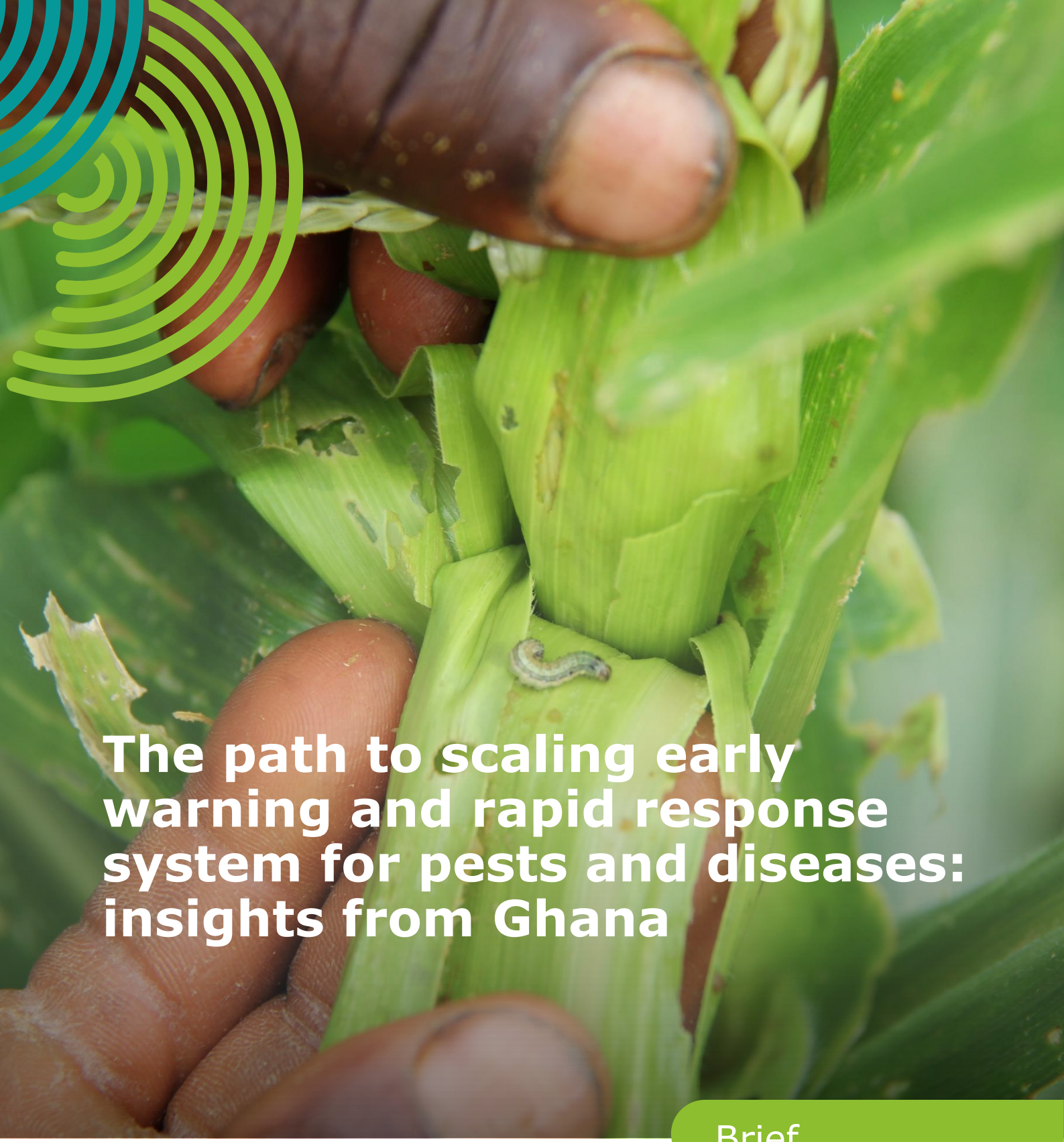


The path to scaling early warning and rapid response system for pests and diseases: insights from Ghana

Brief

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Accelerating Impacts of CGIAR Climate Research for Africa

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About AICCRA Reports

Titles in this series aim to disseminate interim research on the scaling of climate services and climate-smart agriculture in Africa, in order to stimulate feedback from the scientific community.

