**Milestone 2:** Institutionalizing Digital Tools and AgData Hubs for Resilient Food, Land, and Water Systems

**Executive summary (Rupsha)**

* *Problem: Briefly state the challenge of fragmented, project-based digital tools in agriculture and their failure to build long-term resilience*
* *Solution: introduce institutionalized, government-owned AgData Hubs, enabled by public-private partnerships, as a sustainable solution*
* *Key findings: Summarize the status across the six countries (established, emerging, roadmap) highlighting 2-3 major achievements and 2-3 critical challenges (e.g. sustainability models, data governance)*
* *Core recommendations: Present the top-level strategic recommendations from the “Way Forward” section, emphasizing the roles of AGRA, governments, and the private sector.*
* *Call to action: A concluding sentence on the urgency and opportunity for investment and collaboration*

1. **Introduction (2 pages max)**

Across Africa, digital solutions for agriculture have multiplied, yet impact at scale remains uneven. Too many platforms begin as time-bound pilots, optimized for a single crop, district, or donor reporting cycle, then stall as funding ends or institutional champions rotate. The result is a mosaic of apps and dashboards that seldom interoperate, struggle to ingest reliable agrometeorological data, and rarely evolve into national public goods. This leads to loss of timely, localized guidance, duplicated efforts, lack of trust by insurers and financiers in indices; and early warnings failing to translate into action where most needed (World Bank, 2023). Fragmentation raises costs undermines data quality (gaps in station feeds, bias-correction, and skill verification) and erodes trust among users. Without shared standards and national stewardship, weather and climate layers are inconsistently updated, advisory content is not localized or validated, and last-mile channels (USSD/IVR, WhatsApp, radio) are bolted on, rather than designed as core infrastructure. Advisory delivery mechanisms work best when they sit atop coherent data backbones and institutional arrangements and not as stand-alone tools.

Digital climate and agrometeorological services should operate as nationally governed public goods with sustainable operational and maintenance budgets, transparent service level agreements, and stable APIs. This enables different players such as ministries, ag-techs, cooperatives, insurers, and researchers to build on them. An example of such a shift is the World Meteorological Organization’s WIS 2.0 framework (<https://community.wmo.int/en/activity-areas/wis/wis2-implementation?utm_source=chatgpt.com>); which is lowering barriers for standardized data sharing aligned with the Unified Data Policy and Global Basic Observing Network (GBON)[[1]](https://euc-word-edit.officeapps.live.com/we/wordeditorframe.aspx?ui=en-GB&rs=en-US&wopisrc=https%3A%2F%2Fcgiar-my.sharepoint.com%2Fpersonal%2Fb_rupsha_cgiar_org%2F_vti_bin%2Fwopi.ashx%2Ffiles%2F10de4b1780a64a599d758907be167794&wdlor=cD105873B-9951-46C5-B9C4-A3422C9FECCC&wdenableroaming=1&mscc=1&wdodb=1&hid=A3AFCBA1-A015-0000-8A21-E70A3D383CCF.0&uih=sharepointcom&wdlcid=en-GB&jsapi=1&jsapiver=v2&corrid=4e849a76-82c1-ff27-9f61-4f0ed7812548&usid=4e849a76-82c1-ff27-9f61-4f0ed7812548&newsession=1&sftc=1&uihit=docaspx&muv=1&ats=PairwiseBroker&cac=1&sams=1&mtf=1&sfp=1&sdp=1&hch=1&hwfh=1&dchat=1&sc=%7B%22pmo%22%3A%22https%3A%2F%2Fcgiar-my.sharepoint.com%22%2C%22pmshare%22%3Atrue%7D&ctp=LeastProtected&rct=Normal&wdorigin=Outlook-Body.Sharing.DirectLink.Copy&wdhostclicktime=1759473650857&afdflight=3&csiro=1&instantedit=1&wopicomplete=1&wdredirectionreason=Unified_SingleFlush#_ftn1), reinforcing the principle of leaving no Member behind.

National meteorological services, agriculture ministries, and extension systems have the potential to perform best when they co-own data policy, verification pipelines, and alerting protocols, while private and producer actors specialize in user experience, distribution, and feedback. Scale and durability depend on public-private-producer partnership (4P) ecosystems. Where these roles are institutionalized, advisory content is trusted, distribution is diversified (USSD/IVR, WhatsApp/SMS, radio, dashboards), and sustainable business models emerge beyond pilot phases. Country profiles for Kenya, Ethiopia, Rwanda, Mozambique, Burkina Faso, and Nigeria showcase both the promise of this architecture and the costs of fragmentation.

AgData Hubs pose as a potential solution for fragmentation as well as the promise of the 4P, as they are nationally governed, standards-compliant digital backbones that collect quality-control, and publish agriculture-relevant layers, especially agrometeorology, hydrology, rangeland/forage, soils, markets, and risk via open, well-documented APIs and public dashboards. They combine a foundational layer (data lake/catalog, bias-correction/downscaling, skill scorecards, access control) with plug-in modules that translate data into decisions for specific geographies, value chains, and user groups (e.g., sowing windows, heat-stress/temperature- humidity and forage indices, flood and drought alerts). The hubs have the potential to address bottlenecks around hyper-local data scarcity in climate-vulnerable hotspots that hampers DCAS quality and trust. AgData Hubs push impact-based advisories (what to do, not just what the weather will be) through multiple media, speeding response and enabling bundled services (credit for drought-resilient inputs, index-based insurance payouts, feed and forage market intelligence) AgData Hubs have the potential to strengthen public institutions and empower producer organizations (localized, trusted advisories; feedback loops; inclusion by design) by converting agrometeorological and climate data into a durable public goods, creating the conditions for sustained DCAS scale-up, diversify, and remain financially viable long after projects end.

