TRAINING GUIDE

Climate-Smart Agriculture and Climate Information Services Action for Food Systems Transformation in Ghana: Capacity strengthening and Stakeholder consultation

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CGIAR | AICCRA
Accelerating Impacts of CGIAR Climate Research for Africa

Climate-Smart Agriculture and Climate Information Services Action for Food Systems Transformation in Ghana: Capacity strengthening and Stakeholder consultation

The training was organized at Airport View Hotel, Accra, Ghana, May 24 – June 02, 2022 to promote and improve accessibility of validated climate information services and climate-smart agriculture technologies.

1. Background and training objectives

AICCRA Ghana Cluster in collaboration with WA Regional Cluster and national, regional and international partners convened a two-week capacity strengthening event. The format of the event was hybrid with important in-person attendance arranged.

The training aligns with the clusters expected contributions to specific project targets against four AICCRA performance indicators: **PDO1-** CCAFS partners and stakeholders in the Project area are increasingly accessing enhanced climate information services and/or validated climate-smart agriculture technologies; **IPI 2.2-** Partnerships launched/ strengthened between AICCRA-funded CGIAR and NARS scientists, universities, public sector stakeholders, farmer organizations, NGOs and private sector; **IPI 2.3-** People engaged in AICCRA-funded capacity development activities; and **IPI 3.1-** Validated climate information services and climate-smart agriculture technologies disseminated / made accessible. Therefore, the training was structured around four main segments: 1) Climate-smart one-health approach and partnership launch; 2) Early Warning & Rapid Response (EWRR) for a climate-smart IPM; 3) NFCS partnership strengthening and stakeholder consultation; 4) Enhancing access to CSA/CIS bundles while addressing gender and social inclusion (GSI).

The link with the West and Central African Council for Agricultural Research (CORAF) as AICCRA regional partner was two-fold and meant to: i) equip Ghana Cluster with the regional partner's expertise on strategic institutional arrangements required for effectively scaling CSA/CIS and building up collaboration roadmap for

EWRR systems; ii) enable the regional partner to learn from developments in Ghana Cluster in order to better organize south-south learning events.

The event aimed at promoting and improving accessibility of validated climate information services and climate-smart agriculture technologies, while empowering the country to build its resilience to climate shocks and to effectively prepare its Nationally Determined Contributions.

2. Training content

2.1. Climate-smart one-health approach and partnership launch

The aim of this segment is to promote one-health tools and provide advanced training on approaches for one-health sensitive CSA/CIS interventions. Stakeholder consultation will also take place to come up with innovative partnership mechanisms to accelerate the scaling of one-health sensitive CSA/CIS products.

2.1.1. Best-bet plant health practices: towards an IPM 3.0

Our vision for best-bet plant health practices – towards IPM 3.0 - describes a new paradigm of 'precision pest management', which is anchored on:

1) straightforward and real-time farmer access to decision making;

2) pest and disease management options relying on science-based ecological control, which will be detailed by the case study of the legume pod borer in West Africa;

3) the use of advanced genomic approaches and enhanced habitat management practices.

This new paradigm will build on the successes and positive aspects of 'old-fashioned' pest management, by allowing farmers to overcome its major weakness namely the 'judicious use' of pesticides. This central feature is all too often just a mere excuse to spray pesticides- indiscriminately and as the first line of action - with all the unintended side effects on human and environmental health.

Because farmers' buy-in for IPM 3.0 is essential, we put particular emphasis on farmer education and empowerment as the first and most important pillar for our 'precision IPM' strategy. What is also important to stress – once more - is that IPM should be a holistic approach encompassing all interactions occurring at cropping system/landscape and across trophic levels, instead of the usual narrow focus on single pest organisms attacking one crop. We have enough evidence that smarter insect pest management can entirely rely on nature-based solutions if deployed correctly and in the right context, reducing or avoiding the need for the use of synthetic pesticides.

We strongly believe our vision for IPM based on transformative technological advances, involvement of youth, gender-responsiveness and climate resilience will be a game changer. The existing agricultural research and extension capacities alone, particularly with the current public funding levels, however, will not be able to achieve this transformation on their own. We therefore urge a shift in public funding to focus on the need for increased investments in plant health research instead of insisting in quick wins which can easily be achieved by, e.g., scaling projects. For all this to be achieved, a much stronger policy support will be critical.

2.1.2. Aflasafe as a climate smart innovation - its products and success stories

Aflasafe® is a climate-smart innovative bioprotectant that mitigates pre-harvest aflatoxin contamination of crops with continued post-harvest benefits. Aflatoxins are a group of biosynthesized toxic secondary fungal metabolites produced by aflatoxigenic members of *Aspergillus* section *Flavi* that infect multiple crops. Among the aflatoxins, aflatoxin B1 is the dominant aflatoxin, and is a Class 1 carcinogen, the highest category given to unequivocally carcinogen compounds. Sub-Saharan Africa (SSA) has a high risk of perennial aflatoxin exposure due to its geographical situation within 35 ^{o}N and 35 ^{o}S of the equator where the conditions of temperature are ideal for the proliferation of toxigenic A*spergilli* and the biosynthesis of aflatoxins. Also, in many areas in this region, unfortunately there are sub-optimal post-harvest conditions, which increases the incidence of aflatoxin contamination.

Ingestion of aflatoxin-contaminated foods increases the risks of liver disease including liver carcinoma in humans, higher immunosuppression, child stunting and wasting, reduced animal productivity, and increased mortalities. Climate change heightens the risk of aflatoxin contamination. With increasing variations in weather patterns, there are more frequent droughts, water and plant stresses. These stresses predispose plants to increased aflatoxin contamination. Also, climate change encourages higher prevalence of toxigenic strains in the environment and weakens plants abilities for defense that create ideal conditions for increased aflatoxin accumulation. This has implications for one-health. This one-health challenge is being addressed using a natural approach to reduce aflatoxin accumulation by aflatoxin biological control.

Following extensive and rigorous research in multiple African countries, biocontrol agents of aflatoxin control have been selected from naturally-occurring native strains of atoxigenic *Aspergillus flavus* (i.e. not able to produce aflatoxins) strains to produce country specific Aflasafe products. These beneficial strains are identified from collections of thousands of indigenous strains, from multiple crops and diverse agro-ecologies within a target country. Multiple criteria dictate the selection of strains to compose a product, including their dominance across a country, their abilities to mitigate aflatoxin contamination in diverse agro-ecologies when used at pre-harvest stage and safety of the strains. Aflasafe products are developed through an initiative co-led by IITA and USDA-ARS and in collaboration with partners from national and international institutions. After strain selections and effectiveness trials, registration with national regulators, and technology transfer to private sector national governments to manufacture and distribute the products, Aflasafe® products are being used as climate-smart solutions in integrated pest and disease management strategies. To date, there have been over one million tons of aflatoxin-safe crops produced due to using integrated aflatoxin management strategies centered on using Aflasafe. An additional benefit of Aflasafe is that it confers protection to crops at post-harvest due to the associated strains being unable to produce aflatoxins.

At present, Aflasafe products have been registered in 10 countries in SSA: Nigeria (Aflasafe), Ghana (Aflasafe GH01, Aflasafe GH02), Senegal and The Gambia (Aflasafe SN01), Burkina Faso (Aflasafe BF01), Kenya (Aflasafe KE 01), Tanzania (Aflasafe TZ01 and Aflasafe TZ02), Zambia (Aflasafe ZM01, Aflasafe ZM02), Malawi (Aflasafe MZMW01, Aflasafe MW02), and Mozambique (Aflasafe MZMW01, Aflasafe MZ02). Furthermore, product development, testing and registration is being conducted in 12 other countries (see Figure 1).

