Integrated ag-data hub in Zambia using existing CIS platforms coupled with the iSAT and DEA data cube

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Accelerating Impacts of CGIAR Climate Research for Africa project (AICCRA)

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Accelerating the Impact of CGIAR Climate Research for Africa

1. Introduction and context

Agriculture remains central to the livelihoods of millions of Africans, yet far too many agriculture-dependent Africans remain food insecure and malnourished. After a period of moderate improvement, food security throughout the region has recently deteriorated. Slowdowns in productivity growth, combined with increasingly frequent food production failures, point to the need to significantly raise the bar when it comes to increasing the productive capacity and strengthening the resilience of rural households. The economic hardship resulting from the COVID-19 crisis and Russia-Ukraine war are expected to further worsen food insecurity in the region, making resilience-building an even more urgent task. The livelihoods of African farmers and livestock keepers, long known to be vulnerable to the vicissitudes of weather, are being severely impacted by climate change. Climate-related shocks to food production have increased in frequency from occurring once every 12.5 years to occurring once every 2.5 years. The increased frequency of climate-induced production shocks has made it increasingly difficult to maintain positive growth in per capita food production over the longer term. Climate change is projected to further increase the number of drought days in Africa and shorten growing seasons. Droughts, floods, and tropical storms are the climatic events that affect food production the most. Substantial increases in these major drivers of crop and livestock production shortfalls are projected for large parts of Africa. This is happening at a time when the number of people to feed will almost double by 2050 to over 2 billion—a population that will be increasingly urbanized.

Climate change poses a serious threat to crop productivity in sub-regions within Africa that are already food insecure. The impact is projected to be highest in maize, millet, sorghum, and wheat. Climate change will also affect productivity in Africa's livestock sector. Depending on the location and prevailing production systems, water scarcity will lower the productivity of pastures, reduce yields of milk and meat, and increase the incidence of diseases. All this will translate into a significant deterioration in food security, if no action is taken.

Agriculture is an important livelihood source for women throughout sub-Saharan Africa and an important source of employment. Studies consistently show that in most parts of sub-Saharan Africa, productivity of women farmers consistently lags behind that of men farmers. The sources of the productivity gap have been amply documented including land, improved technologies, lesser access to inputs, credit, insurance, and advisory services. They are thus generally less well-resourced, and hence more vulnerable to shocks that negatively impact farming and livestock keeping activities. Women farmers are especially vulnerable to climate change impacts, due to household responsibilities as well as increased agricultural work from male out-migration. Climate-smart agriculture (CSA) options have the potential to provide benefits for women; when they have access to information on CSA, they are just as likely as men to adopt the practices. Women can be important agents of innovation, including in response to climate change, and ensuring that women beneficiaries of the project are able to avail of CSA technologies and climate information will be a focus of the project's gender strategy.

The ambition of many African governments to improve food security, nationally and at household level, is in danger of not being met. The 2014 Malabo Declaration set ambitious 2025 targets to end hunger, double agricultural productivity, halve post-harvest losses, and sustain agricultural GDP growth of at least 6 percent per year. The region is not on track to meet these targets, and it will be difficult to make sustained progress in the face of large climate-induced production shocks. Strengthening the productivity and resilience of African agriculture will depend critically on the ability of governments and their partners to bring science and innovation to the forefront of the development agenda. Urgent action is needed to improve climate adaptation of Africa's food systems.

Incentives, knowledge, science, and finance will all need to play a role, together with increased co-ordination among development partners to improve the climate resilience of production systems, build efficient value chains, facilitate internal and external trade, and boost the purchasing power of the most vulnerable households. As countries contemplate a shift towards climate-smart investments, investing in agricultural research is more critical than ever. The high returns to investment in agricultural research and innovation are well documented, and a large body of evidence shows that such investment is very effective at reducing poverty and hunger. In recognition of the critical role played by science and innovation in enabling the adaptation of African agriculture to climate change, the World Bank recently announced an increase in support to CGIAR.

