



Mapping of Agroecology Interventions in Ghana

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MAPPING OF AGROECOLOGY INTERVENTIONS IN GHANA

COUNTRY REPORT

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CSIR - Science and Technology Policy Research Institute

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List of Abbreviations and Acronyms

CEAL	Center for Ecological Agriculture and Livelihoods
CIDA	Canadian International Development Agency
CIKOD	Center for Indigenous Knowledge and Organizational Development
CSIR	Council for Scientific and Industrial Research
DANIDA	Danish International Development Agency
DFID,	Department for International Development
FAO	Food and Agriculture Organization
FARA	Forum for Agriculture Research in Africa
FASDEP	Food and Agriculture Sector Development Policy
GASIP	Ghana Agriculture Sub Sector Improvement Project
GEF	Global Environmental Fund
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
	Ghana National Climate Change Master Plan Action Programmes for Implementation
GSGDA	Ghana Shared Growth and Development Agenda
IFAD	International Fund for Agricultural Development
KNUST	Kwame Nkrumah University of Science and Technology
LEISA	Low External Input and Sustainable Agriculture
MESTI	Ministry of Environment, Science, Technology and Innovation
METASIP	Medium Term Agriculture Sector Investment Plan
MOFA	Ministry of Food and Agriculture
NCCP	The National Climate Change Policy
PARI	Program Accompanying Research in Agricultural Innovation

SAPIP	Savannah Zone Agricultural Productivity Improvement Project
STEPRI	Science and Technology Policy Research Institute
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
WB	World Bank

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EXECUTIVE SUMMARY

Ghana faces a number of urgent and interconnected challenges. Evidence of climate change in Ghana manifest in form of increasing temperatures; rainfall variability, including unpredictable extreme events; and sea-level rise. This, in combination with other stresses, is projected to lead to highly unpredictable agricultural productivity, loss of biodiversity, greater food insecurity, as well as socio-economic instability. Food systems are at the heart of these challenges—and are changing fast. Crop production, livestock, and fisheries account for nearly 18% of the Gross Domestic Product and employ more than 42% of the population. On one hand, Ghana's agriculture is still characterized by diverse agro-sylvo-pastoral production systems: 90% of agricultural production is accounted for by smallholder farms, producing a range of foods for their households and communities on small plots of land. But export commodity zones, large-scale land acquisitions, and huge influxes of foreign investment ('FDI') are also a feature of this complex and varied landscape—signaling the accelerating efforts to commercialize and industrialize all aspects of Ghana's food systems.

Agroecology is emerging as a compelling response to the challenges Ghana faces, and a viable alternative to the industrial agri-development pathway. Agroecological systems build resilience through crop/species diversity and natural synergies across the whole agro-ecosystem, thereby offering a response to the urgent challenges of climate change and resource scarcity. Furthermore, agroecology is labour intensive, does not require major land restructuring or upscaling, and relies on farmer-to-farmer and intergenerational modes of knowledge exchange – making it well-adapted to the structure and economic realities of Ghana's agriculture. Despite several interventions to promote agroecology in Ghana, government's participation is still limited. This study aimed to undertake a mapping of agroecological interventions in Africa and qualitatively analyze their design, the stakeholders' understandings of agroecology, and their impacts. Besides, a mapping of existing qualitative and quantitative datasets on agroecology will be performed.

Both desktop reviews of literature and stakeholder interviews were employed to solicit responses from stakeholders in agroecology space in Ghana. Initially, 40 organizations and institutions in agroecology space were selected after desk review of projects and programs related to agroecology, climate smart, organic agriculture and permaculture. After careful evaluation based on the location of the intervention, and agroecology practices introduced, 20 organizations were selected. During the phase one of the survey, data collected included project objectives, duration of intervention, information about stakeholders involved, funding agencies, categories of agroecological practices covered, agroecology approaches adopted, number of beneficiaries of the intervention, amount budgeted for the intervention, and agroecological zones the project covered. The phase two survey collected data on the challenges, opportunities and impact of the interventions on yield, labor use, and perceived changes on economic, ecological and social outcomes.

Impacts of Agroecology Interventions

Various organizations have introduced agroecological practices to farmers in Ghana. These practices include cover crop/green manure, weed, pest, and disease management practices, fertilisation management practices, irrigation management practices, crop temporal successions and crop spatial distribution. Cover crop/green manure, weed, pest, and disease management practices and crop temporal successions are the main practices introduced to farmers. Several agroecological approaches were used. These include agroecology, climate smart agriculture, agroforestry, sustainable intensification, conservation agriculture, organic farming. Most organizations adopted agroecology approach. Through agroecology interventions, the use of improved seeds, soil fertility, water consumption (in crop production), biodiversity on the farm and biomass yield (crop residues, leaf litter, stover) have increased. Also, the interventions led to significant increase in agricultural income and off-farm income of participants.

The interventions have increased significantly the yields of maize, rice, soybeans and vegetables during the period of the interventions. Also, demand for hired labour have increased in almost all the stages of production.

Perceived factors influencing the success of interventions

According to the findings from the stakeholder interview, the perceived factors influencing the success of agroecology interventions in Ghana include the following:

1. Support of the local authorities
2. Cooperation amongst smallholder farmers
3. High awareness creation among farmers about benefits of agroecology practices
4. Capacity building opportunities
5. Farmers saw prospect in organic farming
6. Timely implementation of activities
7. Government's support through local government for training and other activities under the projects
8. Farmers willingness to learn the practices they were taught
9. Availability of funds for timely implementation of activities
10. Active interest among farmers
11. Willingness of stakeholders to work together
12. High interest among participants to acquire skills in alternative livelihoods
13. The results of the project encouraged farmers to participate
14. Groups formed made working with farmers easier
15. Frequent supervision of the beneficiaries

Major challenges faced during implementation

Potential obstacles/challenges to be overcome may include:

1. Inadequate financial inflows for the intervention
2. Agricultural land tenure issues/ unavailability of land for commercial farmers
3. Inadequate farm mechanization services
4. High cost of production. Nearly 40 percent increase during implementation period
5. High cost of farm implements for farmers
6. Inadequate access to timely input
7. High prices for farm inputs especially organic fertilizers
8. Insufficient tricycles to help farmers bring their produce from the farm
9. Inadequate storage facilities for farmers
10. Lack of reliable and ready market for farmers' produce

1.-BACKGROUND AND CONTEXT

The world population is expected to reach 9 billion people by 2050 and there is the need to increase global food production by about 70 percent by 2050. Among the major developing areas of Asia and Africa, Sub-Saharan Africa (SSA) has shown a steady increase in its population since 1950 and this is projected to continue up to 2050. In this context, there is a consensus on the need to change production methods for sustainable production systems and meet sustainable development goals (SDG), particularly 1 and 2. Agroecology is more and more promoted as the way forward for a sustainable alternative to existing farming approaches with more and more funding allocated to it with FAO's scaling-up agroecology initiative particularly in African countries.

However, scaling-up initiatives should learn from existing initiatives, particularly their outcomes and under which conditions such outcomes were reached. This is not possible if such initiatives go unnoticed. There is a multiplicity of agroecology interventions in Africa reported in the literature and potential multiple others not yet known. Furthermore, the concept of agroecology is still abstract and subject to controversies in many aspects. First, the concept has several definitions and principles that render it subject to multiple interpretations on what to consider as agroecology in practical terms. Second, the performance of agroecology in Africa is location-specific and dependent on the practices adopted, their combination, local specificities such as land quality, climatic considerations etc. Therefore, this study aimed to undertake a mapping of agroecological interventions in Africa and qualitatively analyze their design, the stakeholders' understandings of agroecology, and their impacts. Besides, a mapping of existing qualitative and quantitative datasets on agroecology will be performed.

2. INTRODUCTION

Globally, the challenge confronting agriculture is meeting growing food needs while concurrently reducing environmental degradation in terms of soil organic matter decline, soil erosion, biodiversity loss, ground and water contamination (Kirschenmann, 2010; Foley et al., 2011). It is estimated that demand for food will increase by 70 percent as the world population rise from 7.4 billion to 10 billion by 2050 (Béné, et al., 2015). This requires doubling crop productivity to meet food demand (Hunter et al., 2017), through the widespread usage of chemical fertilizers and pesticides. However, this approach will certainly increase agriculture's impact on water quality and the climate (Foley et al., 2011; West et al., 2014). In the past three decades, there are growing concerns about the long-term sustainability of food production (Campbell et al., 2017; Kremen and Merenlender, 2018). Sustainable food production is necessary for ensuring appropriate food production and reduced losses and waste, while also safeguarding human and environmental health, political stability and better livelihoods with less environmental consequences (HLPE, 2019). Agroecological practices have been promoted as alternatives that can accomplish a transition towards more sustainable food systems.