Institutionalizing AgData Hubs as the foundational digital public good then layering value-chain plug-ins (e.g., iSAT agronomic rules, KAZNET-style citizen observation/market/rangeland tasks, finance/insurance indices) could be the reliable path to scale and sustainability; it converts scattered inputs into trusted, verifiable, hyper-local DCAS for crops and livestock; reduces duplication; anchors partnerships; and unlocks commercial and cooperative innovation through stable APIs and clear governance. The six country landscapes already show the institutional anchors and last-mile channels that are required to make it possible.

The objective of this report is therefore to assess progress, identify best practices, and provide a strategic roadmap for institutionalizing AgData Hubs in the six target countries, while drawing lessons from countries where the AgData Hubs have been established and are functional.

1. **AgData Hubs (2 pages max)**

AgData Hubs are nationally governed, standards-compliant digital backbones that collect, quality-control, and publish agriculture-relevant layers, especially agrometeorology, hydrology, rangeland/forage, soils, markets related information, among others, via open, well-documented APIs and public dashboards. The Hubs orchestrate ingestion (stations, satellites, reanalysis), calibration (quantile mapping against national truth), and exposure in one place, so multiple services (extension, finance/insurance, cooperatives, market platforms) consume the same verified layers. They institutionalize analytics (e.g., rainfall/temperature anomalies, sub-seasonal downscales, NDVI/EVI-based forage deficits) and publish skill scorecards so agencies and farmers (crops and livestock) see where forecasts perform and where uncertainty is high. AgData Hubs are a digital infrastructure, and not *“one more app.*” They are meant to feed USSD/IVR and WhatsApp for low-literacy access, radio for mass reach, and dashboards for extension/disaster risk management, while exposing APIs so public and private actors can build farmer-facing innovations responsibly and at scale. This section outlines some of the basic requirements for establishing AgData Hubs, while also giving examples of countries where the hubs have been established and operational; two of which are the AGRA target countries.

*Partnerships: who must be at the table*

A functional AgData Hub rests on clear institutional roles. The national meteorological/hydrological service (NMHS) acts as the data steward and skill authority, operating observing networks, issuing official forecasts, validating and downscaling routines that feed the Hub. The agriculture line ministry, with its extension system, is the lead client and co-owner; it defines agronomic and livestock decision rules (e.g., sowing windows, temperature and humidity /forage advisories), vets advisory content, and embeds Hub’s outputs into call centers, digital platforms, and field routines. An ICT/data authority underwrites platform policy, security, and long-term operations and management by setting open-data and API governance, hosting standards, cybersecurity, and SLAs oversight ensuring stable cloud tenancy and budgets beyond projects. Universities and research actors, including CGIAR centers, co-design analytics, publish forecast skill scorecards, and maintain open methods, while private firms and producer organizations provide last-mile scale through USSD/IVR, WhatsApp/SMS, radio, cooperative dashboards, and farmer-facing apps; also enabling embedding of finance/insurance products and structured feedback and citizen observation.

These roles are best formalized through a collaboration framework such as MoUs with data-sharing agreements, licensing/IP, privacy provisions, and SLAs for uptime, latency, and support. Some of the examples include Mali-Météo hosting the national AgDataHub-Mali; Kenya has linked the Hub to Kenya Agriculture Observatory Platform (KAOP), and private digital channels. Ethiopia’s Ministry of Agriculture hosts the national Hub and connects it to sector programs and ‘mini-hubs/independent platforms’; and in Zambia, the Smart Zambia Institute has been engaged to host the Hub and align it with national systems such as Zambia Integrated Agriculture Management Information System (ZIAMIS).

*Infrastructure and core functionalities: what the Hub must provide*

* Data platform – the foundation

The core platform ingests multi-source streams such as national station feeds for rainfall, temperature, and wind; hydrology networks; satellite products and partner datasets, then runs a processing pipeline that performs bias-correction (e.g., quantile mapping against national truth), downscaling, ensemble blending, and rigorous metadata management. Data are stored in a cloud data lake with a searchable, versioned catalog, and exposed through open, well-documented APIs and OGC services (maps/coverages/features), with bulk downloads and Common Alerting Protocol (CAP) feeds for alerts; sensitive layers are protected with role-based access. The Zambia prototype for example, demonstrated the ‘foundation + analytics + access’ stack in practice by coupling the iSAT decision-rules engine with the Digital Earth Africa data cube and Enhancing National Climate Services (ENACTS) layers to generate actionable advisories.

* Decision services and analytics - plug-ins

The decision services and analytics/ plug-ins support the foundation by translating data into decisions. Crop modules generate planting windows, water-balance insights, and frost/heat alerts; livestock and rangeland analytics have the ability to provide heat-stress warnings, forage deficit/greenness tracking, and water-point status which are critical for pastoral and mixed systems. Risk and finance plug-ins compute drought/forage indices consumable by insurers and banks and power exposure dashboards for cooperatives and SMEs. Content operations add multilingual templating, low-literacy IVR scripting, and testing, to optimize message efficacy. The AgData Hub in Ethiopia explicitly positions these capabilities as sector plug-ins on a common backbone, enabling ‘mini-hubs and independent platforms’ to consume verified layers without rebuilding the stack.

* Delivery and observability

Delivery spans inclusive, multi-channel pathways such as USSD/IVR, SMS/WhatsApp, radio scripts, extension and DRM dashboards, along with a developer portal to ensure reach across literacy levels, devices, and institutional workflows. Observability is built in: real-time uptime and latency dashboards, usage analytics, and public skill scorecards make performance transparent and improvable. In Kenya, wiring Hub APIs into the national agriculture platform (KAOP) upgraded its data sources and analytics, illustrating how an existing government platform can extend its reach and value through standardized Hub integrations.

* Governance, security, and sustainability

The operating model includes Role Based Access Control (RBAC), audit logs, and incident playbooks; data licensing aligned with national policy; and a costed operations and management plan covering cloud, connectivity, SMS/USSD traffic, and verification incentives, backed by a tiered API model for high-volume or commercial users. Experiences from AICCRA underscores that formal institutional hosting, dedicated budgets, and routine data refreshes are prerequisites for moving beyond prototype status and ensuring the AgData Hubs as a national public good.