The World Bank's increased support for CGIAR comes at a critical time, when the COVID -19 pandemic as well as Russia-Ukraine war are further threatening food security throughout the region and undermining the livelihoods of millions of agriculture-dependent households. Going forward, efforts will be needed to increase domestic food production throughout the region and make food supply chains more resilient to the threat of pandemics, by promoting innovation and building additional capacity to manage pests and diseases while monitoring the health and safety of food. CGIAR will be at the forefront of these efforts.

Development Objective(s) of AICCRA

The Development Objective is to increase access for agriculture research and extension service providers in Africa to knowledge, technologies, and decision-making tools relevant to enhancing the resilience of agriculture and food systems in the face of climate change. Achievements of the Project are being measured using the following PDO level indicators:

1. **Results Area 1:** Knowledge and tools needed to project likely impacts of climate change on agricultural systems available for use by beneficiaries in project area.
2. **Results Area 2:** Climate-smart agriculture technologies available for upscaling in project area.

AICCRA Description in Zambia

AICCRA's focus is on bridging the gap between the research institutes that produce improved technologies and the development organizations that promote the adoption of improved technologies, for the purpose of enhancing the resilience of Africa's agriculture and food systems in the face of climate change. Through support to CCAFS, AICCRA seeks to strengthen the technical, institutional, and human capacity needed to move CGIAR innovations off the shelf and achieve impacts at scale in IDA-eligible countries in Africa. AICCRA will strengthen systemic capacity to monitor climate change in Africa, project the likely impacts of climate change on local agri-food systems, identify improved technologies that can strengthen the resilience of those systems in the face of climate change, and transfer knowledge about the improved technologies to agri-food system actors. The knowledge, technologies, and decision-making tools promoted under AICCRA will be of value not only to productive agents (e.g., farmers, livestock keepers, assemblers, processors, and distributors), but also to the public, private, and civil society organizations that play critical roles in delivering improved technologies to productive agents. Climate advisories generated through monitoring networks and early warning systems work much better when they flow rapidly and easily into decision support systems and are integrated with input provision. For that reason, there is a need not only to strengthen monitoring and analytical capacity to make sure systems are in place that can generate timely and relevant climate advisories and early warnings, but also a need to implement policies and reinforce institutions to ensure that those climate advisories and early warnings can be translated into effective preventive actions, for example through changes in the types and amounts of inputs being used, or adjustments in management practices. In addition, decision support systems must be capable of channelling information from service users back to service providers, to inform research so that it becomes more demand-driven and responsive to local needs.

In Zambia, AICCRA project works with IWMI, ICRISAT, IITA, World Fish, IRI and ZMD. The project is being implemented in the following provinces based on vulnerability assessment report on climate hotspots: Northern province (Kasama, Luwingu, Mbala, Mpulungu and Mungwi districts); Eastern province (Chipata, Petauke, Lundazi, Nyimba and Sinda), Central and Southern Province. AICCRA will work with Zambian partners including SMEs to scale climate information services (CIS) and climate-smart agriculture (CSA) innovations to achieve water and food security and build resilience.

AICCRA consists of three components and this report will therefore focus on the progress to date on these components from the ICRISAT side.

Component 1. Knowledge and Services

Component 1 supports the generation and sharing of knowledge products and tools that will address critical gaps in the design and provision of climate services, enable climate-informed investment planning, and support the design of policies to promote uptake of CSA practices.

Subcomponent 1.1. Africa-wide. Sub-component 1.1 supports the generation of new knowledge and associated delivery platforms that are expected to be relevant throughout the region to improve targeting in the provision of agro-climatic services as well as planning of CSA investments. The following activities will be undertaken, inter alia: (i) Identification of adaptation interventions targeted to agricultural land-use categories, small-scale farmer groups and associated climate hazards; (ii) Development of climate information service packages to accompany climate-smart interventions based on needs assessments and qualitative-quantitative cost-benefit analyses; (iii) Development or refinement of indicators and other adaptation tracking systems that can feed into planning processes and assist with national reporting related to NDCs and NAPs; (iv) Identification of big-ticket CSA investment opportunities, detailing the potential social, economic, and environmental benefits at national, regional, and continental scale (an example might be assessing the potential to launch large-scale initiatives to produce and distribute seed of drought-resilient varieties); (v) Development of business models and identification of innovative finance options for scaling-up CSA and climate-resilient value chains, with special consideration of gender and social inclusion; and (vi) Undertaking climate, agricultural and environmental policy coherence analyses to identify regional policy overlaps, gaps and alignment.

