comprehensive NSA curriculum with inputs from the health and other relevant sectors to implement the curriculum at relevant academic institutions.

Thirdly, the thesis suggests that decentralization in Ghana presents an untapped opportunity for integrating agriculture and nutrition at the local government level (that is, the regional and district levels). The effects of the burden of diet-related non-communicable diseases and childhood malnutrition are evident at the local government levels, affecting not only health systems but also an individual's academic achievements (Machado et al., 2022). Furthermore, challenges have been identified with achieving multisectoral collaboration in implementing nutrition activities. Bach et al. (2020) explained that multisectoral collaboration during the implementation of nutrition activities was hampered by a lack of accountability among stakeholders in Ethiopia. In Ghana, Sackar et al. (2023) reported that power relations and funding issues generated tension, leading to weak multisectoral coordination among stakeholders within the nutrition policy space. Thus, it is crucial to enhance coordination and communication mechanisms at the local government level to foster the co-creation of comprehensive and integrated multisectoral nutrition work plans, which leverage existing local government structures such as the agriculture extension delivery system to ensure accountability, minimize duplication of efforts, and address inequalities in funding allocations. Improving mechanisms to enhance coordination and communication among stakeholders could involve various strategies, such as: 1) Establishing clear communication channels by leveraging technology such as mobile phones, 2) conducting stakeholder analysis to clearly define roles and understand the needs and concerns of stakeholders, 3) implementing regular meetings to facilitate ongoing dialogue and collaboration, and 4)

developing a comprehensive communication plan for sharing updates on milestones, addressing potential issues, and ensuring alignment with the project's goals.

Furthermore, a decentralized governance structure could facilitate collaborative efforts among various stakeholders to improve nutrition outcomes. For instance, evidence from the African Millennium Villages project[29] showed that collaboration between sectors such as health, agriculture, education, and social protection at the decentralized levels of government led to better nutrition outcomes. The study, which was conducted in nine sub-Saharan African countries[30], showed that the prevalence of stunting in children less than two years of age at year three of the project was 43% lower (adjusted OR:0.57; 95% CI: 0.38, 0.83) than baseline (Remans et al., 2011). Similarly, a recent study of a multisectoral intervention in Chad found that the odds of a child under two years of age being severely wasted and underweight were 76% lower (95%CI: 0.59–0.86, $p = 0.001$) and 33% lower (CI: 0.15–0.48, $p = 0.012$), respectively, in the treatment versus the control groups (Marshak et al., 2020). In Ghana, the multisectoral approach has been previously implemented in various sectors; however, there is a lack of evidence to support its effectiveness in achieving nutrition outcomes. For instance, the National AIDS Commission was established to coordinate the activities of stakeholders from various sectors, including health, local government, and finance, to combat HIV/AIDS (Ghana AIDS Commission, 2019). Additionally, a committee comprising stakeholders from different sectors, such as natural resources and defence, was formed to tackle illegal mining

[29] The African Millenium Villages project was a multisectoral project that focused on 1) agriculture through the provision of seed and fertilizers, farmer training and storage expansion, and crop diversification, 2) health through the installation of mosquito nets and vaccine supply and pest control, 3) education through the construction of schools and installation of water supply, 4) infrastructure through the provision of sanitation, roads, and 5) business development through the provision of micro-credit and cooperative training. The project leveraged mobile phones and regular meetings to enhance communication and service delivery.

[30] The sites for the study were located in 1) Koraro, Ethiopia, 2) Bonsaaso, Ghana,3) Sauri, Kenya, 4) Mwandama, Malawi, 5) Tiby, Mali, 6) Pampaida, Nigeria, 7) Potou, Senegal 8) Mbola, Tanzania, and 9) Ruhiira, Uganda.

in Ghana (Ministry of Environment, Science, and Innovation, 2018). These examples demonstrate that Ghana has experience implementing multisectoral approaches to address complex issues. Overall, the evidence suggests that multisectoral collaboration can lead to better nutrition outcomes, particularly when it involves collaboration between health, agriculture, and other relevant sectors.