*Countries where AgData Hubs are in place*

* Kenya

The AgData Hub underpins an upgraded Kenyan Agriculture Observatory Platform (KAOP), expanding data sources and analytics while emphasizing joint stewardship by the meteorological and agriculture agencies. Through stable, documented APIs, the Hub feeds extension dashboards and private digital channels, creating a clear pathway to add livestock heat-stress and forage advisories and to operationalize the CAP-compliant alerting across inclusive last-mile channels such as USSD/IVR and radio.

* Ethiopia

The Integrated National AgData Hub, hosted by the Ministry of Agriculture, functions as a unifying backbone, both as a national repository and a sourcing layer that enables multiple mini-hubs and independent platforms to consume verified datasets. With active technical consultations and a public developer site offering API documentation, the Hub standardizes partner access, supports evidence-based operations from policy to farm level, and provides a consistent venue to plug in crop and livestock analytics.

* Zambia

A prototype AgData Hub integrates station and ENACTS layers with iSAT and the Digital Earth Africa data cube, complemented by field data ingestion through the DMMU mobile app. To move from prototype to institutional service, the next steps are formal hosting with Smart Zambia/ZIAMIS, agreed SLAs and budgets, and routine forecast refreshes from the Zambia Meteorological Department (ZMD).

* Mali

Hosted by Mali-Météo, the national AgData Hub is evolving through iterative dashboard enhancements informed by user feedback. It provides real-time and historical climate insights and agro-meteorological analysis, and exposes digital advisories via a public-facing portal and APIs, allowing partners to build farmer-facing services that can scale across crops and livestock systems

1. **Digital Climate Advisories for the 6 countries (2 pages max for each of the countries)**

**Countries with established hubs (KE+ET) – specific focus on addressing the challenges that still exist and the areas of improvement that are required to enable the AgData Hubs to realize its full potential [2 pages per country].**

**This includes achievements and services delivered so far, current gaps in terms of data standardization, governance, sustainability as well as recommendations for next-phase improvements to realize full potential (e.g., expanding reach, gender-responsiveness, integrating AI/ML) [Ram for KE and Teferi for ET]**

**3.1 Kenya**

*Technical architecture of the AgData Hub*

Kenya’s AgData Hub integrates heterogeneous climate, weather, market and rangeland data, and exposes them through standards-based services for public dashboards, KAOP, e-extension, and last-mile channels. On the data side, the weather domain is organized across forecasts, current conditions, and historical baselines. Short-range forecasts (7–10 days) ingest Kenya Meteorological Department (KMD) outputs alongside Global Forecast System (GFS) to provide ward-level predictions for rainfall, Tmin/Tmax and relative humidity; medium range (2–4 weeks) blends IRI models (IRI-CFS, IRI-ESRL, IRI-GFS); and seasonal/sub-seasonal layers combine ICPAC, IRI-NMME and downscaled KMD products, ensuring both global skill and local authority. Current rainfall monitoring relies on CHIRPS and TAMSAT for all 47 counties, while a 30-year archive (1994–2024) aggregates CHIRPS, TAMSAT, ARC2 and KMD observations to ground decisions in climatology. These layers are catalogued and versioned in a cloud environment and delivered via open APIs/OGC services, with role-based access for any sensitive data, enabling multiple institutions to consume the same verified information. In 2025 a new feature was added that allows lat-long based weather data to be displayed.

The AgData Hub is integrated with KAOP, transforming it from a static map viewer into a agricultural decision-support system. Through API integration, KAOP users (policy, research, startups, county officers) can drill down from county to ward levels to retrieve localized forecasts, agro-meteorological layers, and decision tools; and the same APIs are wired into KALRO’s e-extension mechanisms, so seasonal and short-range advisories move directly to farmers via SMS and digital channels. This architecture also accommodates market and rangeland feeds—e.g., KAZNET providing the potential for advisories to be linked with biophysical conditions, market prices, livestock body-conditions and household indicators for more contextual messages.

*Value- chain specific plug-ins*

The Hub follows a ‘foundation + plug-ins’ design, through which a common, validated data backbone supplies sector apps that translate data into decisions for specific crops, geographies, and user groups. Two flagship Kenya plug-ins illustrate the approach. iSAT (Intelligent Advisory System for Agriculture) consumes the Hub’s forecast/historical layers to generate actionable, crop-specific recommendations, such as planting windows, variety selection, fertilizer timing, pest management, harvest planning, for cereals, legumes and groundnuts. It is already configured for four ASAL counties (Kitui, Makueni, Taita Taveta, Machakos) and pushes guidance through KALRO’s e-extension, reaching ~0.5M registered farmers. KAZNET is the livestock-focused crowdsourced plug-in which integrates rangeland greenness/forage status with market and household indicators to produce pastoral advisories, currently engaging ~400 producer and marketing groups in Kenya’s drylands. The Hub undergirds both tools by standardizing data sourcing, quality control and spatio-temporal alignment, so implementers can focus on decision rules and delivery rather than rebuilding pipelines.

*Experience and lessons learnt*

Three implementation lessons stand out. **First**, integration beats replacement. By upgrading KAOP through Hub APIs (rather than launching yet another portal), there has been preservation of institutional memory and user familiarity while unlocking new data sources, analytics and finer spatial resolution. The result is a single pane of glass for counties and services, and a smoother path to embed advisories into e-extension and private channels. **Second**, co-production and translation matter as much as modeling. Kenya’s PSP/NCOF processes and KMD convenings is helping convert seasonal outlooks into locally credible agronomic guidance; pairing those with radio/baraza/WhatsApp dissemination, keeping advisory content timely and trusted. **Third**, breadth of channels is critical for equity and reach. The landscape mapping showed a mesh of last-mile outlets, such as extension agents, KAOP, DigiFarm, iShamba, radio/TV (e.g., Shujaa FM, Mbaitu FM; Shamba Shape-Up) which could be fed from the same Hub sources, improving consistency and scale.