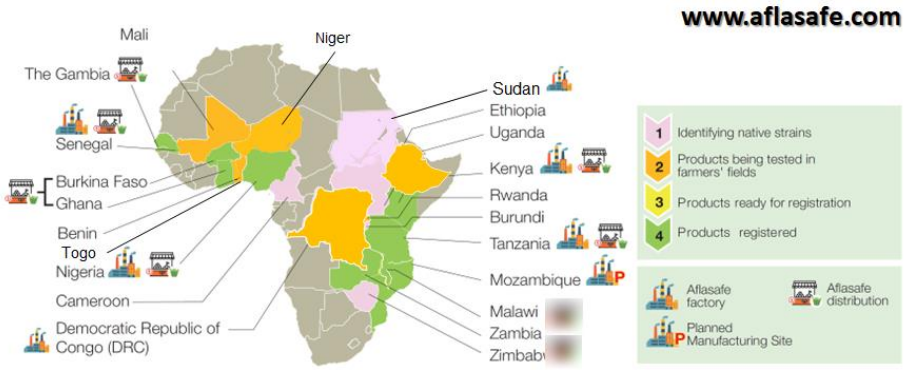

Figure 1. Development of aflatoxin biological control for Aflasafe production in sub-Saharan Africa

Figure 2. How Aflasafe works

Aflasafe application is simple and effective. Aflasafe is applied in maize, groundnut and sorghum fields at two to three weeks prior to crop flowering by broadcasting under moist conditions. When the beneficial strains sporulate, they displace toxigenic fungi and confer protection to the crop (see Figure 2). Due to the effectiveness of Aflasafe in aflatoxin biocontrol of above 80% aflatoxin reduction (even reaching up to 100% reduction in some cases), Aflasafe use is growing. In some countries Aflasafe factories have been established by partners in the private sector or the government for increasing the production scale to facilitate crop protection from aflatoxins. Factories have been established in Senegal, Nigeria, Kenya, Tanzania and are under development or being planned in some other countries (see Figure 1). This is contributing to improvements in food safety by reducing aflatoxin contamination from the production stage with continuing benefits due to healthy association with atoxigenic strains postharvest. More information about Aflasafe is available at the Aflasafe website (www.aflasafe.com).

2.1.3. Agro-eco-health products and success stories

We have been able over the past 10 years to build technologies which are very Agro-Eco-Health sensitive. These technologies include: (i) Biopesticides, botanicals (plant protection), (ii) Rational agro-chemical utilization, (iii) Minimal tillage/intermittent flooding (soil and irrigation technologies in rice systems), (iv) BSF technologies for quality composting, frass production for soil restoration, quality animal feeds. Listed technologies are under implementation in several countries and are used by several farmers. These technologies have been very helpful in improving soil, water, plant and animal health for improved community health and livelihood. We are also working with communities to identify business niches around developed technologies for farmers to generate additional income from these technologies

2.1.4. Facts and needs for a one-health version 2.0

Current operationalization of the One-Health concept has been mainly focused on zoonosis and, this has been mainly conducted by 2 of the 5 pillars of the One Health namely the Human and Animal health pillars of the OneHealth concept. The current questions are: What of other 3 pillars like Plant health, Soil health and Water health? Is there not a need to put emphasis on all 5 pillars? Considering current challenges like the use of agrochemicals on plants, soil, environment, animal and humans and also the challenges on climate changes, is it not necessary to have a more holistic view of the One-Health concept to well open this concept to all its 5 pillars? Is there not a need to well bundle One-Health and Climate change concept by developing technologies which are climate smart and One-Health sensitive.

2.1.5. How does a one-health version 2.0 look like?

One-health is a collaborative, multisectoral, and trans-disciplinary approach - working at local, regional, national, and global levels - **to achieve optimal health (and well-being) outcomes recognizing the interconnections between people, animals, plants and their shared environment** (Figure 3).

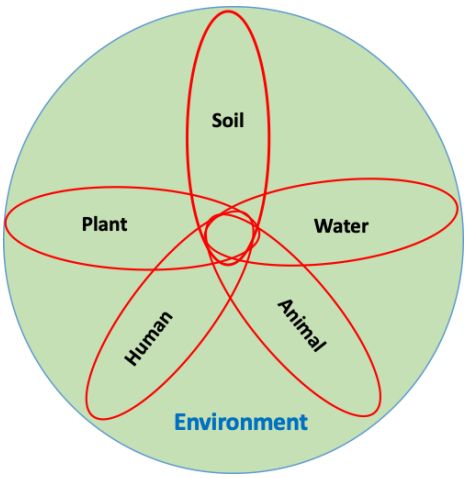

Figure 3. One-health version 2.0 working chart

2.2. Early Warning & Rapid Response (EWRR) for a climate-smart IPM

Segment 2 intends to share novel knowledge and make tools accessible to foster co-development of EWRR systems for climate-driven pests and diseases. The CORAF-WAVE-BIMAF model will be presented as potential instrument to empower viable partnerships in deploying sustainable EWRR systems.

2.2.1. Climate change impacts on insect pests and natural enemies: decision support tools

Agriculture production system is characterized by complex and interacting processes which can be summarized in the following: i) the influence of climate on insect population abundance over time; ii) the influence of climate on insect consumption activities and then growth rates; iii) interactions between insect behaviors and crop physiological processes; and iv) direct effects of climate on crop physiology. All these processes are influenced by the physical, biological, social, and economic factors under which crops are grown. In this regard, a change in climate may influence certain mechanisms of insect pests and natural enemies that include the metabolic rates, that translate to crop consumption rate, and population growth rate, and affect insect population size. Models and algorithms package as decision support tools (DSTs) are widely used to identify areas of pest invasion risk, assess the impact of climate of change and management priority with natural enemies (parasitoids and predators).

Technically, the DSTs are broadly grouped as inductive or deductive. In the inductive technique, the presence of an insect in a location is related to the prevailing bio-climatic variable and the likelihood of the presence of the insect in other areas are predicted using a 'top-down' approach. Software such as the Maximum Entropy (MaxEnt) and the Genetic Algorithm for Rule-set Prediction (GARP) utilize this technique. The deductive technique starts by modelling the insect response to environmental variables and applies the algorithm for predicting environmental suitability of the organism in diverse conditions. It is based on a 'bottom-up' technique, whereby direct measurements of the relationships between aspects of the insect life-history (development, survival, productivity, *etc.*) and environmental variables are used to identify the environmental space where the insect persistence should be feasible. Software such as the Insect Life Cycle Modelling (ILCYM) uses deductive technique. The CLIMEX-compare location function and the North Carolina State University (NCSU) Animal and Plant Health Inspection Service Forecasting System (NAPPFAST) are based on a combination of inductive and deductive approaches. In all techniques, presence/absence data are added to environmental and biological variables to predict the likelihood for a location to be suitable for the occurrence/abundance of an organism.