Agroecological practices are agricultural practices that produce significant amounts of food, which integrate ecological processes and ecosystem services (Wezel et al., 2014). Its principles include nutrient recycling, enhancement of soil health, reduction of external inputs, and biodiversity conservation (Wezel et al., 2020). Agroecology embraces a science, a set of practices and a social movement and has evolved over recent decades to expand in scope from a focus on fields and farms to encompass whole agriculture and food systems. Additionally, it represents a transdisciplinary field that includes all the ecological, sociocultural, technological, economic and political dimensions of food systems, from production to consumption (Trabelsi et al., 2016). It involves making the best use of the functions of ecosystems and ecological processes to (i) design a productive agriculture that is less harmful to the environment and human health, (ii) avoid the over exploitation of natural resources, and (iii) reduce the implementation of agricultural practices based on the intensive use of pesticides, chemical fertilizers, and water.

In Ghana, successive governments have recognized the role of agroecology in sustainable farm and food system and inclusive development. As a results Ministry of Food and Agriculture and other government agencies have promoted sustainable and climate smart agriculture and thriving agribusiness through research and technology development, effective extension and other support services to farmers, processors and traders for improved livelihood. Additionally, several policies and plans have also emphasized sustainable agriculture and integration of agroecological principles. These include (1) Food and Agriculture Sector Development Policy (FASDEP I &II), (2) National Environment Policy 2014, (3) The National Climate Change Policy (NCCP) 2014, (4) Medium Term Agriculture Sector

Investment Plan (METASIP) 2009 – 2015, (5) Medium Term Agricultural Sector Investment Plan (METASIP) II, 2014 – 2017, (6) Ghana Shared Growth and Development Agenda (GSGDA) II – 2014 – 2017, (7) Ghana Shared Growth and Development Agenda (GSGDA) II – 2014 – 2017, (8) Ghana National Climate Change Master Plan Action Programmes for Implementation: 2015–2020, (9) Climate-Smart Agriculture and Food Security Action Plan (2016-2020). These policies and plans recognize the progressive impact of climate change and the need to produce food sustainably through implementation of agroecological practices. The current study is to take an inventory and assess the impacts of agroecological interventions in Ghana.

2.1 Study Objectives

The main objective of the study is to undertake a mapping of agroecological interventions in Africa and qualitatively analyze their design, the stakeholders' understanding of agroecology, their impact etc. Besides, a mapping of existing qualitative and quantitative datasets on agroecology will be performed.

3. METHODOLOGY AND STRUCTURE OF THE REPORT

3.1 Study Approach, Sampling, Data Collection and Analysis

Reviews of Literature

Desk research including extensive searches on websites of institutions for reports and documents of relevance was conducted. Websites of organisations such as the Ministry of Food and Agriculture (MOFA), Ministry of Environment, Science, Technology and Innovation (MESTI), forestry commission, lands commission and other related organization that implemented projects in agroecology were consulted. The desk research identified practices relating to agroecology, organic agriculture, climate smart practices, agroforestry, permaculture etc. Organizations who implemented such programmes were selected.

Initially, 40 organizations and interventions were identified. Using the criteria of the PARI project which requires the study to categorize an intervention as an agroecology if at least two of the six ecological principles of agroecology were implemented or introduced to farmers. These ecological principles include recycling, input reduction, soil health, animal health, biodiversity and synergy. The organizations identified included Ministry of Food and Agriculture, Hebron Farms, Peasant Farmers Association, FARA, GIZ, Agriculture Technical Institute, Youth Volunteers for the Environment Ghana, Center for Indigenous Knowledge and Organizational Development (CIKOD), Institute of Sustainable Energy and Environmental Solutions, ACASARD, Agroeco, Ghana Agriculture Sub Sector Improvement Project (GASIP), Goshen Global Vision, Institute for Sustainable Livelihood, Ghana Permaculture Institute, Partners in Sustainable Development, Center for No Till Agriculture, Presbyterian Agriculture Services, Community Self Reliance Center, Volta Sustainable Farms and Center for Ecological Agriculture and Livelihoods (CEAL). They were selected across six agroecological zones which included Sudan Savannah, Guinea Savanna, Coastal Savannah, Transitional Zone, Wet Evergreen and Deciduous Forest.

Data collected included project objectives, duration of intervention, information about stakeholders involved, funding agencies, categories of agroecological practices covered, agroecology approaches adopted, number of beneficiaries of the intervention, amount budgeted for the intervention, and agroecological zones the project covered, challenges and opportunities and the impact of the interventions.

3.2 The Structure and Scope of the Report

This report has been structured into seven main sections. Section one gives the introduction where the national context, justification of the study is outlined. Section 2 gives the introduction to agroecology project in Ghana.

Section 3 also elaborates the methodology employed for the review, data collected and analysis. Section 4, 5 and 6 is dedicated to results and discussion of the study. This report highlights the state of agroecology ecosystem in Ghana, descriptions of agroecology interventions, and agroecology practices introduced to farmers, challenges and opportunities for agroecology upscaling and impacts of agroecology intervention on labour and land productivity in Ghana. The closing section, section seven provides the conclusions and the recommendations.

4. RESULTS AND DISCUSSION

4.1 The State of Agroecology Interventions in Ghana

Some agroecology programmes and projects in Ghana (completed and on-going) were identified by this study. The interventions include (1) Women economic empowerment through shea value chain by the Presbyterian Agriculture Services (2) Agroecological program by Peasant Farmers Association (3) Participatory guarantee system (organic market for development) by Go West Africa (4) Ghana Agriculture Sub Sector Improvement Project by Ministry of Food and Agriculture (5) Sustainable Land and Water Management Project, which is implemented within the wider Volta basin in the Guinea and Savannah (6) Market Oriented Agriculture Programme by GIZ (6) Vibrant Village Foundation by Centre for No-Till Agriculture in Ghana located at Nkawie near Kumasi (7) Building women capacity in agroecology by Institute for Sustainable Livelihood. Others are climate smart agriculture training programme, agroecology business project, sharing information on agroecology to farmers in Ashanti region, vegetable garden training for farmers, Low External Input and Sustainable Agriculture (LEISA), integrated farming, agroecology practices promotion: a tool against land grabbing, training of farmers on integration of grasscutter into crop production systems and agroecology/sustainable farming and food systems and political participation of small scale farmers in decision making in Ghana. The principles of agroecology implemented under these projects included biodiversity, recycling, input reduction, soil health, resilience and co-creation and sharing knowledge.

4.1.1 The Initiation, Purpose and Implementation of the Interventions

Most of the interventions were initiated by the organizations or institutions. However, projects such as Sustainable Land and Water Management project, Ghana Agriculture Sub Sector Improvement Project and Savannah Zone Agricultural Productivity Improvement Project (SAPIP) were government of Ghana's projects implemented in collaboration with development partners. The purpose of these interventions was to train farmers in agroecological practice, conservation agriculture, organic farming, climate smart practices, sustainable agricultural practices and link smallholder farmers to both local and international markets. Specifically, the objectives of the projects are as follows;

1. To sensitize farmers to use low external agriculture input
2. To introduce agroecological farming into the communities in Ghana
3. To promote agro ecological and climate smart agriculture
4. Build resilience of rural farmers in climate smart agriculture and also to increase productivity
5. To introduce farmers to conservation agriculture
6. To improve environment friendly and climate smart agriculture farming practices
7. Help farmers practice organic farming by giving them premium on their produce
8. Train farmers, advocate for organic farming and to link farmers to markets
9. To reduce land degradation in order to improve agricultural productivity among smallholder farmers
10. To promote agroecology practices among farmers
11. Training of vegetable farmers and to introduce agroecological practices to them
12. To reduce poverty among smallholder women and men farmers through sustainable agricultural practices

4.1.2 Funding Sources of Agroecological Interventions

Several private and Non-Governmental Organizations (NGOs) fund agroecology interventions in Ghana. The study revealed that in the past two decades, nearly twenty (20) organization were involved in providing funds for diverse agroecology-related programs and projects. These include African Union, Federal Ministry for Economic Cooperation and Development (BMZ), GIZ, Global Environment Facility, The World Bank, United State Forest Services, Oxford Committee for Famine Relief (OXFAM), Groundswell Canada, Kerk in Actie, Mondelez, Open Society Initiative for West Africa (OSIWA), One tree planted and AFR 100, Peace Corps, Bread for the World, Germany, Joint Action for West Africa (JAFOWA), Elpg Netherlands, Vibrant Village Foundation, United Nations Development Programme (UNDP)- Global Environment Facility (GEF) - The Specialist Development Programme (SP) and Global Policy Network (GPN), Germany.