Finally, under the decentralized system in Ghana, the established agriculture extension delivery system at the local government level can be leveraged to deliver nutrition-sensitive information and programs to rural populations facing malnutrition. Improving the structure of the extension delivery system, building staff capacity, and increasing staff numbers can also improve NSA program delivery. Furthermore, establishing a funding system that allows governments, development partners, and donors to provide financial incentives to local government departments that collaboratively draw nutrition work plans and integrate nutrition sensitivity into their respective policies and strategies can create opportunities to enhance the nutritional status of the population at large. By taking these steps, Ghana can align with the Sustainable Development Goal 2's focus on ending hunger by 2030 and make progress towards improving nutrition in the country.

In addition to the aforementioned lessons, there are several potential future research directions that could be pursued in the field of nutrition sensitivity in the Ghanaian agriculture sector. These include 1) investigating the long-term impacts of implemented policies, strategies, and programs within the agriculture sector on specific nutrition challenges of national concern in Ghana, such as the rising rates of overweight and obesity, and 2) examining the influence of external factors such as political changes on agricultural staff capacity to implement NSA programs in Ghana. Exploring these potential research directions could yield valuable insights for enhancing the nutrition-sensitive agriculture

policy landscape in Ghana and contribute to addressing critical nutrition challenges such as the rising rates of overweight and obesity.

7.4 Conclusions

Stakeholder partnerships, relationships, and influence in Ghana are vital for advancing NSA. Despite the implementation efforts made through specific donor-funded projects, such as the Guinea Fowl Project, to improve nutrition in Ghana's agriculture sector, the integration of nutrition into agriculture policies and strategies remained limited. To further integrate nutrition into agriculture policies and strategies, stakeholder capacity needs to be advanced at both the national and local government levels. Moreover, the agriculture extension delivery system could play a strategic role in the delivery of NSA programs, with lessons feeding back into the development of NSA policies and strategies in Ghana. Additionally, collaboration among stakeholders in agriculture, health, and other relevant sectors is imperative to enhance the skills and knowledge of agriculture extension workers, improve coordination and communication among stakeholders, and increase financial resources to expand NSA efforts and improve nutrition-sensitive programming at the national and sub-national levels in Ghana, which would lead to positive nutrition outcomes for all.

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Appendices

Appendix 1 National level Net-Map interview guide

Title of project: Assessing the nutrition-sensitivity of food and agriculture policies and investments in Ghana's agriculture sector

Net-Map Interview Guide

National Level

Overall question: Who influences agriculture-for-nutrition policymaking at the national level in Ghana's agriculture sector?

Probe question:

Who was involved in developing the Food and Agriculture Sector Development Policy II and its corresponding Medium-Term Investment Plans (METASIP)?

Introduction

The project aims to improve understanding on agriculture-for-nutrition policymaking processes in the Ghanaian context.

*Net-Map is an interview technique that examines the goals, perspectives and influence of various stakeholders, and looks at the different ways in which these stakeholders interact with each other. We will start by **listing** all the actors involved in this issue, then determine how they are **linked**, examine how **influential** each actor is in the development of two key national policy documents (i.e. the Food and Agriculture Sector Development Policy II (FASDEP II) and its corresponding Medium Term Investment Plans (METASIP), and finally look at their different **roles and goals** and how these might be used to enhance the incorporation of nutrition objectives into future revisions of the two key policy documents.. A particular feature of Net-Map is that it allows us to look at how things are actually done and not only what is written in formal documents. This is why we need the insight of people like you, who are part of the process and know it from the inside. All responses are strictly confidential, and any results will be fully de-personalized before being used in any presentation.*

Overall question: Who influences agriculture-for-nutrition policymaking at the national level in Ghana's food and agriculture sector?

Probe question:

1. **Who was involved in developing the Food and Agriculture Sector Development Policy II and its corresponding METASIP?**

Step 1 - Actor generation:

We will start by listing all the organizations involved in policymaking with specific reference to the two key policy documents. These could include those people or organizations directly supportive of or providing services for policy development in Ghana's food and agriculture sector; and those with competing priorities, whether or not they are aware of it themselves. We can go back at any time throughout this process and add more stakeholders as you think of them. (Prompt according to the different categories below, one after the other).

- Government……..……**Green**
- Donor……..……..**Yellow**
- INGO/NGO/…….. Red

- Civil Society……..…… **Pink**
- UN…… **Tourquoise**
- Private sector…… **Orange**
- Research/Academia……... Brown
- Media…… Blue

Step 2: Drawing links between actors

For the following institutions, who gives _____to who? *(Prompt according to the different categories below, one after the other)*

a) Formal command
b) Flow of funds
c) Technical assistance
d) Advocacy
e) Dissemination of evidence-based agriculture-nutrition information

Draw the links one at a time, completing all of one type of link before moving on to the next.