The main impediment is all these DSTs are formulated using a linear ('one- way') approach, which is not realistic. To improve understanding and realistically assess the impact of climate change in insect pest and natural enemies, we propose a multi-trophic approach that connects; the crop-insect-environment-soil systems, the ecosystem functions and processes, the socio-economic, socio-ecological challenges and cultural practices as well as respective interactions and feedback loops, biophysical flows, time delays, and nonlinearity within functional fluctuating bounds. Such holistic and systemic concept fit very into the concept of "One Health" that enables to capture both qualitative and quantitative information to explore system behavior and allows for upscaling by accounting for processes occurring at a given level of hierarchy within the whole system.
While acknowledging that long-term resolutions for a skill assessment of the ***Climate change impacts on insect pests and natural enemies*** through DSTs can only be achieved by restructuring and managing these system components in ways that maximize the array of fundamental 'built-in' ecosystem preventive strengths, integrating nature inspired tactics in integrated manner. The "One Health" approach stresses holism, utilizing agroecological principles and nature inspired tactics combine with a socio-economic and policy framework that stress human resource development and well-being. However, the full implementation of such a complex system requires a

systematic steps and skills which may take years to be developed and implemented therefore for now we opted for Common Digital Plant Health Service (CDPHS) as quick action
The proposition is to gather data; then build a data hub and data platform to provide a 'one-stop shop' of labeled, cross-referenced, and free data access. This can be achieved through coordinated effort connecting existing data systems and tools to generate a (CDPHS) that can be beneficial for crop pest management at the local, country, regional and continental levels. A core element of such a mega system will be to ensure interactions and data sharing between systems and data sources to use and overlay data to feed into analytics for insect pest risk and management interventions. This approach will require the strengthening of developed common data management cultures and policies which avoid a divergent range of processes and protocols around data collection and entry and enable stakeholders and governments to own data-dependent decision-making systems.

2.2.2. Early Warning and Rapid Response system

Climate-driven biotic stresses and mostly invasive alien species (IAS) are regarded as one of the biggest threats to local and global biodiversity and ecosystem services. Accompanied by climate change, the two may become a deadly duo and cause significant and rapid changes in the composition of ecosystems. Climatic disturbances, and particularly raising temperatures affects insect development, reproduction and survival, leading to i) uncertain pest population dynamics, ii) range expansion of native pests/diseases into new geographic areas, iii) more frequent and overlapping pest cycles per season, and iv) increased damage potential from IAS.
A scenario Africa is experiencing right now is the establishment of new pre- and post-harvest pest species with severe economic impact. The degree of invasive alien species introductions, especially in and within the continent, suggests that many countries lack capacity to prevent invasions and to respond rapidly for the management of any biological invasion. The impact of climate change on biodiversity linked to biotic stresses can also have a severe impact on agricultural productivity worth tens of billions US dollars annually. For instance, it is anticipated that climate change might influence established biological control by deregulating natural enemy-pest interactions, because of a higher sensitivity of higher trophic levels to climatic variability or of different temperature optima compared with pests. Also, extreme climatic events may affect the ecosystem services of beneficial soil biota such as entomopathogenic micro-organisms.

IITA in coalition with national and international partners have established a Biorisk Management Facility (BIMAF) to engage not only researchers, but also the civil society, including farming communities, non-government organizations, and public and private structures, to sustainably address challenges posed by biotic stresses and climate change on agricultural production. This represents a true asset to address the lack of early warning and rapid response systems that can allow timely actions and prevent further spread of pests and diseases into new areas.

The spread of transboundary plant pests and diseases has been on the increase in recent years as a result of climate change, trade, globalization, as well as reduced resilience in production systems. Fall armyworm (*Spodoptera frugiperda*), FAW, is such one of the most devastating invasive alien species that threatens agricultural ecosystems in SSA over the past three years and is here to stay. The first outbreaks were quite alarming. The pest incidence is expected to vary across seasons based on ecosystem structures (e.g. alternative host plants and diversity and abundance of natural enemies) and management practices. Late detection of the pest in fields potentially cause severe damage and critical yield losses. Therefore, there is urgency to cover the lack of preparedness and develop robust EWRR tools in agricultural systems. In the frame of earlier projects, BIMAF in conjunction with NIBIO are at the forefront of strengthening the capacity of key stakeholders from Mali and Niger for the development of Early Warning and Rapid Response (EWRR) systems to help farmers in both countries for early detection of FAW in their fields and timely interventions. Experiences and key learning outcomes will be shared with

participants joining this event. Discussions around how Ghana could structure and build institutional capacities to co-develop an EWRR system will be organized.

Generic EWRRS' components:

i. Risk Knowledge: Public engagement for better access to risks information through efficient risk communication channels, and emergency plans.

ii. Monitoring and Warning Services: Enhancing synergies in infrastructure and tools that delivers pests and diseases forecasts and warnings. Advocacy for improved legislation, institutional arrangements to foster informal collaboration.

iii. Dissemination and Communication: Broadcasting simple and clear warnings through reliable pests and diseases forecasts and customised warning messages through appropriate communication technologies. Advanced strategies to foster interactions among main stakeholders.

iv. Response Capability: Capacity enhancement for increased public and institutional preparedness and for timely and appropriate action by authorities. Advocacy for centralized knowledge and emergency plans and for the development and application of internal policies, arrangements, procedures, and frameworks.

2.2.3. Co-constructing a CORAF-WAVE-BIMAF model for pests and diseases management

AICCRA is catalyzing collaborative linkages between national, regional and international research and training institutions on climate-smart agriculture, and to foster synergies across partner interventions. Therefore, AICCRA Ghana is leveraging from the Biorisk Management Facility (BIMAF) as a regional hub for research, training and action specifically for promoting climate-smart and one-health-sound innovations. The hub is planned to be anchored to the Regional Alliance for climate-driven Biorisk Management (RAB) (Figure 4) under the West and Central Africa Council for Agricultural Research and Development (CORAF)'s authority and in partnership with the Central and West African Virus Epidemiology Program (WAVE). Ghana is identified as one of the pilot countries for deploying the CORAF-WAVE-BIMAF-led RAB's interventions.

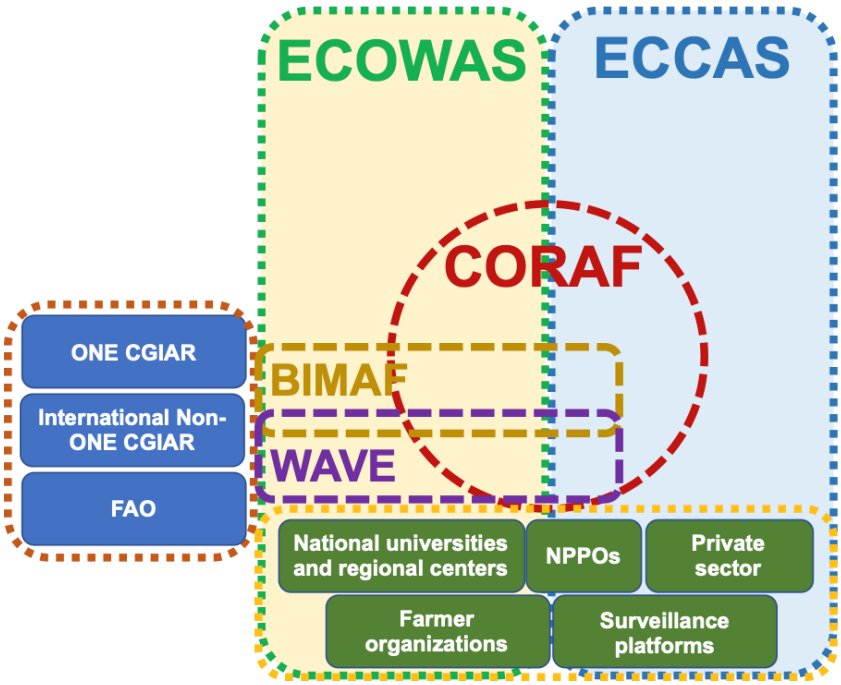

Figure 4. Strategic workflow of the CORAF-WAVE-BIMAF (CWB) Alliance

2.3. Climate Services and NFCS partnership strengthening and stakeholder consultation

This segment aims at reviewing climate services efforts including reviving the engagement on Ghana National Framework for Climate Services (NFCS). The partnership will be strengthened with new tools and consultations will be organized towards operationalizing the NFCS strategy document.