However, organizations such as Volta Sustainable Farms (North East Region, Karimenga), Hebron Farms (Accra), Partners in Sustainable Development (Tanoboase, Techiman) and Agriculture Technical Institute (Accra) self-financed their interventions. Their inability to seek funding from donor agencies limit their operations in the country.

Government funding of agroecology interventions are mainly through nation-wide projects implemented through ministries such as the Ministry of Food and Agriculture (MOFA), Ministry of Environment, Science, Technology and Innovation (MESTI), Forestry Commission, and wildlife division. These government-partnered interventions include Sustainable Land and Water Management Project, Ghana Agriculture Sector Improvement Project (GASIP) and Savana Agriculture Productivity Improvement Project (SAPIP). However, in order to provide nation-wide adoption of agroecology as a practice, there is an urgent need for sustainable funding for these private sector-led interventions across the country.

4.1.3 Agricultural Context of the Interventions

The type of farming system practiced under various interventions include inter cropping, mixed cropping, and mixed farming. Intercropping is a cropping system in which two or more crops are inter-planted on the same field such that their growth cycles overlap, their nutrient requirements are slightly different and their root systems take nutrient from different levels of the soil medium. Smallholder farmers in many areas of Ghana intercropped legumes with cereals, root and tuber crops. In northern Ghana, soybeans-maize intercropping is widely practiced. Mixed cropping involved growing different types of crops on the same plot during a production season while mixed farming is the cultivation of crops and rearing of livestock on the same farm. The crops under various interventions include legumes such as groundnut, soyabean; staple food crops such as cassava, cocoyam, cocoa, plantain, yam; cereals such as maize, millet, rice, sorghum; vegetables like garden eggs, tomatoes, okro and onion.

4.1.4 Carbon Funding for Mitigating Green House Gas (GHG) Emission

Results from the stakeholder interviews show that none of the stakeholder institutions have funding to mitigate green-house gas emission in Ghana. However, going forward it is important to provide funding for mitigating GHG emission.

4.1.5 The Stakeholders in Agroecology in Ghana

Stakeholders in agroecology in Ghana can be grouped into state/public organizations, civil society, producer association and Non-Governmental Organizations, research institutions and development partners.

State/Public Institutions

Public or state institutions involved in implementing projects/programs in agroecology include Ministry of Environment, Science, Technology and Innovation (MESTI), Ministry of Food and Agriculture (MOFA), Environmental Protection Agency, Forest Service Division, and Wildlife Division.

Civil Societies and Non-Governmental Organizations

The stakeholder interview results showed that most of the organizations involved in training, advocacy and sensitizing farmers on agroecology are civil societies and Non-Governmental Organizations. These organizations include Presbyterian Agriculture Services, Peasant Farmers Association, Goshen Global Vision, Centre for Indigenous Knowledge and Organizational Development, Institute of Sustainable Energy and Environmental Solutions, Go West Africa, Institute of Sustainable Energy and Environmental Solutions, Center for No Till Agriculture, ORGIS/Sahel Innovation Center, Partnership in Sustainable Development, Ghana Permaculture Institute, Community Self Reliance Center, Volta Sustainable Farms, Youth Volunteers for Environment Ghana, Hebron Farms and Institute for Sustainable Livelihood. Agroecology interventions in Ghana are private sector led activities.

Research Institutions and Training

Ghana has a massive infrastructural research architecture and training institutions across the length and breadth of the country. Most of them align with the agroecology of their locations, thus responding to their location specific needs in knowledge creation and human capacity enhancement to manage efficiently their natural resources for socio-economic transformation. These research institutions include Council for Scientific and Industrial Research (CSIR), University of Ghana; Faculty of Agriculture, Kwame Nkrumah University of Science and Technology; Faculty of Agriculture, University of Development Studies, University of Cape Coast and University of Energy and Natural Resources. Other organizations such as Ghana Permaculture Institute, Institute of Sustainable Energy and Environmental Solutions, Center for No Till Agriculture, and Peasant Farmers Association also train farmers in agroecology related fields. These organizations train farmers and students in various themes under agroecology including (1) Environment and climate change (2) Organic agriculture (3) Indigenous knowledge and agriculture (4) Agricultural climatology (5) Agriculture and environment (6) Desert Research (7) Dry season irrigation farming in Northern Ghana 8. Alternative off-farm livelihoods development, (9) Integrated pest management across agroecologies (10) Integrated crop management across agroecologies (11) Pest risk analysis and invasion ecology across agroecologies.

Development Partners

Funding for agroecology interventions in Ghana is mainly provided by the development partners. Nearly 70% of all stakeholders interviewed reported that they sourced funding from international donors. The development partners in agroecology in Ghana include GIZ, FAO, Global Environmental Fund, World Bank, CIDA, DANIDA, UNDP, DFID, USAID, Forum for Agriculture Research in Africa (FARA) and IFAD.

4.1.6 Spatial Distribution of Actors in Agroecology in Ghana

Agroecology interventions are dispersed across the country with most of the projects located in Northern Ghana. These projects are located in the six agroecological zones in Ghana. The agroecological zones include transitional zone, sudan savanna, guinea savanna, coastal, deciduous forest and wet evergreen. Majority of organizations interviewed have projects that are connected to agroecology in Northern Ghana. This may be due to climatic and poor soil conditions in Northern Ghana. Some of the communities where the interventions are implemented are Nkawie, Kumasi, Pinda, Paga, Offinso in Ashanti Region; Tanoboase and Techiman in North East Region, Karimenga, in North East Region; Faawoman in Bono Region; Bolgatanga in Upper East Region (Appendix 1).

4.1.7 Project Evaluation and Extent of Participation

The respondents were asked if there has been any evaluation conducted for this intervention in their organizations. Out of 20 organizations interviewed, 12 interventions (60%) were evaluated and have the reports for the evaluation study. With regard to participants drop-out in the course of the projects, only 7 organizations (58%) reported participant drop-out.

The number of participants who dropped out during the course of the project ranged from 8 to 382 people depending on the scope of the project and the number of beneficiaries. This drop-out rate represented about 3.2% of the total beneficiaries of the interventions. The reasons cited for the drop out of the intervention are (1) they could not meet the required standards that were expected from them (2) death of a farmer or relocation to different district (3) inability to meet project performance criteria (4) They could not follow the training given to them.

In all, about 35,870 farmers benefited from various agroecology interventions in Ghana. Nearly 5,170 were youths representing 14.41% while 8,185 (22.88%) were women.

4.2 AGROECOLOGY SYSTEMS IN GHANA

4.2.1 Agroecological Practices Promoted among Smallholder Farmers

Several agroecology practices were introduced to farmers through various interventions. These practices include cover crop/green manure, weed, pest, and disease management practices, fertilization management practices, irrigation management practices, crop temporal successions and crop spatial distribution. Most popular agroecological practices introduced to farmers included cover crop/green manure/residue retention, weed, pest and disease control and crop temporal successions (See figure 1). Nearly all organizations interviewed introduced cover crops/green manure or residue retention as a practice to farmers.