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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. Explore our work at **aiccra.cgiar.org**

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ABBREVIATIONS

AICCRA	Accelerating Impacts of CGIAR Climate Research in Africa
AU	African Union
AUC	African Union Commission
AUDA	African Union Development Agency
BAU	Business as usual
CA	Conservation agriculture
CAADP	Comprehensive Africa Agriculture Development Programme
CBA	cost-benefit analysis
CCAFS	Climate Change Agriculture and Food Security
CGIAR	Consultative Group of International Agricultural Research Centres
CIS	Climate information services
CSA	Climate-smart agriculture
CSAIP	Climate-smart agriculture investment plan
CSEP	Climate-Smart Agriculture Education and Policy Project
CSV	Climate-smart village
FANRPAN	Food, Agriculture and Natural Resources Policy Analysis Network
FAO	Food and Agriculture Organization of the United Nations
FNS	Food and nutrition security
GCCASP	Gender Climate Change and Agriculture Support Programme
ICT	Information and communications technology
iNGO	International non-governmental organisation
IRR	Internal rate of return
MoAMID	Ministries of Agriculture, Mechanisation and Irrigation Development
MSP	Multi-stakeholder platform
NDE	National Designated Entity
NEPAD	New Partnership for Africa's Development
NGO	Non-governmental organisation
NPV	Net present value
PICZ	Professional Insurance Company of Zambia
REC	Regional Economic Community

Summary

Ghana's agricultural sector has faced significant challenges from crop pests and diseases in the past twenty years. The increasing number of invasive and alien species (IAS), majorly driven by climate, biotic and socio-economic factors is causing serious threats to biodiversity and human livelihoods. Outbreaks of the Fall Armyworm (FAW) in 2017 devastated over a million hectares of maize crops. In response to such crises, stakeholders recognized the need for a robust system that enables early detection of crop pests and diseases and rapid intervention to mitigate potential losses in crop yields and quality. The Early Warning and Rapid Response System for Pests and Diseases (EWRRS-PD) was conceived as a comprehensive approach to address these challenges through improved communication, data sharing, and collaborative efforts among various institutions. The concept was first hinted in a couple of scientific publications following the introduction of the fall armyworm and the risks posed by several invasive alien species of pests and diseases, and later fully elaborated and piloted through the Accelerating Impacts of CGIAR Climate Research for Africa (AICCRA-Ghana) project. The primary objectives of the EWRRS-PD are to enhance early warning by developing mechanisms for timely reporting and alerts regarding pest and disease threats; strengthen capabilities for monitoring pest populations and detecting outbreaks before they escalate; foster cooperation among institutions to ensure a coordinated response to pest invasions and equip stakeholders with the necessary skills in risk assessment, communication, and response dissemination. During the AICCRA-led situational analysis in Ghana, farmers voiced their concerns about the emergence of new, climate-induced invasive pests and diseases which pose significant threats to crops such as cereals, roots, tubers and vegetables. Without proactive measures, farmers often found themselves unprepared for these emerging threats, resorting to excessive use of insecticides as a reactionary response. This unsustainable practice resulted in adverse consequences, impacting both human and ecosystem health. The insights assembled from AICCRA's research findings guided the collaborative development of an Early Warning and Rapid Response System for Pests and Diseases (EWRRS-PD) by partners and stakeholders in Ghana. This system is an integral component of the broader Climate-Smart Integrated Pest Management (CS-IPM) strategy. The costs of reaction to IAS can be colossal but useless. This brief is a call to governments and regional organizations to allocate resources for preparedness, prevention and proactive response. Finally, sustainability cannot materialize without a business module factored into the EWRRS-PD through private sector engagement.

1. Background

The increasing threat of pests and diseases poses significant challenges to agricultural productivity and food security in Ghana. This brief on the Early Warning and Rapid Response System for Pests and Diseases (EWRRS-PD) developed through efforts under the Accelerating Impact of CGIAR Climate Research in Africa (AICCRA) aims to provide a comprehensive pathway for designing and scaling the system, recognizing the key roles of strategic stakeholders involved in pest management – farmers, agricultural extension workers, policymakers, and researchers. The EWRRS-PD is designed to enhance the capacity for early detection and prompt response to pest outbreaks, thereby mitigating potential losses in crop yields and safeguarding livelihoods (Honger et al, 2023; Osae et al., 2024).

In Ghana, the interplay of climate change, trade dynamics, and socio-economic factors has intensified the spread of agricultural pests and diseases. By leveraging innovative technologies such as on-ground detection networks, satellite data, and predictive modelling, the EWRRS-PD facilitates timely alerts and actionable information to prevent and combat these threats effectively. The collaborative efforts outlined in this brief emphasize the importance of stakeholder engagement, data sharing, and integrated pest management strategies to foster resilience within the agricultural sector.