*Challenges and gaps*

Despite progress, several structural gaps still limit impact.

* Data fusion and automation: stakeholders cite lack of software/workflows to merge station networks (AWS + synoptic) and to auto-generate weather-based agro-advisories at scale, which slows localization and burdens expert time.
* Adoption and specificity: many advisories remain too generic or meteorology-led; embedding agronomy/livestock rules (and verification) is uneven across counties.
* Coordination and funding: siloed operations and budget constraints at KMD and partner institutions hinder investments in modern infrastructure and staff capacity, and make routine refresh/maintenance difficult.

These findings reinforce the case for continued investment in the Hub as a digital public infrastructure, institutionalized SLAs/budgets, and stronger feedback loops with farmers and private channels.

**3.2 Ethiopia**

*Technical architecture of the AgData Hub*

Ethiopia’s AgData Hub is a standards-based, modular approach that consolidates fragmented agricultural and climate data into a single, interoperable platform governed by the Ministry of Agriculture (MoA). Technically, the stack automates ingestion from multiple sources, such as field surveys and lab data, satellite/remote sensing streams, IoT sensors and drones, plus meteorological feeds through an end-to-end ETL (extract-trasnform-load) pipeline. A systematic curation layer (cleaning, validation, enrichment, anonymization) raises trust and privacy compliance; harmonization/integration aligns units, identifiers and taxonomies using shared metadata and ontologies to resolve legacy silos. The Hub supports multimodal storage for structured tables and unstructured geo-imagery/audio/video, and exposes user access/discovery via simple dashboards, search/graphical query, and secure APIs. Built-in analytics/visualization spans descriptive to prescriptive modules, turning data into maps, dashboards and scenario tools for evidence-based decisions. Development is iterative and user-driven, aligning with the Digital Ethiopia 2025 and the National Digital Agricultural Extension and Advisory Services Roadmap. Governance is anchored by the Ministry of Agriculture and a Coalition of the Willing (CoW) (EIAR, ATI, CGIAR centers, private sector), with FAIR/CARE principles guiding data management and accountability.

*Value-chain specific plug-ins*

Rather than a monolithic app, the Hub powers a family of digital climate advisory services (DCAS), that translate data into actionable, local guidance for crops and livestock. Core integrations include the Ethiopian Digital Agro-Climate Advisory Platform (EDACaP) and the Land–Soil–Crop (LSC) Hub, which fuse high-resolution soil, weather/hydrology, cropping calendars, remote sensing and socio-economic layers sourced from the Hub to produce hyper-local advisories (e.g., planting windows, irrigation timing, input decisions, pest/disease alerts) delivered via SMS, mobile apps, radio and public extension. On the climate side, the Ethiopian Meteorological Institute (EMI) contributes national forecasts and ENACTS Maprooms; the Hub makes ENACTS and other streams interoperable and reliably available to downstream tools. Together, this architecture supports end-to-end DCAS, from data ingestion and fusion to co-produced, farmer-facing advice, while providing open APIs so private agritech, insurers and cooperatives can build value-chain products.

*Experience and lessons learnt*

Some key implementation lessons stand out. The national ownership and policy mainstreaming is ongoing by locating the Hub under the MoA, tying it to the Digital Ethiopia 2025 and the national extension roadmap. This has positioned the platform as a digital public infrastructure rather than a project portal, ensuring coherence, durability and public-good orientation. The inclusive multi-stakeholder governance has unlocked the process of data sharing, through the coalition such as the CoW model (MoA, EIAR, ATI, CGIAR, private sector), easing barriers around data ownership/privacy and created shared responsibility for standards, APIs and product co-design. Ethiopia’s stepwise approach of integrating administrative, survey, satellite and IoT assets have enabled an operable platform while steadily raising data quality and interoperability for advanced analytics and DCAS. There has been an emphasis on user-centered design (dashboards, search, developer-friendly APIs) and clear quality standards (harmonization/anonymization/cleaning), essential for trust, reuse and cross-sector coordination.

*Challenges and gaps*

Despite momentum, constraints remain:

* Infrastructure and access: rural connectivity, power reliability and device access continue to limit last-mile use. Digital literacy of farmers and frontline extension also constrains uptake without targeted training. Data coverage and currency can be uneven across geographies and institutions, affecting fusion and analytics; governance clarity (ownership, privacy/ethics, interoperability) requires continued legal and institutional strengthening.
* Financial sustainability: donor dependence needs to shift toward hybrid public-private models and budget lines for operations. At the value-chain level, the broader Ethiopia CIS/DCAS landscape still faces fragmented stakeholder coordination, capacity gaps, and under-served livestock needs, even as digital platforms like EDACaP expand reach, underscoring the need to institutionalize refresh cycles, formalize SLAs, and embed livestock (e.g., forage/heat-stress) analytics as standard modules.

The gaps and challenges highlight the need for continuing the strengthening the MoA–CoW governance, scale ENACTS-enabled crop and livestock plug-ins, investing in rural connectivity and capacity and while actively pursuing the 4P partnerships for sustainability and scale.