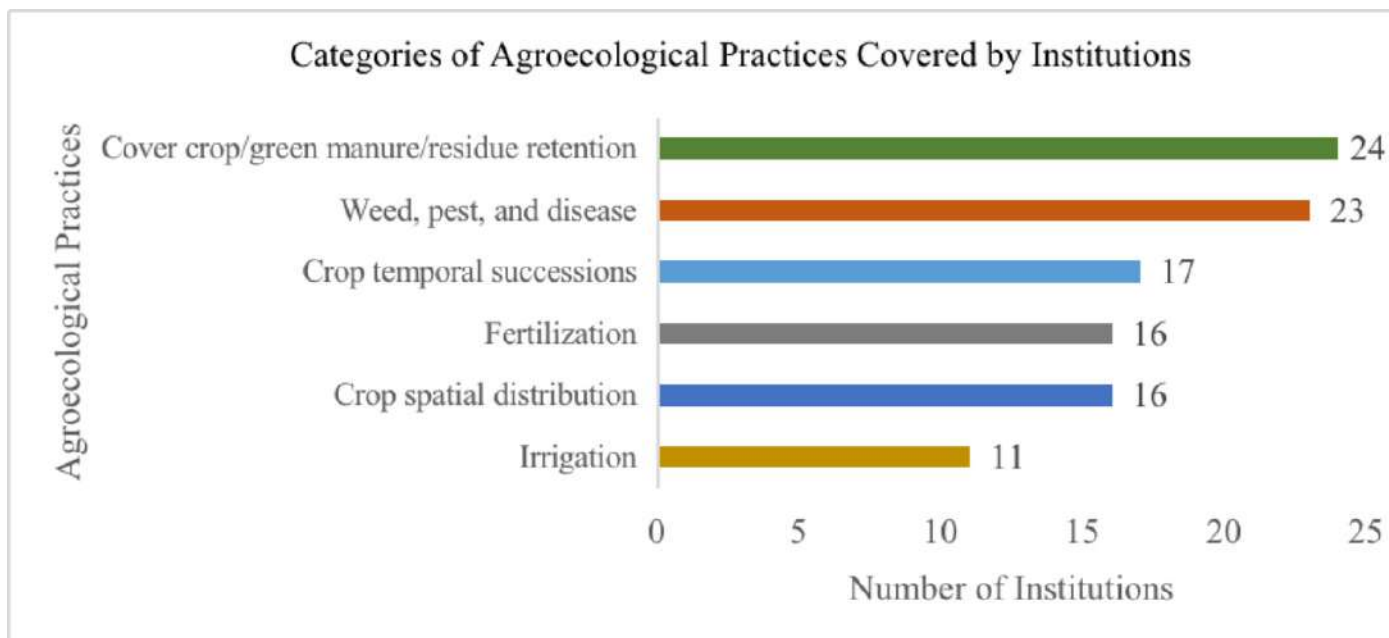


Figure 1: Categories of agroecological practices covered by Institutions

Irrigation management practices such as drip irrigation constituted the least of all the practices that were introduced to farmers. This is mainly due to the fact that most smallholder farmers who benefited from agroecology interventions cultivated crops that do not require irrigation for its production. Staples such as cassava, cocoyam, cocoa, plantain, yam do not require irrigation. However, to achieve self-sufficiency in food production as a country, there is a need to focus training on irrigation and water management practices.

Additionally, the survey results showed that these practices are mostly practised alone. About 17 out of the 20 organizations interviewed reported that these agroecological practices were used without the application of chemical fertilizer, chemical herbicide, chemical pesticide and tillage (See table 1).

Table 1: Agroecological practices applied in combination with other practices

Practices applied in combination	Frequency	Percentage
Chemical fertilizer application	0	0
Chemical herbicide application	1	5
Chemical pesticide application	1	5
Tillage	1	5
None of the above	17	85

4.2.2 Agroecological Approaches Covered by Institutions

With regard to approaches covered/used under the interventions, the results showed that agroecology, climate smart agriculture and agroforestry are the topmost agroecological approaches introduced to farmers through various interventions (See Figure 1). Nearly all organizations interviewed prioritised agroecology as approach while half of the respondents interviewed also used climate smart agriculture and agroforestry. Other approaches are sustainable intensification, conservation agriculture and organic farming.

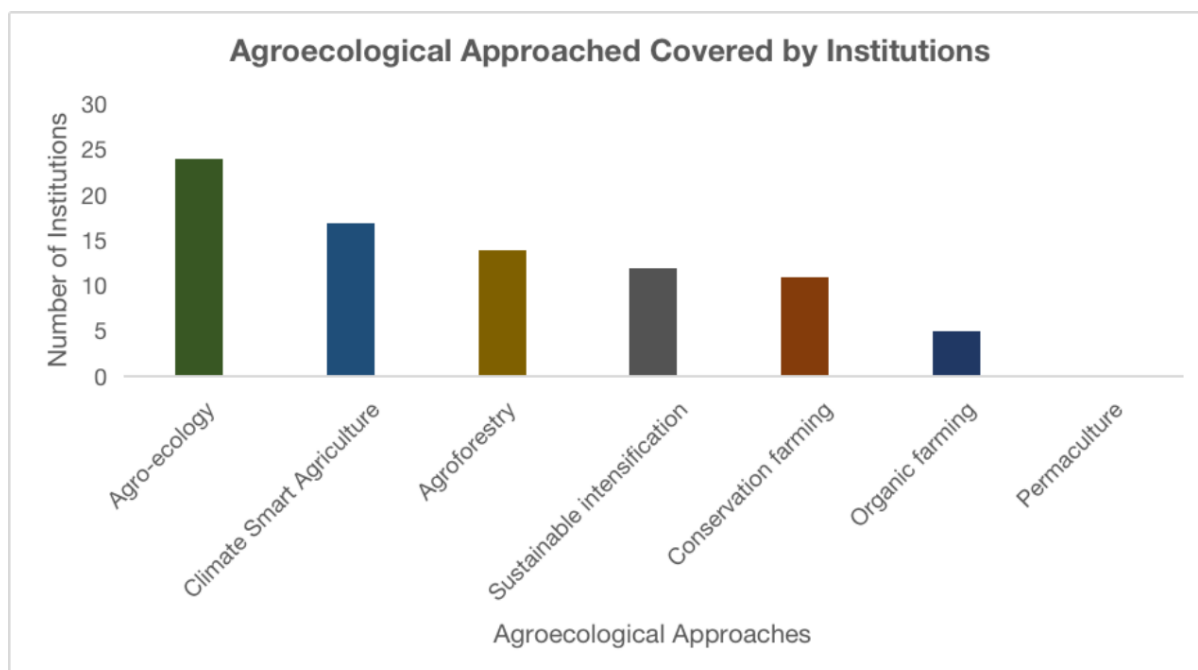


Figure 2: Agroecological approaches covered by institutions

4.2.3 Services Provided to the Participants

The respondents were asked the type of activities/services they provided to participants. The results showed that the main services provided included (1) trainings on agroecological practices (2) advice on agroecological practices and (3) market linkages (e.g., connecting producers with final consumers) (See Table 2).

Table 2: Type of activities/services provided to the participants

Type of activities/services do you provide to the participants	Frequency	Percentage
Loans or credit	1	2.3
Trainings on agroecological practices	15	34
Advice on agroecological practices	15	34
Access to farm inputs	2	4.5
Assisting farmers in certifying their products	2	4.5
Market linkages (e.g., connecting producers with final consumers)	7	15.9
Access to innovation platforms (e.g., where several stakeholders shared information)	1	2.3
Providing funding for agricultural entrepreneurship innovations	1	2.3
TOTAL	44	100

Source: Field Data, 2022

About 68% of the respondents conduct training and advisory services to farmers on agroecological practices (Table 2). Most organizations such as Institute of Sustainable Energy and Environmental Solutions, Center for No Till Agriculture and Peasant Farmers Association offer periodic training to farmers on agroecological practices. Also, these institutions also undertake advocacy and sensitization of farmers on these practices in their respective regions. Government lead projects

such as Ghana Agriculture Sub Sector Improvement Project, Sustainable Land Management Project and Savannah Productivity Improvement Project which train smallholder farmers in practices such as conservation agriculture, organic farming and climate smart agriculture. They also provide some organic input to farmers.

4.2.4 Types of Market Linkages

With regard to linking smallholder farmers to markets, most organizations interviewed reported (1) connecting producers with local traders and (2) connecting producers with other added-value activities (e.g., processing, post-harvesting, packaging).

Table 3: Types of Market Linkages

Types of Market linkages	Frequency	Percentage
Connecting producers directly with consumers	0	0
Connecting producers with local traders	6	50
Connecting producers with other added-value activities (e.g., processing, post-harvesting, packaging)	6	50
Connecting producers to exporters	0	0
TOTAL	12	100

Source: Field Data, 2022

5. IMPACTS OF AGROECOLOGY INTERVENTIONS

The study also assessed changes observed in different outcomes for the participants since the start of the intervention. The participants were required to indicate to what extent these outcomes decreased, increased or remained unchanged based on their experiences and observations.

Majority of the respondents indicated that the use of improved seeds, soil fertility, water consumption (in crop production), biodiversity on the farm and yields of biomass (crop residues, leaf litter, stover) increased a little (see Figure 3). Similarly, respondents also reported that sales in local markets, sales to buyers beyond the local markets and consumption of own production also increased a little.