This brief serves not only as a guide for developing an impactful EWRRS-PD but also present an example of how the system can function. Besides, it is a call to action for all stakeholders to commit to proactive measures that ensure sustainable agricultural practices in Ghana and beyond. By strengthening our response mechanisms and enhancing communication channels, we can work together towards a more secure and productive agrifood systems in current and future contexts.

2. The approach

2.1. Situational analysis

Ghana's agricultural sector faces significant threats from pests and diseases, necessitating the establishment of an EWRRS-PD to enhance food security and protect agricultural livelihoods through timely detection and response to outbreaks. Research indicates that farmers who receive early warning alerts and integrated pest management advisories experience improved food security, with notable yield increases. For example, smallholder maize farmers involved in pest risk information campaigns reported a 4% gain in yields compared to those without access to such information (Honger et al., 2023). This highlights the importance of disseminating actionable pest management information to enhance agricultural productivity and resilience among farming communities.

The landscape of pest surveillance, detection, and warning systems is evolving, driven by both traditional practices and innovative technologies. Several mechanisms are currently in place to address pest and disease outbreaks in Ghana. They include programmes with protocols and systems for detection, reporting, alerts and response components as well as digital tools available as web applications or mobile phone applications. But all these efforts were scattered and operating in silos.

Existing risk detection and response plans and programmes

- **Ghana Emergency Response Plan for Invasive Alien Plant Pests:** Led by the Plant Protection and Regulatory Services Directorate (PPRSD) of the Ministry of Food and Agriculture (MoFA), this plan is a core component of the EWRRS-PD, focusing on invasive alien species.

- **Fruit Fly Surveillance and Alert System:** Ghana has been actively involved in regional efforts to establish fruit fly surveillance and alert systems in West Africa. Ghana is part of the ECOWAS SYRIMAO Project, which aims to set up a regional fruit fly surveillance and control system covering 11 West African countries. The project provides a framework for: monitoring mango production in major growing areas, assessing fruit fly infestation rates, issuing alerts to stakeholders, and planning and evaluating production campaigns. The system utilizes trapping methods for targeted, cost-effective, and environmentally friendly management of fruit flies. The ECOWAS SYRIMAO project has supported capacity building for national laboratories in Ghana and other participating countries. By monitoring populations, assessing risks, and communicating alerts, Ghana aims to minimize the devastating impacts of fruit flies on mango production and exports.

- **WAVE Research:** this is a scientific and technical platform that focuses on plant diseases in Central and West Africa. The main plant diseases that WAVE currently focuses on are Cassava Mosaic Virus Disease (CMVD) and Cassava Brown Streak Virus Disease (CBSVD), which threaten cassava production. CMVD is widespread in Africa and can cause 40–70% yield loss. CBSVD can cause up to 100% yield loss and is currently present in Rwanda, Burundi, South Sudan, Congo, and DRC. WAVE's work includes:

    - Monitoring and predicting the spread of diseases in Central and West Africa;
    - Works with governments, smallholder farmers, and local scientists to develop preventive control measures;
    - Produces incidence and severity maps to identify disease hotspots;
    - Tests cassava varieties for resistance to diseases;
    - Conducts training and mentoring programmes for MSc and PhD students.

Digital tools and innovations

Digital tools are being developed and deployed to enhance the effectiveness of plant health initiatives. A scan of the digital ecosystem brought up the following:

- **Pest Risk Information Service (PRISE):** PRISE is a project initiated by CABI in collaboration with international partners, aimed at improving the livelihoods of smallholder farmers by reducing crop losses due to pests. It utilizes a combination of satellite data, geographic data, earth observation technology, pest modeling and real-time field observations to forecast outbreaks and deliver early warnings about crop pests to farmers. Information is disseminated to farmers through Community Information Centers and SMS, enabling timely action against pests like the fall armyworm, which has caused significant crop losses in Ghana. This information helps farmers implement Integrated Pest Management (IPM) strategies to mitigate potential yield losses. During

the 2021 agricultural season, PRISE successfully forecasted fall armyworm outbreaks, significantly aiding farmers in managing this pest.