1) **Formal command**: draw a link if an actor has formal oversight over the work or actions of another actor
2) **Funding**: draw a link if an actor provides funds, loans, budgets, business payment to another actor
3) **Technical assistance**: draw a link if an actor provides technical support, guide, advice to another actor in the policy formulation process
4) **Advocacy**: draw a link if an actor advocates or targets evidence-based information, lobbying, pressure groups, interest groups to another actor to promote changes in the policy
5) **Dissemination of evidence-based agriculture-nutrition information**: draw a link if an actor is actively involved in circulating or distributing information to other actors about nutrition and nutrition related issues and their links to agriculture. Information could be disseminated through policy briefs, research reports, etc.

Probe for additional links and include on the map

Are there any individuals you would describe as opinion leaders in the policy formulation process?

Probe question: Are there any champions in the policy making process that influenced these policies into being? (NB: they may not necessarily be in the field of agriculture)

Step 3: Opinion leaders:

Now focus on eliciting names of actors that are considered opinion leaders on the issue. They may be individuals embedded within some of the institutions already on the map, or they may be individuals (independent, or even retired). *Add them to the map with a new color sticky note*.

Step 4: Attribute influence

How influential is each actor in the policy formulation process in Ghana's agriculture sector? Rate each actor actor's influence on a scale of zero to five (0=not influential at all; 5=highest level of influence)

We can represent the influence that each stakeholder has on an issue using stacking towers to assign levels- the more towers for an actor, the more influence they have according to the interview participant(s). Ask the participant(s) to think about the influence each person or organization has, and assign them an appropriate level of influence.

1) Define influence in this context:
    a. To what extent can the actors on the map influence, contribute or determine objectives, programs, interventions and projects in the policymaking process? Influence may be due to: control over funding flows, responsibility for implementation of key programs and projects, having authority over programmes or relevant decisions, etc. The focus is on the ability of the actor to influence important decisions on nutrition and not about formal hierarchies.
2) Attribute influence: *Select each actor one by one and ask about the level of influence on a scale of 0-5. Place between 0-5 towers on each actor. Probe "why" they are influential or not for each one.*
3) Review each score; compare and contrast influence levels across actors, probing further about why they are influential.
4) Review the entire board, and let the respondent make any changes

Step 5: Closing and final remarks

Are there any other issues that are important to highlight regarding the stakeholders on the map, their interactions, their goals and their influence in affecting the policymaking process?

How may we enhance the incorporation of nutrition objectives into future revisions of the policy documents based on what you have learnt from the development of the netmap? Probe: for any dormant organizations/ institutions that can be included in the process. Ask the participant(s) to think strategically about the network and develop ideas to ensure adequate incorporation of nutrition objectives into future revisions of the FASDEP II and METASIPs.

Thank the participants for their time and explain next steps in the research to them.

Appendix 2 Regional level Net-Map interview guide

Title of project: Assessing the nutrition-sensitivity of agriculture policies and investments in Ghana's agriculture sector

Net-Map Interview Guide

Regional Level

Pre-interview face-to-face (group)

- Write the overall question at the top of the flip chart paper/ on the PowerPoint page.
- Write the date and the name and job title of the respondent on the paper (One-on-one interview).
- Write the link types in the corner of the flipchart page, using the colour to correspond with links.

Overall question: Who participates in planning and implementing nutrition-sensitive agriculture programs, projects, and interventions developed in line with the Food and Agriculture Sector Development Policy 2 and its corresponding medium-term investment plans at the regional level?

Introduction

The project aims to improve understanding on agriculture-for-nutrition implemenetation in the Ghanaian context.