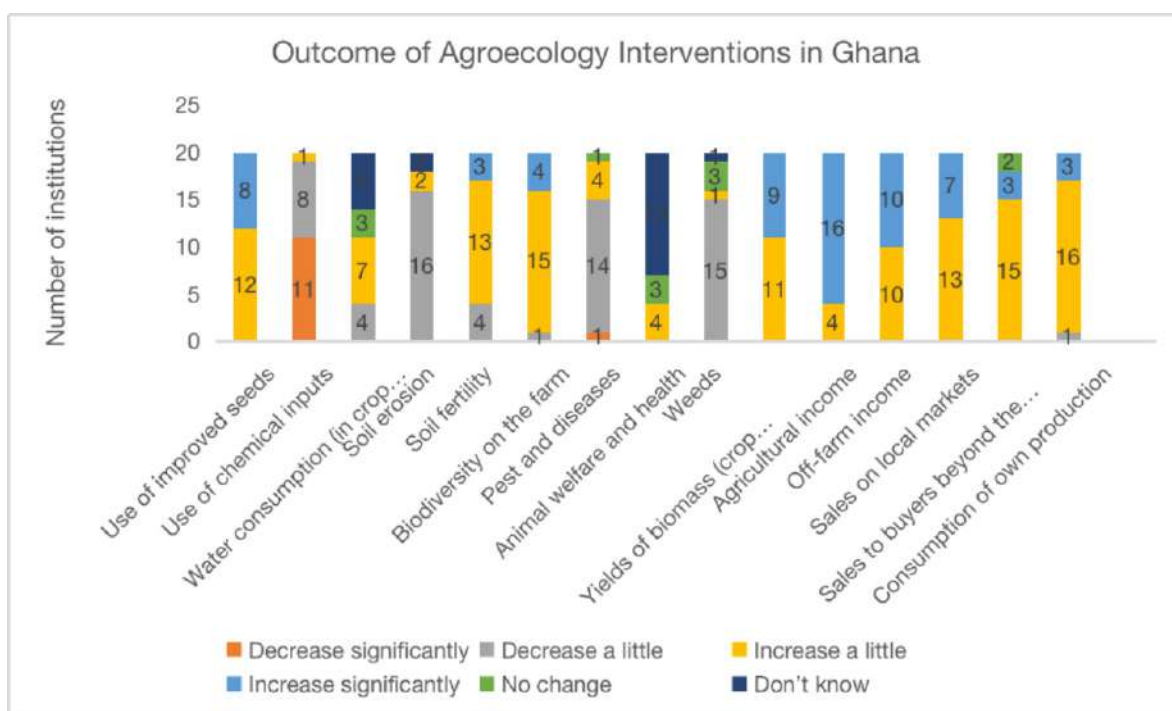


Figure 3: Outcome of agroecology interventions

The implementation of agroecology interventions has had significant impact on smallholder farmers' income. The respondents reported that the interventions significantly increased their agricultural income and off-farm income.

The respondents also reported that soil erosion, pest and diseases, and weeds occurrence have decreased a little during the intervention periods. With regard to the impact of the intervention on animal welfare and health, the respondents reported not to be aware of any impact. This reflects the over prioritization of crop production practices over animal health and welfare issues. The results also showed that the use of chemical inputs decreased significantly (see Figure 3). Farmers in Ghana spray their crops with pesticides to control pest and diseases. Nearly 87% of Ghanaian vegetable farmers use chemicals and pesticides for pest and disease control. They consist of pesticides 36%, fungicides 30%, herbicides 30% and nematicides 4%. Herbicide use in the country has caught up with many farmers that key stakeholders and actors in agroecology opposed to their use will need time and resources to minimize its use or completely reverse this trend. Despite the widespread adoption of chemical inputs, results showed that through training and sensitization, farmers have significantly reduced the usage of chemical inputs such as inorganic fertilizers, chemical pesticides, and chemical herbicides.

5.1 Impact of the interventions on yields

There have been diverse views as to the impact of agroecological practices on yields and the extent to which it reduces the cost of production for the farmers. Generally, the respondents reported significant increases in yields of maize, rice, soybeans and vegetables during the period of the intervention (see Figure 4).

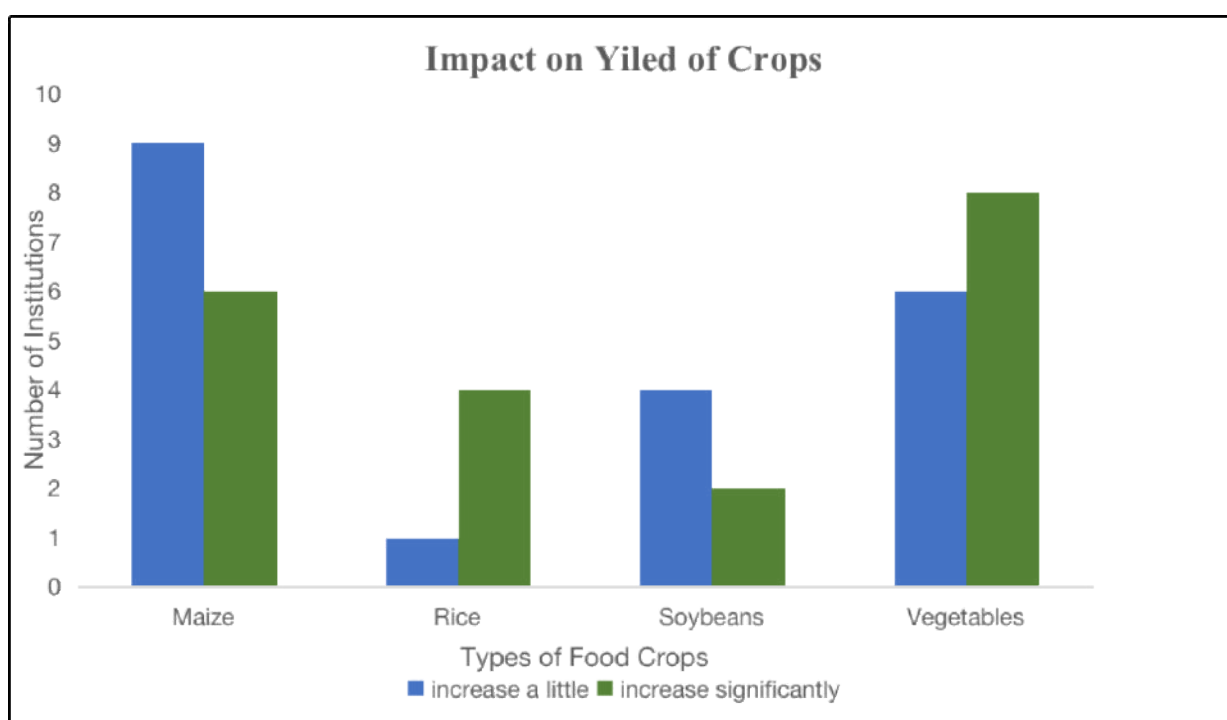


Figure 4: Impact of intervention on yield of crops

Source: Field Data, 2022

With regard to maize, nearly half of the respondents reported that yield have increased a little. Producers of vegetables indicated that they have observed significant increase in yield over the periods within which the projects were implemented. Averagely, the respondents reported that the yields of maize, rice, soybeans and vegetables increased by 700.67kg/ha, 1,400kg/ha, 834kg/ha and 644.71kg/ha, respectively.

5.2 Comparison of average yields of non-participants and participants

The respondents were asked to compare the observed average yields to those of non-participants of the project by rating whether it has been significantly lower, little lower, little higher, significantly higher, same or don't know. Majority of maize, rice and soybean farmers indicated that compared to non-participants their average yield have increased significantly while other reported that their yield have increased a little (see Figure 5).

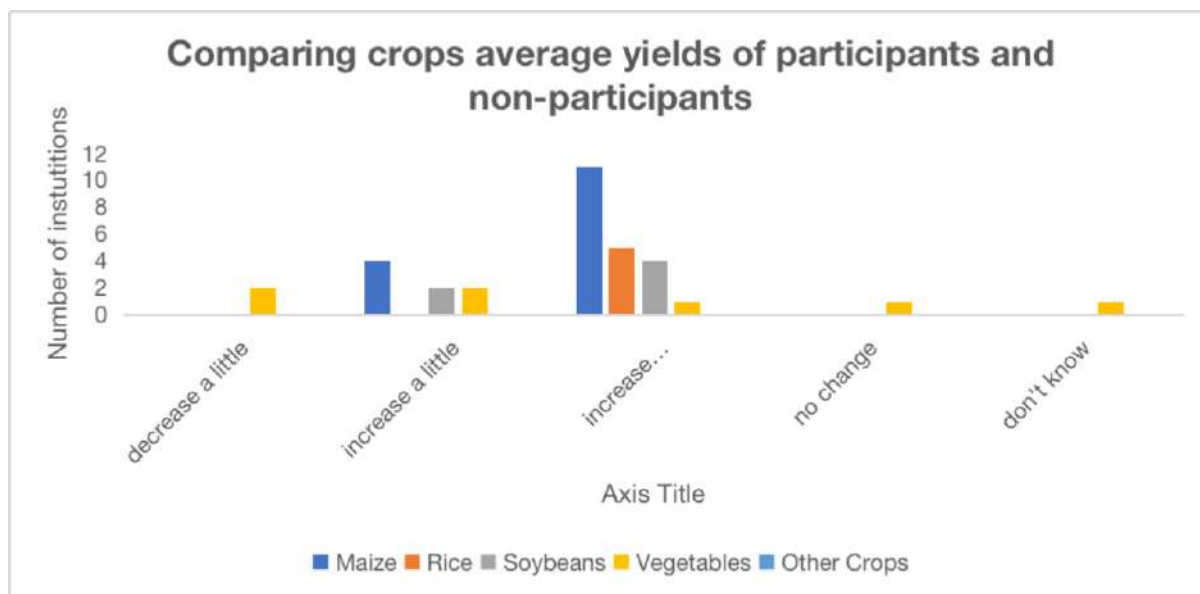


Figure 5: Comparison of crops average yields of participants and non-participants