- **PlantwisePlus:** is a global programme developed by CABI to help countries predict, prepare for, and prevent plant health threats in a changing climate. The programme aims to reduce crop losses and empower smallholder farmers to increase their incomes, food security, and food safety by producing more and higher quality food. Key objectives of the programme include:
    - Strengthen detection of and response to pest outbreaks;
    - Provide agricultural service providers with better digital advisory tools to support farmers in sustainable crop management;
    - Enhance the availability of nature-positive and low-risk plant protection products to reduce reliance on high-risk farm inputs;
    - Increase consumer demand for and supply to local markets of safer, higher quality and locally produced food.

PlantwisePlus follows three key impact pathways:

- Strengthening pest surveillance and mitigation;
- Promoting sustainable crop protection practices;
- Reducing pesticide risk and enhancing food safety.

- **Farmers Connect:** is a Ghanaian registered Tech Start-Up focused on using STS2, a satellite-based digital technology that integrates satellite-derived data and a blend of modern technologies like Machine Learning (ML), Artificial Intelligence (AI), and big data analytics to answer large-area issues in the agriculture. They can provide farm mapping and pest/disease forewarning among a range of services to farmers. Specifically, they can inform farmers about pests and diseases that are likely to be prevented during the current season, provide recommended control measures to mitigate the risk of pest damage. They also include information on the symptoms of diseases for quick identification and utilize weather data to predict the likelihood of certain pests and diseases. In addition, they create detailed information for common pests and diseases affecting specific crops.

- **Africa FarmNet Limited:** runs a mobile App called MyAgro360. This App enables farmers to map their farms, diagnose pest and disease situations and access farm advisory services.

- **Community Information Centres (CICs):** CICs play a crucial role in disseminating pest risk information to farmers. Alerts regarding pest outbreaks, such as those for the fall armyworm, are communicated through these centres and via SMS, enabling farmers to take timely action. This grassroots approach ensures that vital information reaches those most affected by pest threats.

2.2. Science-driven response

Though an EWRRS-PD can leverage on existing progammes and tools, a thorough analysis of the Ghanaian agricultural ecosystem shows lots of disconnected risk prevention and response platforms. A rigorous

path to mapping strategic organizations and tools, and to institutionalizing an interoperable and functional EWRRS-PD is fundamental to its impact and sustainalibity. AICCRA resources were used to carry out a comprehensive assessment of the demand and the market for pest and disease alert and response. A couple of scientific articles were published to this effect, calling for a need for coordination (Sekabira et al. 2022; Tepa-Yotto et al. 2021). The findings led by the AICCRA project (Ghana Cluster) played a pivotal role in catalyzing the co-design of an innovative and integrated institutional framework known as the Early Warning and Rapid Response System for Pests and Diseases (EWRRS-PD) in Ghana. This groundbreaking tool is underpinned by Ghana's Ag-Innovation Data Hub (AIDH), co-developed and hosted at the Institute for Scientific and Technological Information of the Council for Scientific and Industrial Research (CSIR-INSTI). The primary mission of the AIDH revolves around the dissemination of customized climate information, pest and disease alerts, and advisories to key stakeholders and targeted farming communities.

3. Institutionalization

3.1. Partner mapping and role definition

Series of stakeholder consultations (Figure 1) were organized to map organizations from the public and private sectors in Ghana that are delivering pest and disease risk alerts, prevention and management services. Key organizations were identified from consensus to be instrumental for long-term deployment and maintenance of an EWRRS-PD in Ghana, these are:

- **Plant Protection and Regulatory Services Directorate (PPRSD).** As the NPPO of Ghana with legal mandate for crop pests and diseases management, PPRSD is to play a lead role and serve as the EWRRS-PD Authority.

- **Biotechnology and Nuclear Agriculture Research Institute (BNARI).** The BNARI was established with the mandate to explore biotechnology and nuclear science applications for sustainable agriculture solutions. The institute has developed capacity in pest and disease surveillance, integrated pest and disease management and the development of new tools against pests and diseases. As a co-lead on the EWRRS-PD, BNARI is to be involved with pests and diseases surveillance, pest risk assessment and the development of response plan alongside other knowledge institutions. Having expertise in research and development of climate smart one-health solutions, BNARI is to ensure the one-health compliance of the EWRRS-PD.

- **Centre for Scientific and Industrial Research – Institute for Scientific and Technological Information (CSIR-INSTI).** The mandate of the CSIR-INSTI as established is to develop a national capacity and capability for efficient and effective provision of scientific and technological information on demand, for the benefit of research scientists, policy makers and industrialists in appropriately packaged form for national development. It is the lead institution involved with the development, implementation and hosting of the Ag-Innovation Data Hub (AIDH); a communication tool that is central to the EWRRS-PD for risk reporting and response dissemination.