2.3.1. IRI support to enhance climate services at GMet

The Climate Data Tool (CDT)

CDT is part of IRI's **ENACTS** (Enhancing National Climate Services) objective to ***improve the availability and quality of climate data.*** IRI's Climate Data Tool (CDT) is used to generate high-resolutions temporally and spatially complete climate timeseries by organizing all available meteorological observations, performing quality control, and then combining the quality-controlled observations with global proxies. Ghana Met staff been trained on the use of CDT for data organization, quality control, generating temporally and spatially complete climate data, data analysis and visualization

The Automatic Weather Station Data Tool (ADT)

Using Automatic Weather Station Data has been a challenge for many Meteorological Services because different donors provide different types of AWS, and data collected by these different networks are in different formats and may sit on different servers. To overcome this challenge, IRI has introduced the AWS Data Tool (ADT), which is a free web-based application, with an easy-to-use graphical user interface that enables Meteorological Services to access, process, quality control, and visualize data from different systems in one place. ADT has been installed at Ghana Met and staff has been trained.

Next Generation (NextGen) Climate Forecast System

NextGen is an approach to produce weather and climate forecasts at timescales of weeks to years. It's based on more than 25 years of research at IRI and is being implemented in countries across the world. It provides location-specific and actionable forecasts to assess future climate risks and opportunities. One of strengths of NextGen is that it allows users to choose a threshold they are interested in rather than the usual terciles (below normal, normal, above normal). Ghana Met staff has received some training on the NextGen system and more training are planned.

Development of Maprooms to support web-accessible decision support systems

The IRI Data Library is used to develop and make available an array of climate information products and decision support systems for specific applications. Online climate information products (Maproom) developed using the IRI Data Library facilities interactive analysis, visualization, and download of climate data and information products. This will be installed at Ghana Met and staff will be trained.

2.3.2. GMET climate services products

Some GMET climate services products which are but not limited to Daily weather forecast, Weekly Weather Outlook, Seasonal Weather Forecast, Seasonal Onset, Seasonal Cessation, Season Length, Dry Spells, Rolling Seasonal Cumulative Rainfall (January February March, February March April, March April May. April May June, etc ,General advisories), Temperature Forecast (Maximum, Minimum) Intra seasonal weather forecast, Potential Evapotranspiration rate, Standardized Precipitation Index (SPI), Standardized Precipitation Evapotranspiration

Index (SPEI), Wind Roses, Dekadal Climate and Agrometeorological Bulletins, Participatory Integrated Climate Services for Agriculture (PICSA), Numerical Weather Predictions, Marine Forecast.

2.3.3. Operationalizing the NFCS strategy

The National Framework for Climate Services provides background information on the climate outlook in Ghana and sets the scene for the need for the framework for the GFCS priority sectors. The Framework will provide enabling capacity for the development and application of Climate Services in the planning and implementation of risk management in all climate sensitive sectors of the economy. It will guide the improvement of knowledge on Climate Services in all sectors and the provision of efficient climate information services for sustainable socio-economic development.

The main objective of the NFCS is the provision of timely and sector relevant climate services for Climate risk management and adaptation to the impacts of climate variability and change for socio-economic development.
The specific objectives of the NFCS are to ,understand the impact of climate change and the risks it poses, understand the vulnerability of the various sectors, particularly the five relevant sectors (agriculture and food security, water resources, energy, health, disaster risk,transport reduction),enhance capacity in observations and monitoring of climate systems, improve the provision of climate services at the national and local levels, guide the mainstreaming of climate information in development planning and decision-making, guide the capacity in developing, packaging and communicating weather and climate, information ,enhance the capacity of users in understanding and application of climate information and services, improve climate-related research, modelling, and prediction of weather and climate. The NFCS is expected to guide and strengthen institutional capacity in the provision of efficient climate services to promote climate risk management for the impacts of climate variability and change. It is also expected to guide climate change and variability.

2.3.4. Progress towards the co-development of Ghana ag-data hub

The Ghana Agricultural Data Hub (Ag-Data Hub) is being developed as a secure mission-critical, reliable, multi-tier and multipurpose digital data exchange backbone for information and data sharing among stakeholders and for the development of fact-based decision support systems to drive policy-making and to trigger a move towards sustainable climate smart agricultural practices.

This segment builds up on the presentation of the proposed architecture of the Ag-Data Hub during the March event. The segment will demonstrate a mock-up of the front-end implementation of the Ag-Data hub and how various value chain actors can benefit from the Hub. The demonstration will propel the session into a discussion where key stakeholders will have the opportunity to contribute to the proposed implementation of the Ag-Data Hub.
The following have been achieved so far and will be discussed at this segment of the program:

- Key data-holdings and relevant tools have been identified for use and integration as initial data source for the implementation of the Ag-Data Hub
- Final data engineering architecture and infrastructure design for the implementation of the Ag-Data Hub has been developed and shared with stakeholders.
- A four-phased implementation plan has been developed and shared with stakeholders.
- Developed of online service platform for the transformation of GMET data into structured formats for Web portal-based CSI dissemination.
- Commenced the Extraction, Transformation and Loading of pilot dataset to be loaded into Data Lake & Date Warehouse of the AG-Data Hub.

- Selected End-User tools for CSI dissemination and Agro-Advisory are being developed on datasets in the Ag-Data Hub in partnership with GMet and Africa Rising Project respectively.

The discussion is expected to lead into an agreed final implementation plan as well as the joint-drafting and refining of an MoU to be shared and signed by all partners who will contribute data to or access data from the Ag-Data Hub. By the end of this session, key partners are expected to have come to a conclusion on an agreed implementation strategy for the Ag-Data Hub.

2.3.5. Participatory Integrated Climate Services for Agriculture (PICSA): how can Ghana Ag-data Hub further support data collection and analysis for farmers use?

To help farmers coping with the negative impact of climate change the World Agroforestry (ICRAF) is collaborating with various partners including Climate Change Agriculture and Food Security research program (CCAFS), the University of Reading, national meteorological Services, national research institutes and various NGOs in many West African countries to implement innovative approaches such as climate smart agriculture (CSA), climate smart village (CSV) and Participatory Integrated Climate Services for Agriculture (PICSA).

Since 2015, ICRAF is engaged to build the capacity on PICSA approach and awareness rising for climate information use, and the development of tools and methods to support stakeholders track progress in CSA and improve the effectiveness of programming and scaling up and out CSA practices for improved farmers' resilience in Africa. PICSA approach was developed to help farmers to make plans and decisions for their individual contexts by utilizing climate and weather information together with participatory decision-making tools.
The approach is based on the analysis of livelihood activities by smallholder farmers in the light of climate information of their locality including historical weather data as well as seasonal and short-term forecasts. Base on all these elements farmers are able to make risk assessments and take decisions to improve their production and meet their objectives.

This relies on participatory tools such as graphs generated from historical climate data (for at least 30 years) specific to a given site that are not part of the usual products provided by National Meteorological Services. The analysis of the graphs enables farmers (along with field staff) to explore the characteristics of the climate in their location and to identify implications for agricultural planning and decision making e.g. which crops and varieties are most likely to succeed given the amounts of rainfall received in seasons, exactly how is the climate changing and what enterprises and agricultural practices are likely to be most successful. Other participatory tools include resource allocation maps, seasonal calendars, participatory budget analysis.
Ghana Ag-data Hub may be enriched with all historical climate graphs made for various trainings, update and make them available to farmers. As the historical climate information, agricultural information data (including, crop yield / tree biomass and fruit production, pest and disease incidence on crop, livestock or human, fodder availability, food price, etc.) may be drawn for past period (at least 30 years) to improve farmers understanding and their decision making.
Like the seasonal weather forecast made by Ghana Met, one health scientists may elaborate seasonal forecast for pest and disease incidence, make it site specific and in a language easy to understand for farmers. It can be one of the tools for early warning system being in preparation.
At the end of the season, while evaluating PICSA implementation, the accuracy and usefulness of other forecast (pest and disease incidence, agricultural data) could be also assessed to improve the ability of the actors to predict one-health issues and anticipate for the solutions addressing them.
The implementation of PICSA approach (Figure 5) is also being constrained by lack of historical climate records in some localities due to the poor spacial coverage of automatic weather stations. The "Enhancing National Climate Services (ENACTS)" initiative of IRI aiming to improve data availability by filling spatial and temporal

gaps in climate observation through combination of national data with satellite proxies, offers a mean of potentially addressing this.