Source: Field Data, 2022

5.3 Impact of Agroecology Interventions on Labour Demand

The respondents were asked to consider the hired labour requirements for all the different stages of crop production, as to whether the number of person days increased, decreased or remained unchange for land preparation (e.g. weeding, clearing the land), sowing or planting, compost and manure application, chemical fertilizer application, harvesting and post-harvesting. The results showed that hired labour requirement increased a little in almost all the stages of production.

Demand for labour for compost and manure application and harvesting increased significantly. However, demand for hired labour for chemical fertilizer application decreased significantly (see Figure 6). This was mainly due to the fact that, the agroecology practices introduced to farmers required less application of inorganic fertilizer. Farmers were advised to use more organic fertilizers rather than inorganic fertilizer.

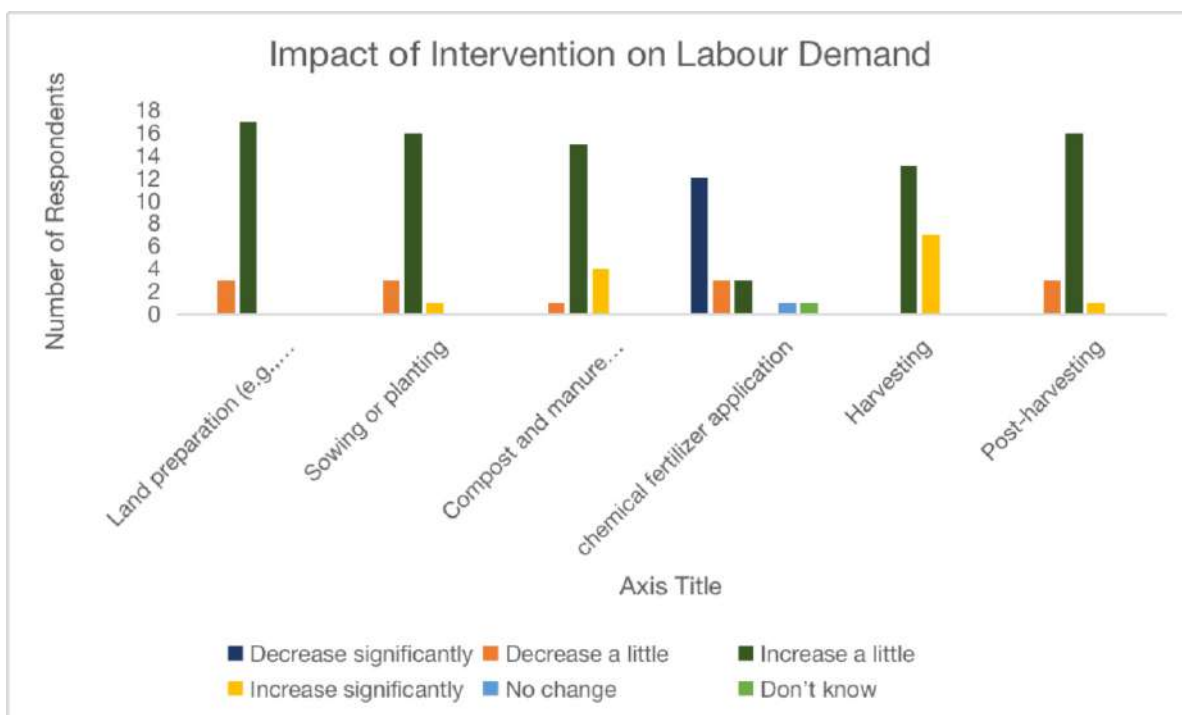


Figure 6: Impact of agroecology interventions on labour demand

Source: Field Data, 2022

6. CHALLENGES AND OPPORTUNITIES FOR SCALING UP AGROECOLOGY

6.1 Perceived factors influencing the success of interventions

Nationally, the drivers for agroecology includes increasing population and the need for food and fibre to feed and supply industries. Climate change and its variability is negatively impacting agricultural development, both below and above ground water and land, productive resources, drive for sustainable agricultural development and labour/youth employment among others. According to the findings from the stakeholder interviews, the perceived factors influencing the success of agroecology interventions in Ghana include the following:

1. Support of the local authorities
2. Cooperation amongst smallholder farmers
3. High awareness creation among farmers about the benefits of agroecology practices
4. Capacity building opportunities
5. Farmers' perceived prospect in organic farming
6. Timely implementation of activities
7. Government's support through local government for training and other activities under the projects
8. Farmers willingness to learn the practices
9. Availability of funds for timely implementation of activities
10. Farmers' ability to negotiate prices of their output.
11. Active interest among farmers
12. Willingness of stakeholders to work together
13. Commitment of the beneficiaries
14. High interest among participants to acquire skills in alternative livelihoods
15. International collaborative opportunities
16. Results of the project encouraged farmers to participate
17. Groups formed made collaborations with farmers easier
18. Frequent supervision of the beneficiaries

6.2 Major challenges faced during implementation—

Potential obstacles/challenges to be overcome may include:

1. Inadequate financial inflows for the intervention
2. Agricultural Land Tenure issues/unavailability of land for commercial farmers
3. Inadequate farm mechanization services
4. High cost of production. Nearly 40 percent increase during implementation period
5. High cost of farm implement for farmers
6. Inadequate access to time-bound input
7. High prices of farm inputs especially organic fertilizer
8. Insufficient tricycles to help farmers bring their produce from the farm
9. Inadequate storage facilities for farmers
10. Lack of reliable and ready market for farmers' produce
11. Perceived lack of premium price for organic or products produced using agroecology practices. This discouraged some farmers from continuing the practices
12. Absence of a policy and action plan on agroecology as a major development pathway for agriculture

7. CONCLUSIONS AND WAY FORWARD

The study aims at mapping agroecology interventions in Ghana and to assess its impact on crop yield and labour demand. In all 20 organizations involved in agroecology projects were interviewed. Principles of agroecology articulated under these projects include biodiversity, recycling, input reduction, soil health, resilience and co-creation and knowledge-sharing. The summary of the findings are as follows:

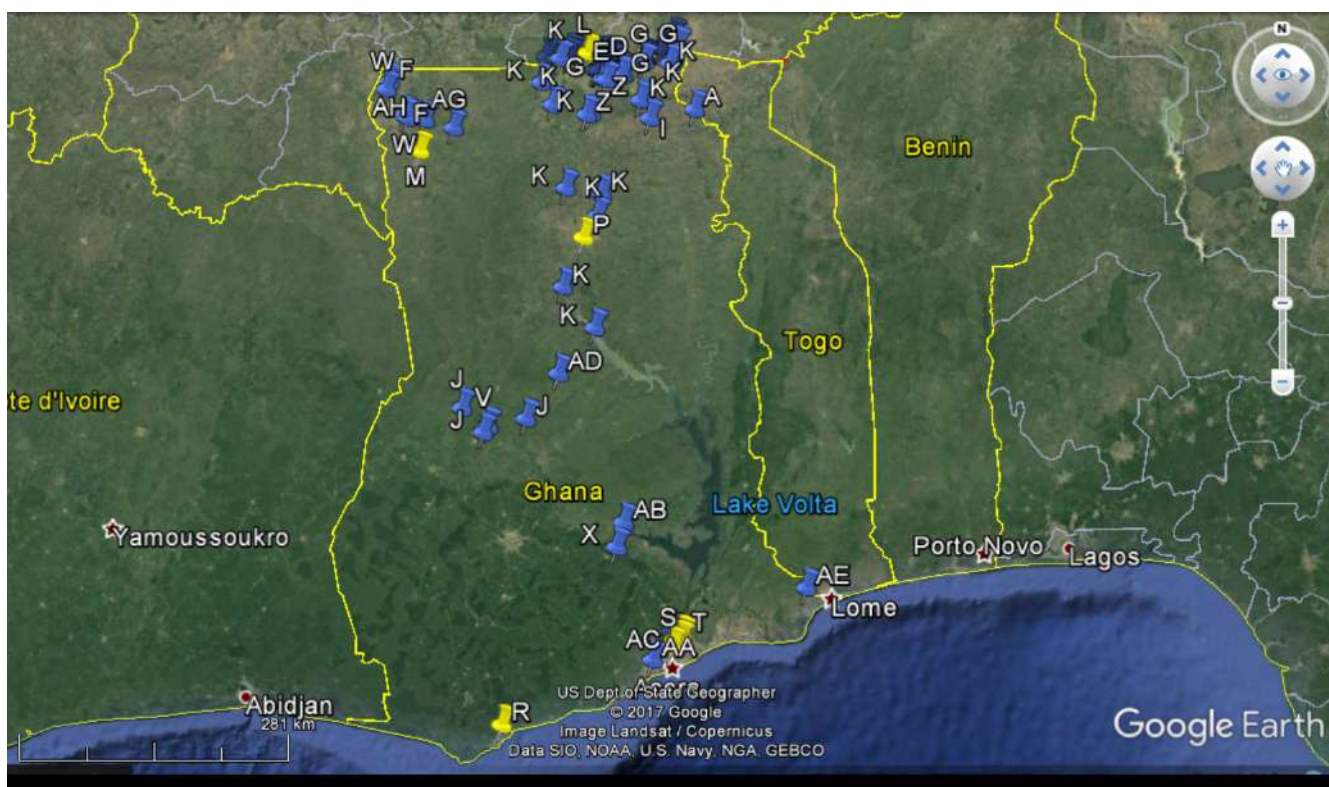
1. Though agroecology may not be the focus in major policy documents, the current review of government policies and agricultural development initiatives and strategies reveal a generally favourable policy and institutional environment likely to support possible prosecution of agroecology as an approach for agriculture and food systems transition.
2. Various organizations have introduced agroecological practices to farmers in Ghana. These practices include cover crop/green manure, weed, pest, and disease management practices, fertilization management practices, irrigation management practices, crop temporal successions and crop spatial distribution. Cover crop/green manure, weed, pest, and disease management practices and crop temporal successions are the main practices introduced to farmers
3. Several agroecological approaches were used. These included agroecology, climate smart agriculture, agroforestry, sustainable intensification, conservation agriculture, organic farming. Most organizations adopted agroecology approach.
4. Through agroecology interventions, the use of improved seeds, soil fertility, water consumption (in crop production), biodiversity on the farm and yields of biomass (crop residues, leaf litter, stover) have slightly increased. Also, the interventions led to significant increase in agricultural income and off-farm income of participants.
5. The interventions have significantly increased the yields of maize, rice, soybeans and vegetables during the period of the intervention. Also, demand for hired labour has also increased in almost all the stages of production.

WAY FORWARD

1. To advance the course of agroecology in Ghana, there is a need for alliance-building and collective action. Though there exist agroecology movement platform in Ghana, the platform requires government's support to make the desired impact. Participatory alliance-building helps actors to see themselves as part of this inter-connected landscape, making it possible to collectively analyze the challenges being faced and to co-develop solutions.

2. Integrated agriculture development policies that prioritize agroecology needs to be developed. Currently there is no policy on agroecology. Reforming the governance of food systems is a powerful tool for advancing agroecology in Ghana.

Appendix 1 Spatial distribution of actors in agroecology in Ghana



Map 1: Spatial distribution of actors in agroecology in Ghana

Source: Janet Nyaaba, 2017

Appendix 2: Identified agroecology stakeholders and their agroecological zones of Ghana

Agroecological Zone	Stakeholder/Projects/ Programmes	Stakeholder Category & Project Location	Roles/Responsibilities/Agroecology Practices
Forest- Transition Zone	Institute of Sustainable Energy and Environmental Solutions	Local NGO Medina, Accra	Providing professional, technical and tertiary training, research, consultancy, extension services and business advisory services in sustainable energy, environmental conservation, sustainable agriculture and agroecology, sanitation and circular economy, biodiversity, natural resources management, water, health and hygiene
	Partnership in Sustainable Development	NGO Located in Offinso in Ashanti region	Sharing information on agroecology to farmers in Ashanti region, training and sensitization of farmers.
	Center For Indigenous Knowledge and Organizational Development (CIKOD)	A local NGO Takyiman, Bono east, Sunyani, Wenchi	Resource Management – Conservation Agriculture activities and involvement of Traditional leaders to enact by-laws on women access to land. Cover cropping. Mixed farming, bunding, planting and ploughing along the slop, composting, ridging.
	Ghana Institute for Sustainable Livelihood	Local NGO Located in Techiman, Faawoman	Provides training to the youth and women and other interested parties in organic agriculture and sustainable livelihood activities.

Guinea Savannah/ Sudan savannah	MOAP-GIZ Project	GIZ Project	Input and Output Market linkages Tree/Legume cropping, Riparian protection, Use of climate smart crop varieties, Cereal/legume intercrop, cereal/legume rotation, bunding In Bole, Sawla-Tuna-Kalba, Cherponi, Bunkpurgu
	Ministry of Food and Agriculture Ghana Agriculture Sub Sector Improvement Project	Public Institution Sudan Savanna and Guinea Savanna	Support smallholder farmers in selected commodity value-chains including maize, soybeans, rice and vegetables. Training and extension service delivery to farmers.
	Ghana Permaculture Institute	Located in the Bono East Region of Ghana	Promotes permaculture systems and social enterprises to overcome social and environmental degradation. Provide training to organizations and individuals.
	Peasant Farmers Association	National Farmer NGO	Over 25 years of operation country wide. Agroecology farming (Demonstration farms) involving about 39,000 men and women farmers in over 55 districts Boreholes for farming Advocating for the inclusion of organic fertilizers Advocating for the increase of public investment in sustainable farming.
	Center for Ecological Agriculture and Livelihoods (CEAL)	CEAL is located in Walewale in the North East Region	Mobilize smallholder farmers and promote organic farming.
	Center for No Till Agriculture	Nkawie, Kumasi	Trains and provides technical assistances to farmers on tree planting and the integration of trees and tree crops with the conservation agriculture practices. Technical assistance is provided to farmers to ensure that they are adopting the agro ecology principles properly under conservation agriculture.

Presbyterian Agriculture Services	Faith Based Organisation (FBO). Based in Tamale, Northern Region with stations in Sandema, Garu, Langbensi and Yendi Mob.0244765079/0265021276	Over 50 years in operation. CA – cover Cropping, zero tillage in Garu and Sandema. Promoting organic agriculture and LEISA technologies. Conducted trainings on advocacy and proper handling of Agro chemicals. Supported farmers to adopt “Zai” method and other sustainable soil and water conservation management practices. Educated farmers on the impact of climate change and adaptation strategies. Supplied over 10,000 grafted mango seedlings to farmers Supported farmers to do dry season farming.
Community Self Reliance Center	NGO Located in the Bolga Municipality, and the Bolga East, Bongo, Nabdam, Talensi districts	romotes organic agriculture. Training includes compost making, use of manure and sea-weed (as an organic fertilizer).
Volta Sustainable Farms	NGO The project is located in North East Region, Karimenga.	Train farmers on integrated farming
ORGIS/Sahel Innovation Center	Pinda, Paga	Train farmers on agroecological practices
Environmental Protection Agency (EPA)	Public Organization, Accra	Strategic resource management assessment. Agro-forestry, tree growing
Sustainable Land and Water Management Project(SLWMP)	MoFA Project	Promoting sustainable land and water management practices including some aspects of CA West Gonja, Sawla-Tuna-Kalba, West Mamprusi, Mamprugu Moaduri
CARE International	International NGO	No till, Cover cropping, Crop rotation CA activities in East Mamprusi, Lambuasi, Sissala, Garu
Savannah Zone Agricultural Productivity Improvement Project (SAPIP)	Project-Donor funded	No till planting, Use of herbicide (total weed killers) West Mamprusi, East Mamprusi, Savelugu, Mion, East Gonja, Lawra
Integrated Water Management for Agric Development (IWAD)	Project	CA – cover cropping, zero tillage

Coastal Savannah	Agriculture Technical Institute	NGO Tanoboase Techiman Transitional agroecological zone	
	Hebron Farms	NGO The project is located in Accra	Training of farmers on integration of grasscutter into crop production system
	Youth Volunteers for the Environment Ghana	NGO The project is located in Coastal Savannah	Promoting and training the youth in Agroecology practices
Deciduous Forest/ Wet Evergreen	Goshen Global Vision	NGO Secondi Takoradi, Elembele Forest area near the Akasa forest	Build resiliency through community-based natural resource management and increasing tree cover while improving livelihoods and capacity building for farmers.