- **Centre for Scientific and Industrial Research – Crop Research Institute (CSIR-CRI).** The CSIR-CRI has a broad research mandate covering all food and industrial crops, with a mission to develop and disseminate demand-driven technologies and build capacity for sustainable food and

industrial crops productivity to enhance livelihoods. Based on this mandate, it is involved as a knowledge institution and is to be involved with pest and disease surveillance, pest risk assessment and the development of response plan alongside other knowledge institutions.

- **Centre for Scientific and Industrial Research – Savannah Agricultural Research Institute (CSIR-SARI).** The mandate of the CSIR-SARI is to provide farmers in the northern savannah regions with appropriate technologies to increase their food and fibre crop production based on a sustainable production system which maintains and/or increases soil fertility. Based on its experience with the savannah agriculture systems and their strategic location CSIR-SARI is to be responsible for pests and diseases knowledge activities in the savannah regions on the EWRRS-PD.

- **Ghana Meteorological Agency (GMET).** The GMET is a governmental agency under the Ministry of Communication mandated to offer weather and climate services, to analyse scientific research findings and provide guidance on climate change. The GMET is the lead institution for Ghana's National Framework for Climate Services. Considering that most of the pests and diseases challenges we face are climate driven and the active role of GMET in the development and implementation of the Ag-Innovation Data Hub (AIDH), it is to be involved with the provision of climate information services for the EWRRS-PD.

- **National Disaster Management Organisation (NADMO).** The mandate of NADMO includes all activities from preparedness to response and recovery, prevent disasters, create awareness in prone communities and institutions on all hazard/disaster types, train and motivate the communities especially volunteers to initiate actions to prevent and respond to disasters; bring relief to disaster victims, assist to reduce poverty in vulnerable and poor communities through social mobilisation for employment creation and income generation. The NADMO is onboard the EWRRS-PD with its expertise in risk forecasting, analysis and management as well as preparedness to response and recovery.

- **University for Development Studies (UDS).** The UDS represents the universities on the EWRRS-PD as a knowledge institution responsible for risk confirmation and development of response tools and advisories. The UDS hosts the West African Centre for Water, Irrigation and Sustainable Agriculture (WACWISA) which was established with the mission to develop skills and knowledge of young men and women to provide practical and sustainable solutions to the challenges of water resources, irrigation, agricultural development and climate change in Africa.

- **Local Government Service – Directorate of Agriculture Extension Services (DAES).** The DAES is responsible for the overseeing of agricultural technology diffusion through the management of an extension delivery service in the country. They work closely with all the key players in knowledge generation and communication and are directly in touch with farmers at the community level. The DAES is to be responsible for communication of pests and diseases risk information, response and advisories as well as training of farmers on risk detection and response implementation.

- **Farmerline.** Farmerline is a private e-extension services company working to give growers access to quality inputs, training and markets, tools they can translate into sustainable, healthy incomes. On the EWRRS-PD, Farmerline is to work closely with the DAES and other stakeholders in pests and diseases risk information communication and use their networks to disseminate response information.

- **Environmental Protection Agency (EPA).** The mission of the EPA is to manage, protect and enhance the country's environment and seek common solutions to global environmental problems. It is responsible for registration, control, management and regulation of pesticides in Ghana and, collaborates with PPRSD to enforce the pesticides law. The EPA is to regulate and provide advisories on pesticides and other related matters for the EWRRS-PD and is to ensure environmental compliance of all surveillance and response activities.



Figure 1. Ghana EWRRS-PD awareness and capacitation event gathering strategic organizations (Airport View Hotel, Accra, 2022).

3.2. Model development and partner capacitation

Series of model design and validation workshops held in Accra saw the commitment of 11 institutions, including the PPRSD, NADMO, EPA, and various research institutes, to collaboratively implement the EWRRS-PD. There was a general agreement that siloed interventions are ineffective and turn out to waste resources. These organizations are tasked with developing surveillance and forecasting tools, engaging with farmers, and conducting research to inform policy and action plans. The collaborative effort emphasizes the need for proactive measures against the increasing threat of pests, exacerbated by climate change.

The anticipated roles for the different strategic stakeholders involved in Ghana's EWRRS-PD are illustrated in Figure 2. These roles encompass the following:

- Reporting

Selected farmers or farmer-based organizations (FBOs) and Agricultural Extension Agents (AEAs) are tasked with transmitting pest and disease reports (suspected new pest or disease species; serious outbreaks of existing pests and diseases causing havoc) to the Ghana EWRRS-PD Authority (PPRSD).