**Countries with emerging hub (Nigeria and Burkina) – specific focus on the setup process: stakeholders involved, platform design, data integration steps, and early successes, highlight enabling policies or institutional innovations, and identify what remains (e.g., governance models, capacity gaps, user adoption challenges)**

**AgData Hub Setup Process: NIGERIA.**

*Institutional mapping*

The institutional mapping of Nigeria's climate services and agro-advisory system was developed through consultations between ILRI’s Digital Agriculture Team and the Nigeria Meteorological Agency (NiMET). At the **governance level**, the Federal Ministry of Agriculture and Food Security (FMAFS), and Federal Ministry of Environment (FMENV) provide policy direction. supported by cross-ministerial coordination mechanisms to ensure alignment with national development goals. **Technical agencies** serve as the primary data producers and validators: NiMET provides meteorological and climate data; Nigeria Hydrological Services Agency (NHISA) contributes hydrological information; National Space Research and Development Agency (NASRDA) and National Centre for Remote Sensing (NCRS) supply geospatial and satellite data; National Agricultural Extension and Research Liaison Services (NAERLS), State Agricultural Development Projects (ADPs), and National Agricultural Research Institutes (NARIs) generate agricultural intelligence; while National Emergency Management Agency (NEMA) and National Bureau of Statistics (NBS) provide disaster management and socio-economic data respectively.

The **private sector and civil society** act as both data users and service providers: telcos and fintech companies enable digital delivery channels; agritech startups and NGOs like Precision Development develop farmer-facing applications; while agricultural input suppliers, cooperatives, and commodity boards facilitate last-mile advisory services. River Basin Development Authorities (RBDAs) contribute water resource data and support irrigation-based advisories. Ultimately, the **beneficiaries**—smallholder farmers (both crop and livestock), pastoralists, agribusinesses, cooperatives, extension workers, and policymakers—both will draw on the AgDataHub for services and feedback usage and adoption data to strengthen the system.

A diagram of a company

AI-generated content may be incorrect.

Figure X: Institutional mapping of Nigeria's AgData Hub ecosystem

*Needs assessment*

Assessing Nigeria's AgData Hub readiness (**Table X**) reveals significant progress alongside critical gaps. The country has established data generation infrastructure through NiMET's AWS network, ADP systems, and NASRDA's satellite capabilities, but interoperability remains limited with data scattered across institutional silos and incompatible formats. While NiMET produces seasonal and dekadal forecasts, localization to LGA level requires strengthening, and livestock-focused products are nascent. Digital delivery channels exist through mobile operators reaching 80%+ of the population, but rural internet penetration remains below 30%, necessitating hybrid approaches (USSD, IVR, radio). Human capacity is constrained with only 200+ meteorologists serving a population of 220+ million, and extension worker-to-farmer ratios often exceeding 1:10,000. Livestock extension specialists are particularly scarce. Infrastructure deficits include inadequate server capacity for Hub hosting, unreliable power supply affecting data transmission, and sparse weather station coverage in the vast Sahel and Middle Belt regions.

**Table X: Current needs of Nigeria's AgData Hub**

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| **Component** | **Status (2024)** | **Gap / Need** |
| **Data Infrastructure** | 170+ AWS, 40+ synoptic stations; NASRDA satellite access; ADP networks | Expand coverage in underserved zones; integrate disparate systems; ensure real-time data transmission |
| **Forecasting Capacity** | Seasonal (PRESASS/GHACOF), dekadal, daily products by NiMET | Downscale to LGA level; improve short-range accuracy; develop livestock/rangeland products |
| **Digital Platforms** | NiMET website, scattered ADP portals, private apps | Build unified Hub with APIs; ensure interoperability; develop public dashboard |
| **Connectivity** | 80%+ mobile penetration; <30% rural internet | Expand rural broadband; strengthen USSD/SMS infrastructure; scale radio networks |
| **Human Resources** | 200+ meteorologists; understaffed ADPs/NAERLS | Train 500+ staff in data science, agroclimatology; recruit livestock extension specialists |
| **Institutional Coordination** | Multiple agencies; weak data-sharing protocols | Formalize MoUs; establish Hub governance board; clarify roles and SLAs (Service Level Agreements) |
| **Funding** | Project-dependent; limited O&M budgets | Secure recurrent government allocation; mobilize donor co-financing |

*Sustainability and institutionalization*

Sustainability of Nigeria's AgData Hub requires embedding it within national strategies, securing diversified financing, and strengthening institutional capacity. The government's role is to act as facilitator and anchor funder through: investing in digital infrastructure such as connectivity, and backup systems, enforcing data-sharing policies mandating government agencies to contribute data to the Hub. The **private sector** is expected to drive last-mile innovation and service diversification. Open APIs from the Hub will enable agritech startups, telcos, and agricultural input companies to build commercial services.

*Risks and mitigation strategies*

Key risks stem from institutional fragmentation, funding uncertainties, capacity gaps, and the digital divide. **Institutional risks** include weak coordination across multiple agencies (NiMET, FMAFS, NASRDA, ADPs) with overlapping mandates and competing priorities, potentially leading to duplicated efforts, delayed decision-making, and inconsistent data-sharing. **Mitigation**: Establish formal Hub Governance Process with clear terms of reference, decision-making protocols, and reviews; sign legally binding MoUs specifying data-sharing obligations, service-level agreements, and dispute resolution mechanisms. **Funding risks** include over-reliance on donor projects (AICCRA, World Bank, AfDB) creating sustainability vulnerabilities when projects end, and insufficient government budget allocations for recurrent operations. **Mitigation**: Advocate for dedicated Hub budget line in National Agricultural Development Fund. **Digital divide risks** include rural areas lacking internet access limiting Hub reach; low digital literacy among smallholders hindering service adoption; and language barriers with most content in English excluding non-literate farmers. **Mitigation**: Prioritize USSD and IVR channels requiring only basic mobile phones; partner with community radio networks

*Way Forward*

The immediate priority is formalizing governance and securing institutional commitments through MoUs and SLAs. Technical infrastructure deployment, establish data ingestion pipelines, create public-facing dashboard featuring: interactive maps visualizing current season rainfall performance and historical weather data at county, state, etc level, build developer-friendly APIs for data sharing. This roadmap provides Nigeria with a concrete, sequenced pathway to establishing a sustainable, impactful AgData Hub serving millions of farmers and pastoralists.