Appendix 3: Questionnaire for Agroecology Survey Stage 2

Objectives:

- investigate whether the coordinating institution has carried out any evaluation or assessment of each intervention
- describe perceived challenges and opportunities for the adoption of agroecological practices
- identify impacts of each intervention (particularly on land and labour productivity)

1.Project Identification (provided by PARI from Phase 1)		
Question	Type of question	Categories (if applicable)
1.1. ProjectID	Numeric	
1.2. Name of the project	Text	
1.3. Country	Text	
1.4. Name of the respondent	Text	
1.5. Institution of the respondent	Text	
2.Project evaluation/assessment (the following questions should be answered per intervention)		
Question	Type of question	Categories (if applicable)
2.1. Is there any evaluation conducted for this intervention?	Categorical	0= No (move to 2.1.2) 1= Yes (move to 2.1.1) 2= not sure (move to 2.1.2)
2.1.1. If yes, is there any report available?	Categorical	0= No (move to 2.1.3) 1= Yes (move to 2.1.1.1) 2= not sure (move to 2.1.3)
2.1.1.1. If yes, are you willing to share it with us?	Categorical	0= No (move to 2.2) 1= Yes (move to 2.1.3)

2.1.2. If no, are you planning to conduct an evaluation in the near future?	Categorical	0= No (move to 2.1.5) 1= Yes (move to 2.1.2.1)
2.1.2.1. If yes, when do you plan to carry this evaluation?	Text	
2.1.3. Is there any dataset available?	Categorical	0= No (move to 2.2) 1= Yes (move to 2.1.3.1)
2.1.3.1. If yes, are you willing to share it with us?	Categorical	0= No 1= Yes
2.2. Does this study include a baseline and follow up data?	Categorical	0= No 1= Yes
2.3. Did you follow any methodology to implement this intervention?	Categorical	0= No 1= Yes (move to 2.3.1) 2= not sure
2.3.1. If yes, could you share this methodology with us?	Categorical	0= No 1= Yes
2.4. Who are the beneficiaries of this intervention?	Categorical (to update based on partners feedback)	1= farming households 2= farmers' groups 3= village leaders 4= other(specify)
2.5. How did you select these beneficiaries?	Categorical (to update based on partners feedback)	1=random sampling 2=identification by the government 3=donor has an ongoing program in the region 4= other (specify)
2.6. What type of activities/services do you provide to the beneficiaries with this intervention?	Categorical (multiple choice) (to update based on partners feedback)	1= loans or credit only 2=trainings on agroecological practices 3=advice on agroecological practices 4=other (specify)
2.7. What it is the average of the area covered by this intervention? (in ha) (if available)	Numeric	
2.8. Is there any monitoring by your office on this intervention?	Categorical	0= No 1= Yes (move to 2.8.1)
2.8.1. If yes, what type of monitoring?	Text	
2.9. From the budget your report earlier to us, could your please give us an approximation on how this budget is allocated? a)Providing organic inputs to farmers: _____% b)Training farmers: _____% c)Setting field experimental sites: _____% d)Other (specify) : _____%	Numeric	Percent
2.10. In addition to funding this intervention, which other role the donor has on the implementation and monitoring?	Categorical	1= supervision by regular visits to the field sites 2= monitoring by regular meeting with our staff to discuss progress 3= other (specify)

2.11. Based on your response earlier on the number of stakeholders engaged in this intervention, could you describe what roles do they have?	Categorical (to update based on partners feedback)	
2.12. Is this intervention part of another national or regional program?	Categorical	0= No 1= Yes (move to 2.1.7.1)
2.12.1.If yes, which program	Text	
2.13. After the completion of this intervention, are there any plans for follow-up?	Categorical	0= No 1= Yes
2.13.1.If yes, what type of follow-up?	Categorical	1= New agroecology project 2= conducting research reports 3= collaborating with NGOs 4=other (specify)
3.Perceived challenges and opportunities		
Question	Type of question	Categories (if applicable)
3.1.From the following options, what do you consider influential in making this intervention successful?	Categorical (multiple choice) (to update based on partners feedback)	1=funds 2=support by the donor/ other organization 3= farmer's willingness to adopt 4= support by the government 5=assistance from village leader/farmers' group 6=other (specify)
3.2.From the following options, what are the major challenges you face for implementation?	Categorical (multiple choice) (to update based on partners feedback)	1=funds not available 2=overlapping with other agricultural projects 3=farmers literacy 4= farmers lack of knowledge on input use (e.g., fertilizer use) 5= farmers' perceptions (describe what type of perceptions) 6=internal coordination (within the organization) 7=no monitoring 8= staff not trained 9=rainfall variability 10= differences between agroecological zones (specify) 11= other (Specify)
3.3.From the following options, what factors are key to disseminate better this intervention and increase adoption?	Categorical (multiple choice) (to update based on partners feedback)	1=working with farmers' groups 2=support from government 3=support from NGOs or international organizations 4=funds available 5=political will 6= other (specify)

3.4.What are the perceived challenges faced by farmers in adopting agroecological practices?		
3.5.What are the opportunities for the adoption of agroecological practices?		
4.Impacts of the intervention (perceived changes on economic, ecological and social outcomes)		
Question	Type of question	Categories (if applicable)
<p>4.1. We would like to learn about the adoption among farmers of the different agroecological practices promoted by this intervention. Based on your experience and observations, could you give us an approximate on the share of farmers that have adopted:</p> <p>a)Use of organic fertilizers: _____%</p> <p>b)Use of own manure or compost: _____%</p> <p>c)Pest management practices: _____%</p> <p>d)Planting of cover crops: _____%</p> <p>e)Tillage: _____%</p> <p>f)Non-tillage: _____%</p> <p>g)Crop rotation: _____%</p> <p>h)Crop diversification: _____%</p> <p>Other (specify): : _____%</p>	Numeric	Percent
<p>4.2.Now, we are interested in the changes you have observed in different outcomes for the farmers (beneficiaries) since the start of the intervention. Please indicate if these have decreased or increased based on your experience and observations:</p> <p>a)Production costs</p> <p>b)Expenditures for buying inputs</p> <p>c)Use of traditional seeds</p> <p>d)Use of improved seeds</p> <p>e)Application of crop residues to the soil</p> <p>f)Livestock production</p> <p>g)Tree planting</p> <p>h)Crop diversification</p> <p>i)Soil erosion</p> <p>j)Pest and diseases</p> <p>k)Agricultural income</p> <p>l)Off-farm income</p> <p>m)Debts</p> <p>n)Participation of young people in farming</p> <p>o)Engagement of women in farming</p> <p>p)Engagement of women in household related activities</p> <p>Diet diversity</p>	Likert Scale	<p>1= decreased significantly</p> <p>2= decreased a little</p> <p>3=increased a little</p> <p>4= increased significantly</p> <p>5= no change</p> <p>6= don't know</p>
4.3. Which are the major crops that have significantly increased/decreased yields since the start of the intervention?	Categorical (Multiple choice) (to update based on partners feedback	<p>1= Maize</p> <p>2= sorghum</p> <p>3= rice</p> <p>4= soybean</p> <p>5=groundnut</p> <p>6=sesame</p> <p>7=cassava</p> <p>8=other (specify)</p>

4.3.1. What are the yields of these crops?	Likert scale	1= decreased significantly 2= decreased a little 3=increased a little 4= increased significantly 5= no change 6= don't know
4.3.2. Has labour for the cultivation of these crops changed since the start of the project?	Categorical	0= No 1= Yes
4.3.2.1. If yes, a)Who, cost, and time	Likert scale	1= decreased significantly 2= decreased a little 3=increased a little 4= increased significantly 5= no change 6= don't know
4.4.If this intervention has been implemented in different agroecological zones, have you observed any change between zones on land and labour productivity? Two questions on labor and output	Categorical	0= No 1= Yes
4.4.1.If yes, is labour productivity 4.4.2.If yes, is land productivity	Likert scale	1=no difference 2=slightly different 3=moderately different 4=very different 5=don't know

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