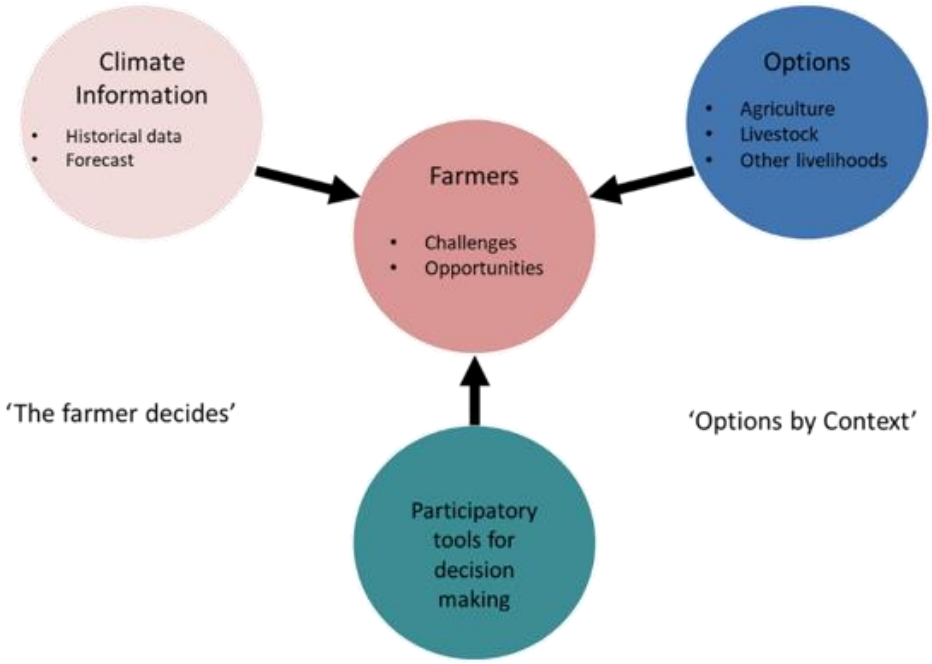

Figure 5. Contextual framework of PICSA approach

2.4. Enhancing access to CSA/CIS bundles while addressing GSI

Several key partners are expected to join this capacitation opportunity including strategic governmental agencies, CSA science-policy platforms and Regional-Extension Linkage Committees (RELCs). The aim of this segment is to promote AICCRA bundled CSA/CIS products and equip participating organizations in the use of impactful innovations to build farming communities resilience. By the end of the training, participants will be able to pass along expertise and develop skills within their respective institutions and innovations dissemination schemes.

2.4.1. AICCRA themes underpinning

2.4.1.1. Climate-Smart Technologies and Practices: Innovative approaches to scaling up climate-smart agriculture (CSA)

Climate-smart agriculture (CSA) aims to sustainability increase agricultural production by adapting to and building resilience to climate change. It focuses on food security and national development goals and, where possible, it also aims to reduce or remove GHG emissions.
Recent analyses indicate that although several CSA programs and on-farm studies were successful, there is only weak uptake of many innovative CSA practices and technologies.
The presentation aims at providing some innovative approaches for scaling up CSA technologies and practices. CSA is operating at different levels (farm, household, village/community, national, global). The presentation will illustrate each of levels with one specific tool/ approach for scaling up CSA. Four approaches will be presented:
i- The climate-smart village (CSV)
The climate-smart village (CSV) approach is an AR4D approach to test, through participatory methods, technological and institutional options for dealing with climate change in agriculture. It is a framework of an integrative strategy for scaling up adaptation options in agriculture.

ii- The CSA Investment Plans (CSAIP)

The CSA Investment Plans identify concrete actions that governments can take to boost climate-smart agriculture, both in the form of investment opportunities and policy design and implementation. Countries can also use the CSAIPs to inform their NDC updates and National Agriculture Investment Plans.

Climate information services (CIS)

Climate services encompass the production, translation, transfer, and use of climate knowledge and information in climate-informed decision-making. Climate services can constitute a tool to scale up CSA by providing an enabling environment that can support the adoption of CSA practices while protecting against the impacts of climate extremes.

Digital climate-smart agriculture (D-CSA)

Digital climate-smart agriculture (D-CSA) leverages digital tools to help smallholder farmers increase productivity and resilience in the face of climate change while contributing to mitigation where possible and appropriate.

2.4.1.2. Scaling and Sustaining CIS-CSA Bundling Business Models

Farmer adaptation to climate variability and change is a multi-faceted challenge. We ensure farmers learn best practices suitable to their crops and their local environmental conditions. Similarly, farmers' capacity is enhanced to engage with different farming advice and information along with climate smart agriculture (CSA) practices in a cost-effective manner. CSA practices are broadly defined and include, among others, aspects ranging from crop selection to fertilizer management to soil enrichment. Depending on the CSA focus, climate information services (CIS) at various time scales may support improved farmer decision making about both CSA practices to apply and when to implement them. This training manual provides a clear guidance on how bundling agricultural innovations associated with CSA with other services such as climate information and financial services (e.g., combining crop varieties that resist drought or heavy rains with recommendations regarding best practices with access to insurance). It (training manual) further demonstrates the synergistic nature between CIS and CSA – and the potential complementarity of each to support the scaling of the other. Together with the trainees and through the training manual we address questions such as (1) how can CIS and CSA be bundled together with other agriculture products and services to support sustainable scaling in the delivery of the same? (b) what are the business models that can support the implementation of CIS and CSA in a manner that maximally benefits farmers and does so in a way that is profitable for private sector implementing partners?

2.4.1.3. Ensuring Gender and Social Inclusion smartness

Gender and Social Inclusion (GSI) is a cross-cutting theme in AICCRA to ensure that women and youth benefit from AICCRA interventions. This segment will provide an overview of GSI in AICCRA and the components of AICCRA gender smart framework. The AICCRA-Ghana GSI approach and various dimensions of integrating GSI into activities will be presented. This segment will build on the gender smart framework and Ghana GSI approach to inform practical actions to mainstreaming gender and social inclusion. Concrete examples of gender and generational differences in needs, resources assess, and priorities from AICCRA value chains and intervention communities will be presented and discussed with participants. By discussing these, the segment aims to co-develop and co-innovate with participants strategic and transformation context-specific actions for ensuring gender and social inclusion in AICCRA activities. By the end of this segment the capacities of participants will be built while ensuring that they become co-producers and co-owners of actionable solutions, and practical tools and approaches to work towards gender and social inclusion in AICCRA.

2.4.2. Media training

2.4.2.1 Climate change in Ghana: facts and figures

AICCRA aims at strengthening the capacity of partners and stakeholders, and enhance access to climate information services and climate-smart agriculture technologies. The media is a key partner in AICCRA and have been identify as a vehicle for education and information. This segment will b**uild networks:** create networks of climate change and agriculture media representatives across the country. These individuals are to serve a leadership role in training and informing citizen audiences. The segment will also **raise awareness**: provide science-based insights on climate change effects and impacts in Ghana. Enhance the knowledge, understanding and reporting capacity on crucial agriculture and climate change issues and the CIS AND CSA technologies and innovations AICCRA has developed/is developing to make farmers and Ghana climate-resilient. The session will also help g**uide story development:** train participants on how to develop stories that are simple, powerful and accurate, and which resonate with the lives of their audiences.