Net-Map is an interview technique that examines the goals, perspectives and influence of various stakeholders, and looks at the different ways in which these stakeholders interact with each other. We will start by ***listing*** *all the actors involved in this issue, then determine how they are* ***linked****, examine how* ***influential*** *each actor is in the planning and implementation of programmes, projects, and interventions arising from the key national policy documents (i.e. the Food and Agriculture Sector Development Policy II (FASDEP II) and the Medium Term Investment Plans), and finally look at their different* ***roles and goals*** *and how these might be used to enhance the incorporation of nutrition objectives into future revisions of the key policy documents. A particular feature of Net-Map is that it allows us to look at how things are actually done and not only what is written in formal documents. This is why we need the insight of people like you, who are part of the process and know it from the inside. All responses are strictly confidential, and any results will be fully de-personalized before being used in any presentation.*

Step 1 - Actor generation:

Overall question: Who participates in planning and implementing nutrition-sensitive agriculture programs, projects, and interventions developed in line with the Food and Agriculture Sector Development Policy 2 and its corresponding medium-term investment plans at the regional level?

We will start by listing all the organizations involved in planning and implementation of programmes, projects, and interventions arising from the key policy documents. These could include those people or organizations directly supportive of or providing services for programme, project or intervention planning and implementation; and those with competing priorities, whether or not they are aware of it

themselves. We can go back at any time throughout this process and add more stakeholders as you think of them. (Prompt according to the different categories below, one after the other).

- Government……..……Green
- Donor……..……..Yellow
- INGO/NGO/Civil Society……..……Pink
- UN……Blue
- Private sector……Orange
- Research/Academia……...Brown

For the following institutions, who gives _____to who? *(Prompt according to the different categories below, one after the other)*

f) Formal command
g) Flow of funds
h) Technical assistance
i) Advocacy or evidence-based information
j) Dissemination
k) Informal

Step 2: Drawing links between actors

Draw the links one at a time, completing all of one type of link before moving on to the next.

6) **Formal command**: draw a link if an actor has formal oversight over the work or actions of another actor
7) **Funding**: draw a link if an actor provides funds, loans, budgets, business payment to another actor
8) **Technical assistance**: draw a link if an actor provides technical support, guide, advice to another actor in the programme, project, or intervention planning and implementation
9) **Advocacy**: draw a link if an actor advocates or targets evidence-based information, lobbying, pressure groups, interest groups to another actor to promote changes in the planning and implementation process
10) **Dissemination of evidence-based agriculture-nutrition information**: draw a link if an actor is actively involved in circulating or distributing information to other actors about nutrition and nutrition related issues and their links to agriculture during planning and implementation. Information could be disseminated through policy briefs, research reports, etc.

Probe for additional links and include on the map

Step 3: Opinion leaders

Now focus on eliciting names of actors that are considered opinion leaders on the issue. They may be individuals embedded within some of the institutions already on the map, or they may be individuals

Are there any individuals that you would describe as opinion leaders of programming, projects, and interventions arising from these policy documents?

Probe: with special emphasis on nutrition

(independent, or even retired). *Add them to the map with a new color sticky note*.

How influential is each actor in the planning and implementation? Rate each actor actor's influence on a scale of zero to five (0=not influential at all; 5=highest level of influence)

Step 4: Attribute influence

We can represent the influence that each stakeholder has on an issue using stacking towers to assign levels- the more towers for an actor, the more influence they have according to the interview participant(s). Ask the participant(s) to think about the influence each person or organization has, and assign them an appropriate level of influence.

5) Define influence in this context:
    a. To what extent can the actors on the map influence, contribute or determine objectives, programs, interventions and projects in the planning and implementation process? Influence may be due to: control over funding flows, responsibility for implementation of key programs and projects, having authority over programs or relevant decisions, etc. The focus is on the ability of the actor to influence important decisions on nutrition and not about formal hierarchies.
6) Attribute influence: *Select each actor one by one and ask about the level of influence on a scale of 0-5. Place between 0-5 towers on each actor. Probe "why" they are influential or not for each one.*
7) Review each score; compare and contrast influence levels across actors, probing further about why they are influential.
8) Review the entire board, and let the respondent make any changes

Step 5: Further questions

Are there any other issues that are important to highlight regarding the stakeholders on the map, their interactions, their goals and their influence in affecting the planning and implementation of programmes, projects, and interventions arising from these policy documents?

How can nutrition programmes/projects/interventions be enhanced in Ghana's agriculture sector?

Ask the participant(s) to think strategically about the network and develop ideas for any challenges or opportunities they may see.

Thank the participants for their time and explain next steps in the research to them.