Sub-component 1.3. Eastern and Southern Africa. Sub-component 1.3 supports the development of new or improved climate service tools that can help bridge the gap between meteorological services and agricultural extension systems. Activities to be undertaken include the development of ag-data hubs, design of climate service and visualization tools and dissemination systems, and strengthening of partnerships for the delivery of early warnings, climate services, and climate-informed digital agro-advisories to support agricultural decision-making. The sub-component will also seek to identify tailored climate information services and digital agro-advisory packages for use in building new extension systems or strengthening existing extension systems.

D24158 Integrated ag-data hub in Zambia using existing CIS platforms coupled with the iSAT and DEA data cube etc.

This report is divided into two parts (i) technical progress on building a prototype of the Agdatahub as well as generation and dissemination of advisories using iSAT (ii) governance mechanisms and stakeholder engagement to host Agdatahub.

Progress made:

(i) Prototype of the Agdatahub

We have built a prototype of the AgDataHub. See this link - http://3.16.201.127/zambia/

We have deployed a mobile app for DMMU and the data from the DMMU teams can be seen on the AgDataHub. Similarly, the indices from Africa data cube and IWMI teams can also be seen on this prototype. We have also been able to deploy a partial version of the NGN dashboard with ENACTS data from ZMD

Constraints to be addressed

1) Institutionalizing the AgDataHub. Need to integrate the Prototype of the Agdatahub on SZI platforms such as ZIAMIS. Smart Zambia is yet to come up with budget to hosting the Agdatahub yet the specifications were shared by AICCRA Zambia
2) Our NGN dashboard needs data from ENACTS of ZMD. However, ZMD aren't updating information on ENACTS. At the same time, the forecasts are not provided at the temporal resolution as desired by hosting the Agdatahub.
3) AICCRA Zambia drafted Letter of agreement between Smart Zambia and AICCRA as a guiding framework to support implementation. There is need for Smart Zambia to fast track signing of the letter of agreement

(ii) Towards an automated messaging system using intelligent agricultural systems advisory tool (iSAT)

Climate services are receiving increasing attention globally as an important component of the climate adaptation agenda[1]. The past two to three decades have witnessed progress towards improved climate prediction. Improvement in prediction of climate variability and impacts is necessary but not sufficient to achieve effective use of climate information. For example, in developing countries, there is a general concern that users have not fully benefited from effective climate services in support of decision-making. Therefore, the realization of these benefits requires meticulous efforts to design and implement effective mechanisms for using climate information. Access to seasonal climate forecasts and reliable in-season forecasts can lead to harmonized options that aim to reduce production risks by assisting farmers to make informed decisions on what, when and how to undertake farm management activities[2]. An effective climate services system should provide tailored, contextual, and actionable advisories to the farmers and this requires appropriate engagement to co-produce knowledge that facilitates and guides action and preparedness. Therefore, there is a need to generate location specific, timely and actionable information that can be disseminated to millions of farmers across diverse agro-ecological regions.

Intelligent Agricultural Systems Advisory Tool (iSAT) is developed to support farmers in making informed decision on their farm management (Fig 1). It is an automated system to generate and disseminate location-specific advisories by taking advantage of developments in ICT i.e. accessing data from multiple sources, analyzing and interpreting data, developing advisory and timely dissemination of the advisory. Two types of advisories are issued to farmers i.e. pre-season advisory and in-season advisory.