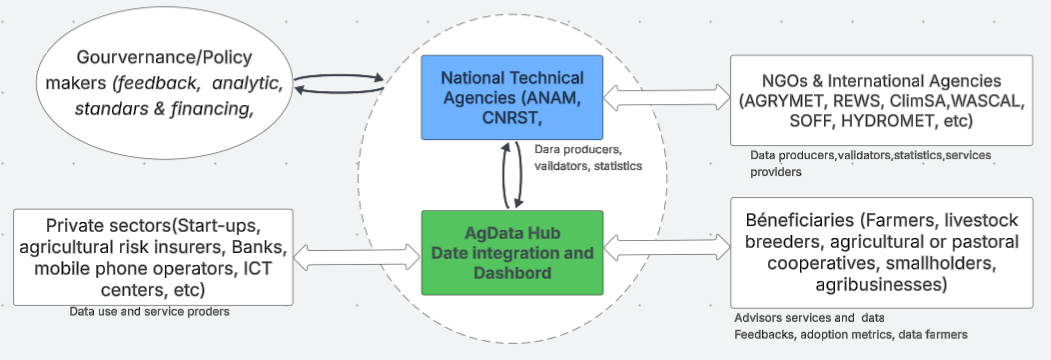
* + Burkina – dexription of the process of set-up of the AgData Hub [**Nombre and Jacob to lead with support from Ram**]

*Institutional mapping*

In Burkina Faso, the institutionalization of climate services and agro-climatic advisory activities has brought together public and private sector actors, as well as NGOs, start-ups, the media, etc. Held in Ouagadougou on August 21 and 22, 2025, under the auspices of the National Meteorological Agency, the workshop on institutionalizing climate services mapping and agro-climatic advice covered three key sectors. The strategic or political sector (MARAAH, MEEEA, MJ, SP/CONASUR, PM), which defines the policies and laws governing the production and use of climate information and agro-climatic advice, as well as the financial and human resources needed to improve performance in agriculture, the environment, and other cross-cutting sectors such as health, urban planning, etc. The second sector brings together actors who produce, exploit, and disseminate climate services and agro-climatic advice. The main players are the government, the National Meteorological Agency (ANAM), and the National Center for Scientific and Technological Research (CNRST) with its branches, and for non-governmental organizations, WASCAL, SNV, FAO, AGRYMET, ACMAD, ClimSA, REWS, SOFF, HYDROMET, etc., which constitute the backbone of climate service providers and agro-climatic advisors. In addition to these actors, it is also important to mention start-ups, agricultural risk insurers (YELEN), and telephone operators (ORANGE, MOOV), which provide agro-climatic services and advice to their customers. Finally, the third sector comprises the end users or consumers of climate services and agro-climatic advice. The main consumers are very often farmers, livestock breeders, agricultural or pastoral cooperatives, smallholders, agribusinesses, etc.

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| Figure1: Consumers of climate services and agro-climatic advice in Burkina Faso |  |

Figure: AgData Hub process in Burkina showing all the interactions from the governance bodies to the end-users of climate informations and advisories services.



*Needs assessment*

According to the World Bank report, the illiteracy rate among the population in Burkina Faso remains very low, with a proportion of 64.0% in urban areas compared to 23.4% in rural areas (World Bank, 2019), where more than 80% of the agricultural population is concentrated. However, the assessment of climate information and agro-climatic service needs in Burkina Faso mentions the existence of digital platforms offering climate information and agro-climatic services, contrasting with the level of literacy. In addition, the success of these platforms lies in the relaying of information within communities by resource persons trained in the use and dissemination of this climate information and agro-climatic services, which mitigates the barrier of illiteracy. This is why, in the process of implementing the AgData Hub, an important role is given to community relays in Burkina Faso to facilitate its use. Furthermore, ANAM, the main structure to produce climate information and agro-climatic services, will be the main entity responsible for the deployment, maintenance, management, and training of AgHub Data users. It is in this sense that key shortcomings have been identified with palliative needs through the Strengths, Weaknesses, Opportunities, Threats (SWOT) methodology.

**Table 1: Current needs of Burkina AgData Hub.**

|  |  |  |
| --- | --- | --- |
| **Component** | **Status (2024)** | **Gap / Need** |
| **Data Infrastructure** | 10 synoptic stations; ANAM , ARGYMET data access; ADP networks | Expand coverage in underserved zones; integrate disparate systems; ensure real-time data transmission |
| **Forecasting Capacity** | Seasonal , decadal, daily products by ANAM | Downscale to LGA level; improve short-range accuracy; develop livestock/rangeland products |
| **Digital Platforms** | ANAM website,Garbal portals, private apps | Build unified Hub with APIs; ensure interoperability; develop public dashboard |
| **Connectivity** | 30%+ mobile penetration; <10% rural internet | Expand rural broadband; strengthen USSD/SMS infrastructure; scale radio networks |
| **Human Resources** | 200+ meteorologists; understaffed ANAM | Train 500+ staff in data science, agroclimatology; recruit livestock extension specialists |
| **Institutional Coordination** | Multiple agencies; weak data-sharing protocols | Formalize MoUs; establish Hub governance board; clarify roles and SLAs (Service Level Agreements) |
| **Funding** | Project-dependent; limited O&M budgets | Secure recurrent government allocation; mobilize donor co-financing |

*Sustainability and institutionalization*

The sustainability of Burkina Faso's CIS/AAS system, including the AgData Hub, will depend on its integration into national strategies such as the NSPs of key ministries (Agriculture+Digital Economy+Territorial Administration and Mobility). NGOs and international organizations could also provide crucial support for this sustainability by continuing their regulatory support but offering new technology transfers. Open APIs should also enable other actors, such as those in the private sector, to develop commercial services such as credit, insurance, and input financing, while developing agricultural service centers and stimulating technological innovation. The AgData Hub will thus evolve into a permanent and institutionalized platform that will support resilient and digitized agri-food systems in Burkina Faso.