2.4.2.2. Climate Information Services

As the impact of climate change on farmers' planning of farm activities becomes more pervasive, innovative ways of supporting smallholder farmers, who are almost completely reliant on rainfall becomes a necessary component of the AICCRA intervention. In achieving this, partnerships on this project will deliver Climate Information Services (CIS) via voice and text SMS (in local language). The information provided to farmers will include information on pests and diseases, the timing and intensity of rains, to enable farmers to plan planting, fertilizer application and pesticide application activities among others. Digital communities of profiled farmers will receive scheduled CIS for the duration of the project from Esoko, in collaboration with other partners on the AICCRA project.

2.4.2.3. Partnerships for delivery

Various partnerships and scaling mechanisms are envisioned in the framework of AICCRA Ghana Cluster project to promote strategic and impactful gender- and one-health-sensitive Climate Smart Agriculture (CSA) and Climate Information Services (CIS) bundles and get the products into the end of farming communities in the six project intervention regions in Ghana. The partnerships include the NFCS, the one-health platform and links with the Research-Extension Linkage Committees (RELCs) in project intervention regions. Figure 4 illustrates the Ghana Cluster impact pathway.

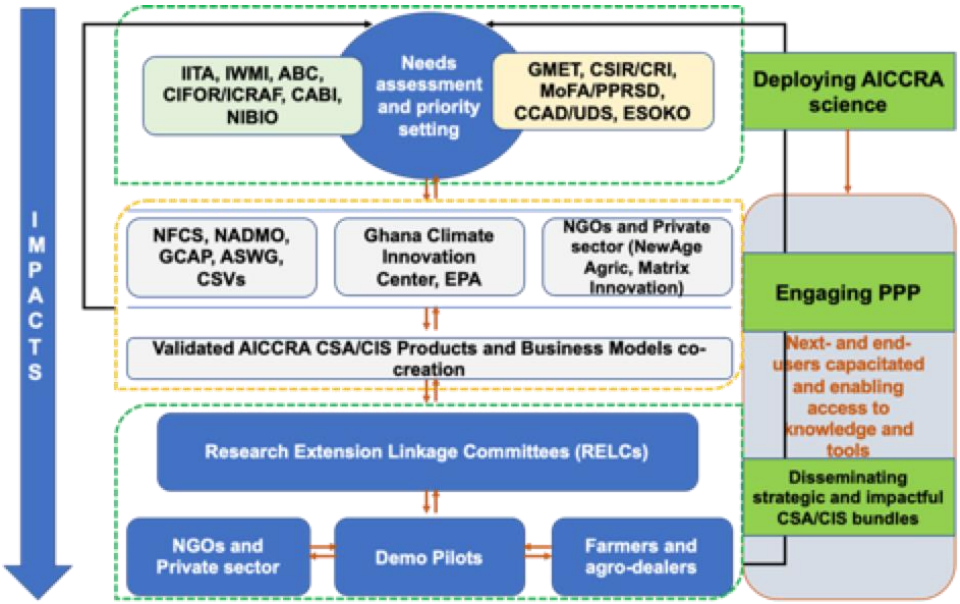

Figure 4. AICCRA Ghana Cluster impact pathway

2.4.2.3. Prioritizing Climate Smart-Agricultural Technologies

Identification and prioritization of CSA technologies and practices supports climate change adaptation planning in agriculture by designing an investment portfolio across various commodity and geographical value chains.

A basic entry to technology uptake and utilization puts emphasis on technology identification and upscaling, a conscious effort is made by value chain actors at identifying and existing Climate Smart Agricultural (CSA) and Climate Information (CI) practices. Prioritizing CSA-CIS technologies is based on the appropriateness and suitability of technology or set of technologies to o end-users' criteria. Based on Damba et al. (2021), the appropriateness and suitability of a given CSA-CIS is based on a technology's contribution to 1) Climate Smartness, 2) Gender and Social Inclusion (GSI), 3) One-Health achievement, and 4) End-User Friendliness. Climate smartness consist of three indicators for assessing the CSA pillars and is comprised of i) Productivity, ii) Adaptation, and iii) Mitigation. The indicators show the potential for a practice/s to generate positive effects for the farmer. GSI is comprised of 4 indicators and includes labour requirement, ii) youth involvement, iii) lower costs and iv) women's friendliness. The women's friendliness is further unpacked to lower associated drudgery, accessibility, affordability, socio-cultural appropriateness of the practice, and lower implementation requirements. In terms of a CSA-CIS ability to contribute to one health by enhancing soil, water, animal, and crop health, 6 indicators notably: reduced pest load, addressing nutrient depletion, increased soil water adequacy, and addressing soil water pollution were captured.

Aside from these criteria, CSA-CIS technology prioritization is geographic-specific and initially requires a pool of technologies commonly found and practiced by end-users before prioritization. An example of a prioritization process was undertaken by AICCRA-Ghana in close collaboration with relevant stakeholders comprising farmers, researchers, media, development practitioners, and extension agents across the six intervention regions. In all, a total of 22 CSA/CIS practices were identified and prioritized based on the four broad criteria, and a 5-point Likert Scale was used to score based on criteria. Commodities of interest included maize, cowpea, yam, potato, pepper, and tomato vegetable value chains. These practices were identified based on the various geographical areas in terms of the Northern, Upper West, Upper East, Bono East, and Central regions of Ghana. Effective CSA/CIS prioritization will unearth the full potential of a given technology and practice towards increased productivity, mitigation, and adaption within a one-health framework. Technology prioritization also addresses the needs of women, youth and the vulnerable end-users since the process allows for participation within an enabling environment

2.4.2.4. Actioning Gender and Social Inclusion in Ghana

To ensure that AICCRA products and innovation are accessible to diverse categories of farmers especially women and youth, AICCRA-Ghana systematically mainstreams gender and social inclusion (GSI) at all stages of technology identification and prioritisation, bundling of products and financing mechanism. Through needs assessment in AICCRA priority value chains and intervention communities, the project customises its knowledge products, dissemination approaches and financing programme to the needs of women and youth. CSA technologies for instance are prioritised for women and youth friendliness and appropriateness emphasizing lower associated drudgery, availability, accessibility, affordability and social cultural acceptability.

The project also disseminates CSA-CIS and one-health technologies to reach women and youth in formats and mediums that are accessible to their respective needs. It therefore, promotes dissemination approaches that are women and youth sensitive and context appropriate. With women and youth constrained in access to sustainable source of finance for the uptake of these technologies, AICCRA Ghana specifically targets their needs in adapting business models with flexible payment modalities for them as beneficiaries while creating opportunities for them to be integrated as suppliers of products.

In addition to targeting the needs of women and youth with GSI sensitive approaches, AICCRA-Ghana also opens space for transformational dialogues in communities around gender and generational norms that create inequalities in access to productive resources. These dialogues confront underlying challenges of women's and youth's persistent vulnerability in building resilient production systems and improving their livelihoods.

Aside the end-users, the project also engages in gender dialogues with partners and collaborators to ensure the systematic integration of GSI in all activities. And to contribute to the advancement of women in climate change and agriculture research and development, AICCRA Ghana ensures that 40% of beneficiaries in training programmes, capacity building events, and knowledge platforms are women. In AICCRA-Ghana, gender and social inclusion is addressed through access to GSI responsive bundled products and promotion of transformational dialogues in communities, and thus, strategically opens opportunities for women and youth to be climate resilient and improve their livelihoods.