Appendix 3 Consent form for national level Net-Map participants

Title of project: Assessing the nutrition-sensitivity of agriculture policies and investments in Ghana

Principal investigator: Priscilla Boadi

Co-Principal investigators: Dr. Grace Marquis, Dr. Paola Perez-Aleman, Dr. Kent Mullinix, Dr. Nii Addy, and Prof. Richmond Aryeetey

General information about the study

The purpose of this study is to assess the nutrition-sensitivity of food and agriculture policies and investments in Ghana's food and agriculture sector as well as identify the stakeholders involved in agriculture-for-nutrition policy development in Ghana. You will be interviewed once for a maximum duration of 2 hours. The session will be audio-taped and transcribed to ensure accurate reporting of the information that you provide. Please take your time to review this consent form and discuss any questions you may have with the study staff, your friends, and your family before you make your decision. This consent form may contain words that you do not understand. Please ask the study staff to explain any words or information that you do not clearly understand.

Benefits of the study

Participants will not directly benefit from this study. However, this study has the potential to contribute to agriculture-for-nutrition policymaking in Ghana. Specifically, the study will:

- Contribute to the ongoing discussions on strengthening the linkages between agriculture and nutrition.
- Provide insights into the extent to which food and agriculture policies and investments in Ghana are nutrition-sensitive.

Risk of the study

Your directors, departmental heads, and supervisors may unduly encourage you to participate in the study.
Your director/ departmental head/ supervisor has been informed that your participation should be strictly voluntary to prevent this risk. No report will be made on you to your head after the study.

Confidentiality

This discussion will be audio-taped solely for the use of the researcher (Priscilla Boadi).

All data collected will be labelled using numbers assigned to participants to ensure confidentiality.

To facilitate analysis, a list of the numbers created in the study will be linked to personal names, which will be password protected, and only Priscilla Boadi will have access to this list. Please provide your consent below for the following:

Yes: _____ No: _____ You consent to be audio-recorded

Individual-level data collected will be stored on an external hard drive that only Priscilla Boadi will have access to. The data files on the external hard drive will be password protected. The list created for data analysis with identifiable data will be destroyed after the analysis of the study is completed.

Compensation

You will be given GHS 20 worth of phone credits as a token of appreciation for your time devoted to this study after this virtual stakeholder Net-Mapping activity has been successfully completed.

Withdrawal from Study

- Participation in this study is voluntary, and participants may withdraw at any time without any penalty.

- Participants will not be affected in any way if they decline to participate or later stops participating.

- Participants or participant's legal representatives will be informed on time if information becomes available that may be relevant to participants' willingness to continue participation or withdraw

COVID-19 Protocols to be followed

The assessments of risks and the protocols to mitigate them for this study are guided by McGill University's Directive: Preventing the spread of COVID-19 on campus and the Directive: Principles and procedures for research on campus. Measures that will be taken to reduce the risk include:

- maintaining 2-metre physical distancing;
- handwashing before and after study participation;
- providing the participant with a disposable facemask if they do not have one;
- limiting the number of times a participant has to come to a research site;
- reducing the time participants are in contact with other people;
- ensuring all high-touch surfaces and objects are disinfected daily and disinfected between users.

All research team members will be trained on preventing the spread of infection and the research team will respond each day to a required self-assessment health questionnaire before we head out to the field. All participants will be screened before accessing the research site and will be asked if they have symptoms of COVID-19 or have been in close contact with anyone who has or has had COVID-19. Participation will be cancelled or postponed when responding yes to any of the screening questions. Wearing a mask that covers the mouth and nose is mandatory.

Contact for Additional Information

If you have any questions about the research, you can contact:
Name: Priscilla Boadi
Address: School of Human Nutrition, Macdonald Campus, McGill University, 21111 Lakeshore Road, Ste Anne de Bellevue, QC. Canada
Telephone number: 059 391 7905

Email: priscilla.boadi@mail.mcgill.ca

If you have any questions about your rights as a research participant in this study, you may contact the Administrator of the Ethics Committee for Humanities, ISSER, the University of Ghana, at ech@ug.edu.gh or 00233- 303-933-866.

In addition, if you have any ethical concerns or complaints about your participation in this study, and want to speak with someone not on the research team, please contact the McGill Ethics Manager at 514-398-6831 or lynda.mcneil@mcgill.ca.

Participant Agreement
"I have read or have had someone read all of the above, asked questions, received answers regarding participation in this study, and am willing to give consent for me, my child/ward, to participate in this study. I will not have waived any of my rights by signing this consent form. Upon signing this consent form, I will receive a copy for my personal records."