*Risk mitigation*

From an institutional perspective in Burkina Faso, overlaps and lack of coordination between ministries could slow down the adoption of emerging technologies. In addition, the main risks identified are poor data quality and fragmentation, insufficient capacity, and uncertainties related to long-term financing. Limited internet access in rural areas, the high cost of the internet, and low levels of digital literacy risk excluding smallholders, while persistent difficulties in data collection and validation could undermine confidence in the system. To mitigate these risks, Burkina Faso intends to implement structured capacity-building programs, stronger data governance frameworks, and cross-cutting platforms that actively involve private sector actors and, above all, community actors to ensure both the sustainability and widespread adoption of the Hub.

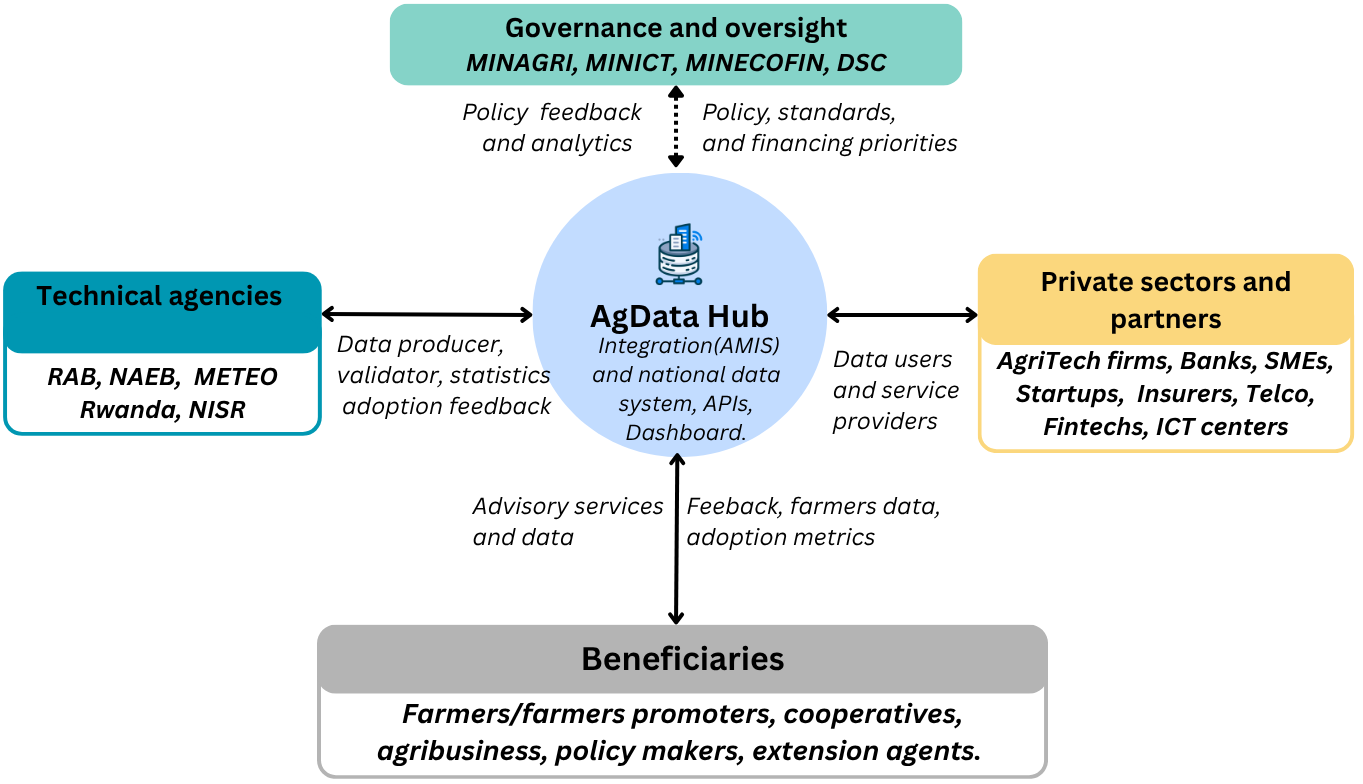
*The way forward*

The way forward for the Burkina AgData Hub is to implement the roadmap with ANAM and key stakeholders through progressive steps that align concurrently with the national strategic plans of the Ministries of Agriculture, Digital Economy, and Territorial Administration and Mobility on digitized agri-food systems. This will involve mobilizing both technical and financial resources, taking into account the roadmap that will be clearly produced, while focusing on the primary needs of end users. This is why, at the operational level, AgHub Data must be built on a system that is interoperable with other existing platforms, while offering ease and flexibility for its understanding and manipulation by the community. At the same time, it is necessary to accelerate capacity building for agricultural technicians and veterinarians, who in turn will provide support for transferring skills to community agents. The well-known network of agents at the community level is essential for reaching the last mile of livestock farmers and agricultural producers.

**A: AgData Hub roadmap: RWANDA**

*Institutional mapping*

The institutional mapping of Rwanda’s climate services and agro‑advisory system — covering readiness for a national climate services curriculum, the AgData Hub, and harmonized agro‑advisory delivery — was developed through multi‑stakeholder consultations and a national workshop held in Kigali in August 2025. The section below presents the mapping specific to the AgData Hub, positioned as a core component of institutionalized and harmonized CIS/AAS services in Rwanda. It highlights four interconnected layers of actors, whose respective roles are illustrated in **Figure 1**. At the governance level, MINICT, MINAGRI, RISA, and MINECOFIN provide policy direction, technical standards, and financing priorities, supported by the Digitalization Steering Committee and the Food Systems Secretariat to ensure cross‑ministerial coordination. Technical agencies — including RAB, NAEB, Meteo Rwanda, and NISR — serve as the main data producers and validators, contributing research, export traceability, climate information, and national statistics. The private sector complements these functions by acting as data users and service providers: banks and insurers extend credit and risk products; agritech firms, telcos, and fintechs develop digital tools and payment systems; while farm service centres, ICT hubs, and certified extension providers deliver inputs, mechanization, and advisory services. Ultimately, the beneficiaries are farmers, cooperatives, agribusinesses, and policymakers, who both draw on the Hub for services and feedback usage and adoption data to strengthen the system**.**



**Figure 1: Institutional mapping of Rwanda’s AgData Hub ecosystem, showing governance bodies, technical agencies, private sector actors, and beneficiaries, and how their roles connect through policy, data, services, and feedback flows**.