- Risk knowledge generation

This facet involves the National Agricultural Research System (NARS), academic institutions, international research organizations and agricultural non-governmental organizations (NGOs) engaging in foresight analysis and the generation of pest and disease risk knowledge.

- Risk mitigation

NARS, academic institutions, international research organizations, and agricultural NGOs are expected to develop and package One Health-compliant IPM products, solutions, technologies and tools aimed at mitigating risks.

- Risk communication

Effective communication is ensured through the efforts of CSIR-INSTI using trapping and field scouting information shared on the Ag-Innovation Data Hub (AIDH) risk communication platform, GMET (via the National Framework for Climate Services, NFCS), the National Disaster Management Organization (NADMO) and Climate Information Service (CIS) providers of private companies to transmit risk information to the perusal of Ghana EWRRS-PD Authority (PPRSD).

- Monitoring and warning

Selected farmers, agricultural extension agents (AEAs) and the Department of Agriculture at the local government level coordinate routine monitoring and surveillance activities. These encompass methods such as pheromone trapping, field scouting and the utilization of digital tools like pest applications. The Ghana EWRRS-PD Authority (PPRSD) subsequently disseminates pest forecasts and warnings to stakeholders, via various channels including WhatsApp; national, regional and community radio stations; television stations; social media; Climate Information Service (CIS) providers of private companies; and the CSIR-INSTI through the Ag-Innovation Data Hub (AIDH).

- Risk assessment

Institutions equipped with relevant expertise, NARS and advanced research organizations — conduct risk assessments and share the outcomes with the Ghana EWRRS-PD Authority (PPRSD).

- Risk and response dissemination

The Ghana EWRRS-PD Authority (PPRSD) disseminates official messages to stakeholders through digital platform outlets of CIS providers; national, regional and community radio stations; television stations; social media; and Farm Radio International (FRI) and related community radios. These messages convey information on the type of risk and relevant response products, solutions, technologies and tools.

- Recycling and capacity strengthening

The Ghana EWRRS-PD Authority (PPRSD), in collaboration with donors and partners, organizes regular recycling and capacity strengthening sessions to enhance the effectiveness of the system. This collaborative effort ensures that the EWRRS-PD remains adaptive and resilient in the face of evolving challenges and dynamics.

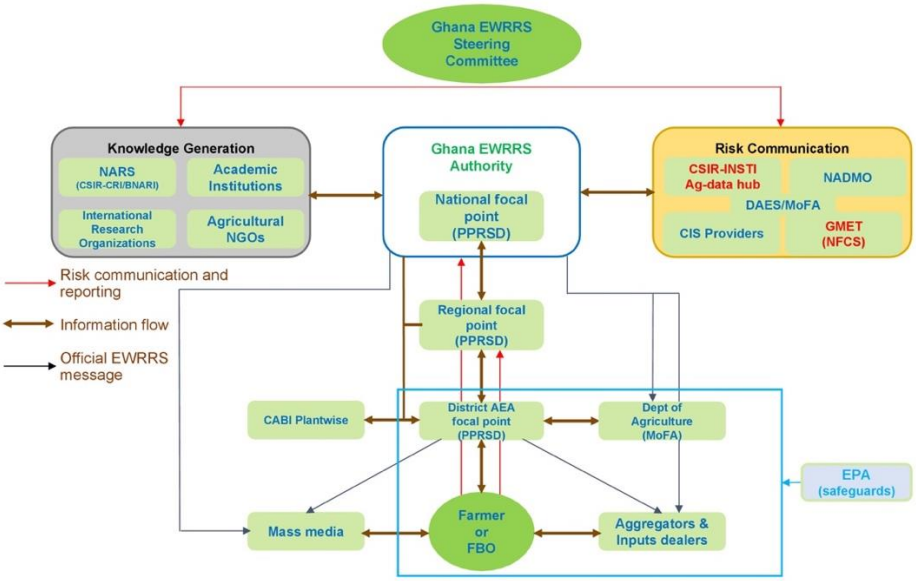


Figure 2. Ghana Early Warning and Rapid Response for Pests and Diseases (EWRRS-PD) workflow (Tepa-Yotto et al. 2024).