_____
Name of Participant

_____ _____
Signature or mark of Participant Date

Appendix 4 Consent form for regional level Net-Map participants

Title of project: Assessing the nutrition sensitivity of food and agriculture policies and investments in Ghana

Principal investigator: Priscilla Boadi

Co-Principal investigators: Dr. Grace Marquis, Dr. Paola Perez-Aleman, Dr. Kent Mullinix, Dr. Nii Addy, and Prof. Richmond Aryeetey

General information about the study

The purpose of this study is to assess the nutrition sensitivity of food and agriculture policies and investments in Ghana's food and agriculture sector as well as identify the stakeholders involved in agriculture-for-nutrition policy implementation in Ghana. You will be interviewed once for a maximum duration of 2 hours. The session will be audio-taped and transcribed to ensure accurate reporting of the information that you provide. Please take your time to review this consent form and discuss any questions you may have with the study staff, your friends, and your family before you make your decision. This consent form may contain words that you do not understand. Please ask the study staff to explain any words or information that you do not clearly understand.

Benefits of the study

Participants will not directly benefit from this study. However, this study has the potential to contribute to agriculture-for-nutrition policymaking in Ghana. Specifically, the study will:

- Contribute to the ongoing discussions on strengthening the linkages between agriculture and nutrition.
- Provide insights into the extent to which food and agriculture policies and investments in Ghana are nutrition-sensitive.

Risk of the study

Your directors, departmental heads, and supervisors may unduly encourage you to participate in the study. Your director/ departmental head/ supervisor has been informed that your participation should be strictly voluntary to prevent this risk. No report will be made on you to your head after the study.

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Yes: _____ No: _____ You consent to be audio-recorded

Individual-level data collected will be stored on an external hard drive that only Priscilla Boadi will have access to. The data files on the external hard drive will be password protected. The list created for data analysis with identifiable data will be destroyed after the analysis of the study is completed.

Compensation

You will be given a token of appreciation to cover your fuel cost and for your time devoted to this study after this stakeholder net-mapping activity has been successfully completed.

Withdrawal from Study

• Participation in this study is voluntary, and participants may withdraw at any time without any penalty.

• Participants will not be affected in any way if they decline to participate or later stops participating.

• Participants or participant's legal representatives will be informed on time if information becomes available that may be relevant to participants' willingness to continue participation or withdraw

COVID-19 Protocols to be followed

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• maintaining 2-metre physical distancing;

• handwashing before and after study participation;

• providing the participant with a disposable facemask if they do not have one;

• limiting the number of times a participant has to come to a research site;

• reducing the time participants are in contact with other people;

• ensuring all high-touch surfaces and objects are disinfected daily and disinfected between users.

All research team members will be trained on preventing the spread of infection and the research team will respond each day to a required self-assessment health questionnaire before we head out to the field. All participants will be screened before accessing the research site and will be asked if they have symptoms of COVID-19 or have been in close contact with anyone who has or has had COVID-19. Participation will be cancelled or postponed when responding yes to any of the screening questions. Wearing a mask that covers the mouth and nose is mandatory.

Contact for Additional Information

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Name: Priscilla Boadi

Address: School of Human Nutrition, Macdonald Campus, McGill University, 21111 Lakeshore Road, Ste Anne de Bellevue, QC. Canada

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Participant Agreement

"I have read or have had someone read all of the above, asked questions, received answers regarding participation in this study, and am willing to give consent for me, my child/ward, to participate in this study. I will not have waived any of my rights by signing this consent form. Upon signing this consent form, I will receive a copy for my personal records."

_____ _____

Name of Participant **Signature**

Appendix 5 Consent form for focus group discussion participants

Title of study: Assessing the nutrition sensitivity of food and agriculture policies and investments in Ghana
Principal investigator: Priscilla Boadi
Co-Principal investigators: Dr. Grace Marquis, Dr. Nii Addy, Dr. Kent Mullinix, Prof. Paula Perez-Aleman, and Prof. Richmond Aryeetey.