*Needs assessment*

Assessing the CIS/AAS needs (**Table 1**) identified Rwanda has made notable progress in digital agriculture, with platforms such as AMIS, the Smart Nkunganire System (SNS), and Food Basket Sites (FoBaSi) forming the backbone of emerging data systems. However, gaps remain in interoperability, rural connectivity, human resource capacity, and infrastructure. While 85% of farmers own a phone, only 30.5% have internet access, underscoring the need for USSD/SMS services and expanded ICT centres. Training of 5,000 agronomists and veterinarians is underway, but advanced digital literacy and AI/data analytics skills are still limited. Infrastructure such as Farm Service Centres (FSCs), AgriHubs, and upgraded RAB stations require scaling to ensure last‑mile delivery and equitable access**.**

**Table 1: Current needs of Rwanda’s AgData Hub.**

|  |  |  |
| --- | --- | --- |
| **Component** | **Status (2023)** | **Gap / Need** |
| AMIS | Under construction; livestock module due 2025 | Integrate with AgData Hub; ensure interoperability |
| SNS | Operational input subsidy & farmer registry | Expand coverage; link to Hub for profiling |
| FoBaSi / AgriHubs | Pilots established | Scale up; integrate digital advisory & data capture |
| Connectivity | 85% phone access; 30.5% internet penetration | Expand ICT centres; strengthen USSD/SMS |
| Human Resources | 5,000 agronomists/vets targeted for training | Build digital literacy; AI/data analytics capacity |
| Infrastructure | 6 FSCs established; ICT centres functional but weak | Expand FSCs; upgrade RAB stations; equip ICT centres |

*Sustainability and Institutionalization*

Sustainability of Rwanda’s CIS/AAS system, including the AgData Hub, will depend on embedding it within national strategies such as PSTA5 and the digital agriculture agenda, securing diversified financing through public budgets, PPPs, and user‑based models, and strengthening institutional capacity. The government’s role is to act as a facilitator and coordinator through structures like the Digitalization Steering Committee and Food Systems Secretariat, while investing in digital infrastructure, interoperability, and rural connectivity. The private sector, expected to lead under PSTA5, will leverage open APIs from AMIS and the Hub to develop commercial services such as credit, insurance, and input financing, while also expanding farm service centres and driving technological innovation. Together, these measures ensure the Hub evolves from a project into a permanent, institutionalized platform that underpins resilient, digitized agri‑food systems in Rwanda.

*Risks mitigation*

Key risks stem from the digital divide, weak data quality and fragmentation, institutional and capacity gaps, and long‑term funding uncertainties. Limited rural internet access and low digital literacy risk excluding smallholders, while persistent challenges with data collection and validation could undermine trust in the system. Institutional overlaps and poor coordination across ministries may slow adoption of emerging technologies. To mitigate these risks, Rwanda will need structured capacity‑building programs, stronger data governance frameworks, and cross‑cutting platforms that actively involve private sector actors, ensuring both sustainability and broad‑based adoption of the Hub**.**

*Way forward*

The way forward for Rwanda’s AgData Hub, is to operationalize the roadmap through phased milestones that align with PSTA5’s Outcome 3.3 on digitized agri‑food systems. Immediate priorities include completing AMIS development and ensuring interoperability with SNS, FoBaSi, AgriHubs, and FSCs, while simultaneously strengthening ICT centres and rural connectivity. In parallel, capacity building for 5,000 agronomists, veterinarians, and extension agents must be accelerated, with emphasis on digital literacy and data analytics. Medium‑term actions will focus on embedding the Hub into national strategies and scaling AgriHubs in Food Basket Sites as service delivery anchors and incentivizing private sector innovation through open APIs and PPPs. Over the longer term, sustainability will hinge on hybrid financing models, robust data governance, and institutionalized coordination mechanisms, ensuring the Hub evolves into a permanent platform that underpins resilient, inclusive, and digitized agri‑food systems in Rwanda**.**

* + Mozambique – Roadmap of what will be required to set -up and Ag Data Hub [**Teferi works with Sydney**]

**Major challenges and lessons (1/2 page) *Can this be changed to ‘Cross-cutting lessons and strategic insights?’***

* Capture insights on scalability, data interoperability, and sustainability **[Ram and Teferi]**.
* Add a use cases paragraph section from each country (e.g., a farmer using SMS-based climate advisory, or an extension officer using data dashboard**).[Specific example from KE by Ram and specific example from ET by Teferi]**
* How gender, youth, and last-mile access are being addressed or require attention **[Rupsha]**
* Indicate where AGRA’s catalytic role has been most critical - technical assistance, co-financing, coordination, etc. **[Rupsha/ Ram]**

**Way Forward (2 pages) [Anthony to add bullet points/content for the framing; Ram and Teferi with contributions from Jacob, Moussa, Nombre and Sydney]**

Iterative process for refinement and making the AgData Hubs fit for purpose with different partners for further downscaling information for the last mile use including policy, infrastructure and capacity needs; role of partners (governments, donors, private sectors, …etc); and steps or ideas for mainstreaming and institutionalizing digital tools. *Or summarize this in terms of three strategic pillars as follows: (i) deepen institutionalization and governance for securing government ownership, policy integration, and formalizing data-sharing frameworks (ii) foster sustainable business and partnership models for diversifying revenue streams and strengthening private sector engagement and (iii) enhance last-mile service delivery and inclusivity for refining content, expanding reach through diverse channels, and mainstreaming gender and youth strategy*.