3.3. Formal arrangement

Convening institutions towards trust building and new collaboration mechanism creation require resources and takes time. Through series of consultations with various strategic institutions (Figure 3), it was established that Ghana's Plant Protection and Regulatory Services Directorate (PPRSD) was best suited to lead the co-development of the EWRRS-PD, given its statutory mandate for pests and diseases management in Ghana. To formalize and regulate the EWRRS-PD, a memorandum of understanding (MoU) was meticulously crafted, reviewed during several consultations and was endorsed and signed by participating organizations, placing it under the stewardship of the PPRSD.



Figure 3. EWRRS-PD's Memorandum of Understanding (MoU) signing ceremony (Tang Palace, Accra, 2023).

4. Ground operationalization

4.1. Risk reporting and response communication

At the core of the Ag-Innovation Data Hub (AIDH), the Extension Portal facilitates seamless interaction among system components, including the EWRR-PD, which delivers timely alerts and warnings to farmers. Additionally, the portal maintains spatial data on farmlands through Farm Polygons, enabling geographic analysis to better inform agricultural decisions. By serving as a conduit between AEAs and farmers, the Agricultural Extension Portal effectively bridges information gaps, empowers farmers, and strengthens the agricultural extension framework.

The EWRR-PD portal under the Ag-Innovation Data Hub (AIDH) functions as a centralized system to manage and coordinate emergency responses for pest and disease outbreaks (Figure 4). At the heart of this system is a structured series of steps designed to streamline the response process, starting with Report Submission. Here, farmers, field agents, and extension officers can report potential pest or disease incidents through the portal, ensuring early detection. The next step, Initial Investigation, leverages the

portal to collect detailed information and verify the initial report, setting the stage for a thorough understanding of the reported threat.

Following the investigation, key stakeholder conducts a Risk Assessment based on the gathered data, evaluating the severity and potential impact of the situation to prioritize response efforts. The process then moves to Verification & Validation, where regional and national teams review the risk assessment and validate the incident, ensuring accurate and reliable information. With validation complete, the portal facilitates Coordination among critical response entities, including Extension Services, PPRSD officers, NADMO (National Disaster Management Organization), and MOFA (Ministry of Food and Agriculture), to align their response strategies.

The Alert Preparation stage involves crafting alerts and advisories tailored to the incident, which are then distributed in the Alert Dissemination phase to key stakeholders, such as extension officers and farmers. This comprehensive workflow integrates with and enables the AIDH Extension Portal users to manage each phase of pest and disease response efficiently, from initial reporting to coordinated action across multiple agencies, ensuring a robust and unified emergency response system. In 2025 the risk reporting tool was used by field agents of WamiAgro to report fall armyworm (*Spodoptera frugiperda*) at 606 pheromone monitoring sites across Ghana.