Annex 1. Event Science Conveners

- Segment 1- Rousseau Djouaka, One-health Specialist (ITTA, R.Djouaka@cgiar.org)
- Segment 2- Victor Clottey, One-Health & EWRR Specialist (CABI, V.Clottey@cabi.org)
- Segment 3- Tufa Dinku, Senior Research Scientist (IRI/Columbia University, tufa@iri.columbia.edu)
- Segment 4- Stephen Yeboah, Senior Research Scientist, AICCRA Technical Focal Point (CSIR/CRI, proyeboah@yahoo.co.uk)

Annex 2. Event agenda (Time zone is UTC/GMT)

Sessions	Activities	Facilitator
Segment 1. Climate-smart one-health approach and partnership launch		
Day 1. 24 May		
MORNING		
Registration **[08:00 – 09:00]**	• Participants registration	• Grace Asante-Yeboah
Opening remarks **[09:00 – 10:30]** Coffee break **[10:30 – 11:00]**	**Hybrid plenary [09:00 – 10:30]** • Ghana Cluster Leader (Ghislain Tepa-Yotto, 10 min) • WA Regional Cluster Leader (Robert Zougmore, 10 min) • GMET Representative (Francisca Martey, 10 min) • CORAF Representative (Nieyidouba Lamien, 10 min) • MoFA Representative (TBD, 10 min) • Group photo (Reginald Kyere, 10 min) • Interviews (Reginald Kyere, 30 min)	• Mustapha Dalaa
Capacity strengthening on one-health approach **[11:00 – 12:30]**	**Plenary [11:00 – 12:30]** • Best-bet plant health practices: towards an IPM 3.0 (Manu Tamò, 20 min) • Aflasafe products and success stories (Titilayo Falade, 20 min) • Agro-eco-health products and success stories (Rousseau Djouaka, 20 min) • General discussions (30 min)	**Facilitator** • Komi Fiaboe (IITA)
AFTERNOON		
Lunch **[12:30 – 13:30]** Capacity strengthening on one-health approach **[13:30 – 17:00]**	**Plenary [13:30 – 15:00]** • How does a one-health version 2.0 look like? (Ghislain Tepa-Yotto, 10 min)	**Facilitator** • Titilayo Falade

Coffee break **[15:00 – 15:30]**	• Facts and needs for a one-health version 2.0 (Rousseau Djouaka, 40 min) • Discussions (40 min) **Breakout [15:30 – 17:00]** • What one-health interventions are needed for Ghana? • What institutional arrangements will foster the uptake of one-health innovations in Ghana? • What should be key messages for a policy brief?	
Day 2. 25 May		
MORNING		
One-health stakeholder consultation **[09:00 – 12:30]** Coffee break **[10:30 – 11:00]**	**Breakout (cont.) [09:00 – 10:30]** • One-health partnership operationalization needs assessment **Plenary [11:00 – 12:30]** • Presentation of breakout group outcomes (45 min) • Discussions (45 min)	**Facilitator** • Michael Osae (BNARI)
AFTERNOON		
Lunch **[12:30 – 13:30]** Draft One-health memorandum of understanding document assembled for Ghana **[13:30 – 17:00]** Coffee break **[15:00 – 15:30]**	**Breakout [13:30 – 15:00]** • Reviewing the draft One-health memorandum of understanding document assembled for Ghana **Plenary [15:30 – 17:00]** • Presentation of breakout group outcomes (45 min) • Discussions (45 min)	**Facilitator** • Michael Osae (BNARI)
Segment 2. Early Warning & Rapid Response (EWRR) for a climate-smart IPM		
Day 3. 26 May		
MORNING		
Capacity strengthening on EWRR **[09:00 – 12:30]** Coffee break **[10:30 – 11:00]**	**Plenary [09:00 – 10:30]** • Climate change impacts on insect pests and natural enemies: decision support tools (Henri Tonnang, 30 min) • Transboundary plant disease management (Justin Pita, 30 min) • Discussions (30 min) **Plenary [11:00 – 12:30]** • Pest Horizon scanning platform (Victor Clottey, 30 min)	**Facilitator** • Komi Fiaboe (IITA)

	• EWRR system (Ghislain Tepa-Yotto, 30 min) • Discussions (30 min)	
AFTERNOON		
Lunch **[12:30 – 13:30]** Capacity strengthening on EWRR **[13:30 – 17:00]** Coffee break **[15:00 – 15:30]**	**Plenary [13:30 – 15:00]** • Co-constructing a CORAF-WAVE-BIMAF model for pests and diseases management (Emmanuel Njukwe, 30 min) • Discussions (60 min) **Breakout [15:30 – 17:00]** • EWRR partnership operationalization needs assessment • What should be key messages for a policy brief?	**Facilitator** Ghislain Tepa-Yotto
Day 4. 27 May		
MORNING		
Draft memorandum of understanding EWRR document assembled for Ghana **[09:00 – 12:30]** Coffee break **[10:30 – 11:00]**	**Breakout (cont.) [09:00 – 10:30] & [11:00 – 12:30]** • Reviewing the draft memorandum of understanding EWRR document assembled for Ghana	**Facilitator** • Ghislain Tepa-Yotto
AFTERNOON		
Lunch **[12:30 – 13:30]** Draft memorandum of understanding EWRR document assembled for Ghana **[13:30 – 17:00]** Coffee break **[15:00 – 15:30]**	**Plenary [13:30 – 15:00] & [15:30 – 17:00]** • Presentation of breakout group outcomes (90 min) • Discussions (90 min)	**Facilitator** • Henri Tonnang
Side meetings		
Day 5. 28 May		
Synergies and Scaling mechanisms **[09:00 – 15:30]** Morning Coffee break **[10:30 – 11:00]** Lunch **[12:30 – 13:30]**	• Ghana Cluster meeting with MoFA/Digital Platform Project representatives (TBC) • Ghana Cluster meeting with CSA Science-policy platforms representatives (TBC) • Ghana Cluster meeting with RELCs representatives (TBC)	**Facilitator** • Stephen Yeboah

Afternoon Coffee break **[15:00 – 15:30]**	• Ghana Cluster Team meeting (Targets and deliverables)	
Day 6. 29 May		
Social and team building activities	• Ad hoc meetings (TBC)	**Facilitator** • Mustapha Dalaa
Segment 3. NFCS partnership strengthening and stakeholder consultation		
Day 7. 30 May		
MORNING		
NFCS partnership capacity strengthening **[09:00 – 12:30]** Coffee break **[10:30 – 11:00]**	**Plenary [09:00 – 10:30]** • IRI ***support to enhance climate services at GMet*** (Tufa Dinku, 30 min) • GMET climate services products and Status of the NFCS strategy document (Francisca Martey, 30 min) • Discussions (30 min) **Breakout [11:00 – 12:30]** • How best could the Ghana NFCS serve as a true asset for climate services in agriculture? • What kind of services does the country need in the agricultural sector? • How can the services concretely reach farming community targets?	**Facilitator** • Catherine Dembele
AFTERNOON		
Lunch **[12:30 – 13:30]** Operationalizing the NFCS strategy document **[13:30 – 17:00]** Coffee break **[15:00 – 15:30]**	**Breakout (cont.) [13:30 – 15:00]** • What are general and priority human and institutional capacity development needs to make the Ghana NFCS fully operational? • What should be key messages for a policy brief? **Plenary [15:30 – 17:00]** • Presentation of breakout group outcomes (60 min) • Discussions (30 min)	**Facilitator** • Tufa Dinku
Day 8. 31 May		
MORNING		
AICCRA Ag-data Hub – Ghana Digital Agriculture Platform dialogues **[09:00 – 12:30]** Coffee break **[10:30 – 11:00]**	**Plenary [09:00 – 10:30]** • Progress towards the co-development of Ghana Ag-data Hub (Michael Wilson, 30 min) • Participatory Integrated Climate Services for Agriculture (PICSA) (Catherine Dembele, 30 min)	**Facilitator** • Francisca Martey