General information about the study

The purpose of this study is to identify the barriers and facilitators to implementing nutrition-sensitive recommendations in Ghana's food and agriculture sector using the Global Capacity Needs Assessment Methodology developed by the Food and Agriculture Organization of the United Nations in 2020. This study will be a focus group discussion to assess organizational capacity to implement nutrition-sensitive recommendations. You are being asked to participate in this research study involving a focus group discussion. The duration of the focus group discussion is 2 hours. The focus group discussions will be audio-taped and transcribed to ensure accurate reporting of the information you provide. Please take your time to review this consent form and discuss any questions you may have with the study staff, your friends, and your family before you make your decision. This consent form may contain words that you do not understand. Please ask the study staff to explain any words or information that you do not clearly understand.

Benefits of the study

Participants will not directly benefit from this study. However, this study has the potential to contribute to agriculture-for-nutrition policymaking in Ghana. Specifically, the study will:

- Contribute to the ongoing discussions on strengthening the linkages between agriculture and nutrition.
- Help identify barriers and facilitators in implementing nutrition-sensitive recommendations in Ghana's food and agriculture sector, thereby contributing to our understanding of organizational capacity in nutrition-sensitive agriculture.

Risk of the study

1. Your directors, departmental heads, and supervisors may unduly encourage you to participate in the study. Your director/ departmental head/ supervisor has been informed that your participation should be strictly voluntary to prevent this risk. No report will be made on you to your head after the study.

Confidentiality

Participants in the in-depth interviews will be interviewed individually and privately to ensure confidentiality. Interviews will be audio-taped solely for the use of the researcher.

All data collected will be labelled using numbers assigned to participants to ensure confidentiality.

To facilitate analysis, a list of the numbers created in the study will be linked to personal names, which will be password-protected, and only Priscilla Boadi will have access to this list. Please provide your consent below for the following:

Yes: _____ No: _____ You consent to be audio-recorded

Individual-level data collected in both the in-depth interviews and the survey will be stored on an external hard drive that only Priscilla Boadi will have access to. The data files on the external hard drive will be password protected. The list created for data analysis with identifiable data will be destroyed after the analysis of the study is completed.

Compensation

You will be given refreshments as a token of appreciation for your time devoted to this study after each focus group discussion.

Withdrawal from Study

- Participation in this study is voluntary and participants may withdraw at any time without any penalty.
- Participants will not be affected in any way if they decline to participate or later stops participating.
- Participants or participant's legal representatives will be informed on time if information becomes available that may be relevant to participants' willingness to continue participation or withdraw.

COVID-19 Protocols to be followed

The assessments of risks and the protocols to mitigate them for this study are guided by McGill University's Directive: Preventing the spread of COVID-19 on campus and the Directive: Principles and procedures for research on campus. Measures that will be taken to reduce the risk include:

• maintaining 2-metre physical distancing;

• handwashing before and after study participation;

• providing the participant with a disposable facemask if they do not have one;

• limiting the number of times a participant has to come to a research site;

• reducing the time participants are in contact with other people;

• ensuring all high-touch surfaces and objects are disinfected daily and disinfected between users.

All research team members will be trained on preventing the spread of infection and the research team will respond each day to a required self-assessment health questionnaire before we head out to the field. All participants will be screened before accessing the research site and will be asked if they have symptoms of COVID-19 or have been in close contact with anyone who has or has had COVID-19. Participation will be cancelled or postponed when responding yes to any of the screening questions. Wearing a mask that covers the mouth and nose is mandatory.

Contact for Additional Information

If you have any questions about the research, you can contact:

Name: Priscilla Boadi

Address: School of Human Nutrition, Macdonald Campus, McGill University, 21111 Lakeshore Road, Ste Anne de Bellevue, QC. Canada

Telephone number: 059 391 7905

Email: priscilla.boadi@mail.mcgill.ca

If you have any questions about your rights as a research participant in this study, you may contact the Administrator of the Ethics Committee for Humanities, ISSER, the University of Ghana, at ech@ug.edu.gh or 00233- 303-933-866.

In addition, if you have any ethical concerns or complaints about your participation in this study, and want to speak with someone not on the research team, please contact the McGill Ethics Manager at 514-398-6831 or lynda.mcneil@mcgill.ca"

Participant Agreement

"I have read or have had someone read all of the above, asked questions, received answers regarding participation in this study, and am willing to give consent for me, my child/ward to participate in this study. I will not have waived any of my rights by signing this consent form. Upon signing this consent form, I will receive a copy for my personal records."

_____ _____

Name of Participant Signature