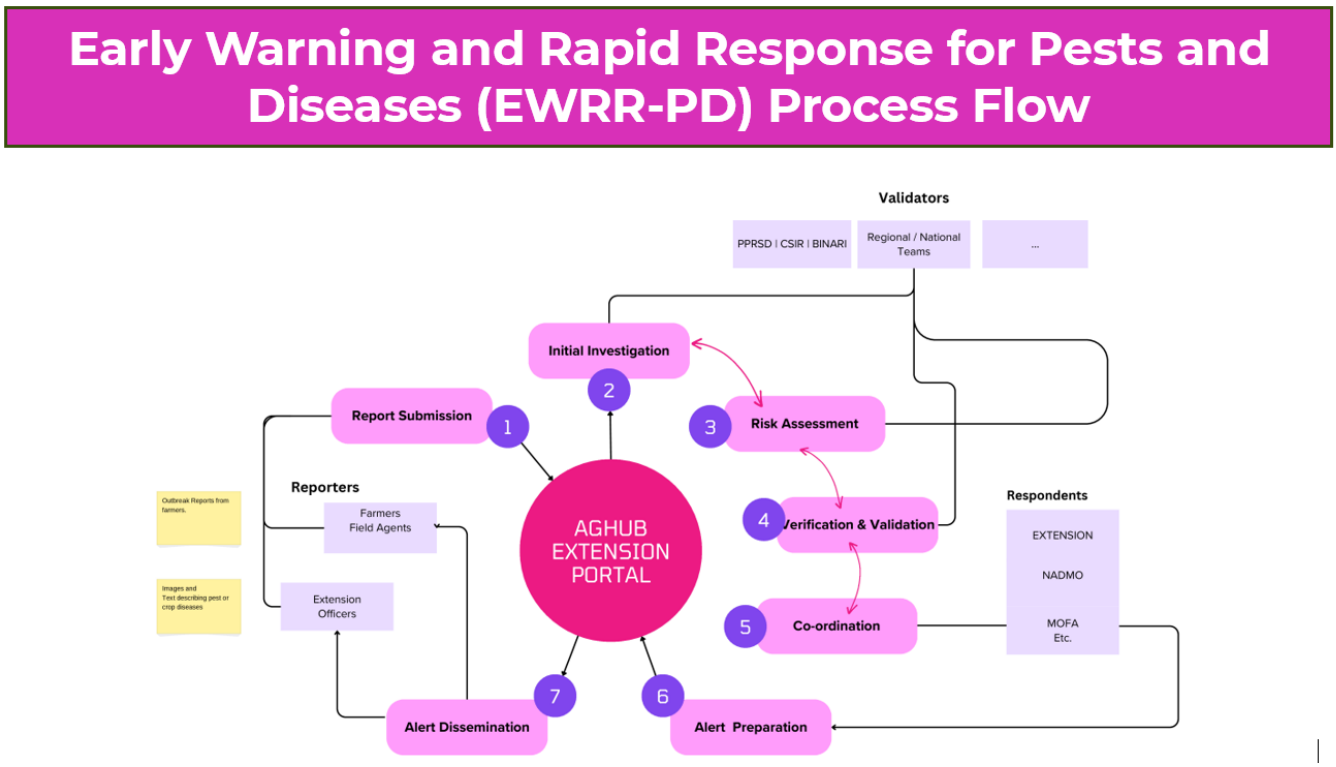


Figure 4. Ghana EWRRS-PD's risk reporting and response communication process flow factored in the Ag-Innovation Data Hub (AIDH) (Wilson et al., 2024). The AIDH is hosted by CSIR-INSTI.

4.2. Sustainability

A public–private partnership business model was piloted through the engagement of an accelerator to disseminate a climate smart integrated pest management (CS-IPM) bundle in Ghana. The bundle consisted of pest risk reporting through the Ag-Innovation Data Hub (AIDH) and the dissemination of advisories with climate smart agriculture (CSA) and integrated pest management co-benefits. The CS-IPM accelerator was led by WamiAgro company. WamiAgro, in partnership with CSIR-INSTI, implemented the

CS-IPM bundle to strengthen smallholder resilience against climate-driven pest outbreaks in maize and tomato systems across Northern Ghana. The project mobilized 30,023 farmers across Kumbungu and Bongo districts, with 40% being women. Mobilization efforts built on existing farmer-based organizations and local community structures to ensure broad participation and inclusivity. Five training sessions were conducted across 15 communities covering, Integrated Pest Management (IPM), Fall Armyworm (FAW) identification and control, Integrated Soil Fertility Management (ISFM), and the use of the CS-IPM risk management portal for advisory dissemination.

To enhance surveillance and early warning, 300 pest monitoring sites were established and equipped with traps. Farmers received Interactive Voice Response (IVR) and Short Message Service (SMS) advisories in Dagbani and English on fall armyworm (FAW) *Spodoptera frugiperda* identification, neem extract application, field scouting approaches, and post-harvest practices. A total of 550 units of neem extract were distributed, with approximately 75% of farmers reporting improved crop growth and lower pest infestation levels. Field data collected were integrated into the risk reporting tool of Ag-Innovation Data Hub (AIDH) hosted by CSIR-INSTI, syncing with WamiAgro's Pukpara digital platform to strengthen the accuracy and timeliness of advisories.

5. Conclusion

Crops' pests and diseases can cause significant losses and serious havoc to agricultural systems. Lessons learnt from recent outbreaks point to need of sustainable prevention and management options. In an ecosystem with interesting digital solution penetration, preparedness, prevention and response vis-à-vis invasive and alien species (IAS) can still appear to be inefficient. Messy and siloed pest and disease tools and lack of coordination can compromise tangible outcomes. In this brief we demonstrate the benefit of science-driven institutionalization and development of technological innovations to sustain an Early Warning and Rapid Response for Pests and Diseases (EWRR-PD). By institutionalizing we don't necessarily mean the creation of new institutions but improving collaboration and communication across key stakeholders in a coordinated manner to ensure effective risk reporting/communication and response dissemination. The costs of reaction to IAS can be colossal but useless. This brief is a call to governments and regional organizations to allocate resources for preparedness, prevention and proactive response. Finally, sustainability cannot materialize without a business module factored into the EWRRS-PD through private sector engagement.

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