	• Discussions (30 min) **Plenary [11:00 – 12:30]** • Scene-setting for addressing institution- and policy-related bottlenecks for successful launch of the Ag-data hub and strategic synergy with the evolving Ghana Digital Agriculture Platform (Michael Wilson, 30 min) • Discussions (60 min)	
AFTERNOON		
Lunch **[12:30 – 13:30]** Draft Ag-data hub memorandum of understanding document assembled for data sharing between partners in Ghana **[13:30 – 17:00]** Coffee break **[15:00 – 15:30]**	**Breakout [13:30 – 15:00]** • Reviewing the draft Ag-data Hub memorandum of understanding document assembled to enable data sharing between partners in Ghana • What should be key messages for a policy brief? **Plenary [15:30 – 17:00]** • Presentation of breakout group outcomes (60 min) • Discussions (30 min)	**Facilitator** • Michael Wilson
Segment 4. Enhancing access to CSA/CIS bundles while addressing GIS		
Day 9. 1 June		
MORNING		
AICCRA partners capacity strengthening **[09:00 – 09:45]** AICCRA Themes underpinning: approach coherence and sustainability principles for successful scaling of CSA/CIS bundles	**Plenary [09:00 – 09:45]** • AICCRA Theme 2 Session. Climate-Smart Technologies and Practices: Innovative approaches to scaling up climate-smart agriculture (CSA) (Mathieu Ouedraogo, 20 min) • General discussions (25 min)	**Facilitator** • Stephen Yeboah
AICCRA partners capacity strengthening **[09:45 – 10:30]** Coffee break **[10:30 – 11:00]**	**Plenary [09:45 – 10:30]** • AICCRA CSA/CIS Bundling Session (Desire Kagabo, 20 min) • General discussions (25 min)	**Facilitator** • Osman Damba Tahidu
AICCRA partners capacity strengthening **[11:00 – 12:30]**	**Plenary- Ghana Cluster products [11:00 – 12:30]** • Topic 1- Climate Information Services (Daniel Asare-Kyei, 20 min) • Topic 2- Partnerships (Victor Clottey, 20 min)	**Facilitator** • Stephen Yeboah

	• Topic 3- Climate Smart-Agricultural Technologies (Osman Damba Tahidu, 20 min) • General discussions (30 min)	
AFTERNOON		
Lunch **[12:30 – 13:30]** AICCRA partners capacity strengthening **[13:30 – 17:00]** Coffee break **[15:00 – 15:30]**	**Plenary (Hybrid session) [13:30 – 15:00] & [15:30 – 17:00]** • AICCRA Theme 3. Gender and Social Inclusion Session (Sophia Huyer) • General discussions	**Facilitator** • Faustina Obeng
Day 10. 2 June		
MORNING		
Media training **[09:00 – 14:30]** Coffee break **[10:30 – 11:00]** Lunch **[12:30 – 13:30]**	**Plenary- Ghana Cluster products (Hybrid session) [09:00 – 10:30] & [11:00 – 14:30]** ○ Topic 1- Climate change impacts on agriculture in Ghana: Facts and Figures (Stephen Yeboah, 10 min) ○ Topic 2- Climate Information Services (Daniel Asare-Kyei, 20 min) ○ Topic 3- Climate Smart-Agricultural Technologies (Osman Damba Tahidu, 20 min) ○ Topic 4- Gender and Social Inclusion (Faustina Obeng, 20 min) ○ Topic 5- Partnerships (Victor Clottey, 20 min) Topic 6- My community and climate change (Gideon Sarkodie Osei & Nana Effah, 10 min) Topic 7- Climate change reporting- The right way (Judith Akolo, 30 min) Topic 8- How to present climate change to different audiences (Godfred Akoto Boafo, 30 min) Topic 9- Mobile journalism and climate change (DW Akademie, 60 min) Topic 10- Application of learning and feedback (Reginald Kyere, 30 min)	**Facilitators** • Reginald Kyere
AFTERNOON		
Closing remarks **[14:30 – 15:00]**	**Hybrid plenary [13:30 – 15:00]** • IITA's WA Hub Director (Michael Abberton, 10 min) • ESOKO CEO (Daniel Asare-Kyei, 10 min) • WA Regional Cluster Leader (Robert Zougmore, 10 min)	• Mustapha Dalaa

	• Participant vote of thanks (TBD, 10 min) • MoFA Representative (TBD, 10 min) • Interviews on participants' satisfaction (Reginald Kyere, 40 min)	

Annex 3. Participants list-Number of partners trained

No	Organization	Stakeholder group	Attendance
1	CSIR - SARI	RELC	In-person
2	CSIR-SARI	RELC	In-person
3	CSIR-SARI	RELC	In-person
4	CSIR/CRI	RELC	In-person
5	CSIR/ARI	CCAFS Science-Policy Platform	In-person
6	Universityof Cape Coast	CCAFS Science-Policy Platform	In-person
7	MoFA	CCAFS Science-Policy Platform	In-person
8	CSIR/ARI	CCAFS Science-Policy Platform	In-person
9	Alliance BC	Ghana Cluster partner	In-person
10	Alliance BC	Ghana Cluster partner	In-person
11	CSIR/CRI	Ghana Cluster partner	In-person
12	CSIR/CRI	Ghana Cluster partner	In-person
13	UDS	Ghana Cluster partner	In-person
14	UDS	Ghana Cluster partner	In-person
15	GMET	Ghana Cluster partner	In-person
16	GMET	Ghana Cluster partner	In-person
17	CABI	Ghana Cluster partner	In-person
18	CABI	Ghana Cluster partner	
19	ESOKO	Ghana Cluster partner	In-person
20	ESOKO	Ghana Cluster partner	In-person
21	WorldVeg	One-health partner	In-person
22	WASCAL	One-health partner	In-person

23	CIRDES	One-health partner	In-person
24	BNARI	One-health partner	In-person
25	Agroecohealth	One-health partner	In-person
26	BIMAF	One-health partner	In-person
27	University of Ghana	University	In-person
28	University of Ghana	University	In-person
29	KNUST	University	In-person
30	NEWAGE	Private sector	In-person
31	Radio Bongo	Media	In-person
32	Nabina Radio	Media	In-person
33	GBC Radio Savannah	Media	In-person
34	Diamond FM	Media	In-person
35	Akina Radio	Media	In-person
36	ADARS FM	Media	In-person
37	Ahomka FM	Media	In-person
38	Kingdom FM	Media	In-person
39	Eagle FM	Media	In-person
40	Radford FM	Media	In-person
41	Peace FM	Media	In-person
42	Joy News	Media	In-person
43	TV3	Media	In-person
44	Citi TV	Media	In-person
45	UTV	Media	In-person
46	GTV	Media	In-person

47	Daily Graphic	Media	In-person
48	Ghanaian Times	Media	In-person
49	Ghanaweb	Media	In-person
50	Pulse Ghana	Media	In-person
51	Ghana News Agency	Media	In-person

About AICCRA

Accelerating Impacts of CGIAR Climate Research for Africa (AICCRA) is a project that helps deliver a climate-smart African future driven by science and innovation in agriculture.

It is led by the Alliance of Bioversity International and CIAT and supported by a grant from the International Development Association (IDA) of the World Bank.

Discover more at aiccra.cgiar.org