Climate information in the form of seasonal weather forecasts has the potential to improve farmers' decision-making, leading to reduced risks and increased opportunities. Seasonal climate forecasts for use in on farm decision making has to be:

(i) Reliable
(ii) Able to change decisions

[1] Hansen J.W., Vaughan C., Kagabo D.M., Dinku T., Carr E.R., Korner J and Zougmore R.B. 2019. Climate services can support African farmers' context-specific adaptation needs at scale. Frontiers in Sustainable Food Systems 3: 21

[2] Arendse A and Crane T.A. 2010. Impacts of climate change on smallholder farmers in Africa and their adaptation strategies. What are the roles for research? CIAT Working Document No. 21

(iii) User friendly format/easy to understand
(iv) Available within sufficient lead time

Decision influenced by seasonal climate forecast include: selection of crops and varieties, planning allocation of land, use of farm inputs, planting and pests and disease management among others. Although significant developments have occurred in prediction and dissemination of weather and climate forecasts, this information has not yet been utilized adequately and not integrated effectively into agricultural development. This is largely due to the gap between information provision (supply) and users' (demand) of the information. The demand for climate information is diverse, and customization of information products may not match the local activities. On the other hand, inadequate access, mismatch between farmers' needs and the scale, content, format or accuracy of current operational forecasts limit the climate information use[3][4]. On the other hand, the supply of climate information is often constrained by insufficient data and resolution from local meteorological agencies. Climate information generated is often general and the information cannot influence local decisions. More so, the technical language used by the meteorological agencies are not easy to understand especially for small holder farmers. Thus, provision of climate information should be done in a user-friendly format and be tailored to suit the user needs.

While developing weather-based advisories, the following key factors should be considered;
(i) Explain the agricultural significance of the forecast to the users.
(ii) List the possible location specific options that farmers can explore.
(iii) Development of weather-based advisories should be done in collaboration with meteorological experts, research and agricultural extension service providers.
(iv) Establishment of the most convenient and appropriate user interface (UIPs) to share the information products and receive feedback.
(v) It is important to note that the weather-based advisories are not just recommendations but are the options that may be considered by the farmers to reduce the risks of climate variability.
(vi) Training of farmers and other support agents is necessary in understanding climate uncertainties.

Zambia pre-season advisory

About this advisory

This advisory was developed on 20th November by a team of scientists from Zambia Agricultural Research Institute (ZARI), Zambia Meteorological Department (ZMD), officials from the Ministry of Agriculture and International Crops Research Institute for the Semi-Arid Tropics (ICRISAT). Due consideration was also given to farmers' preferences and views on the adoptability and usefulness of these management practices. This advisory presents the potential options for 2022/2023 growing season.

This advisory is mainly aimed at supporting the farm level decision making in Eastern, Central and Lusaka Provinces in planning agricultural activities for the 2022/23 rainfall season. Application of this advisory to other areas will depend on similarities in soil and climatic conditions of such places as those in the three provinces mentioned above.

[3] Phillips, J.G. 2003. Determinants of forecast use among communal farmers in Zimbabwe. In: Coping with climate variability (Vogel, C., and O'Brien K. eds): The use of seasonal climate forecasts in Southern Africa. Ashgate, Burlington VT. pg 110-128.
[4] Ziervogel, G. 2004. Targeting seasonal climate forecasts for integration into household level decisions: the case of small farmers in Lesotho. *Geography Journal 170*:6–21.

Outlook for the 2022/23 rainfall season

The seasonal climate forecast from Zambia Meteorological Department (ZMD) and other agencies indicates a high possibility of getting above-normal rainfall. This is partly due to La Nina conditions in the Pacific. In such years we can expect more than 800 mm rainfall in Eastern, Central and Lusaka Provinces which is 10-20% higher compared to the non-La Nina years during the period from December to March.

Agricultural implications of forecast

- In these types of seasons, early planting is preferred. Prepare the land in advance and plant the crop at the earliest planting opportunity.
- While preparing the land ensure that excess rain drains safely without causing erosion and flooding the field, especially when the fields are flat and are clayey.
- Use the recommended dose of fertilizers keeping an eye on weather forecasts to avoid application during very wet or dry periods.
- Farmers are advised to apply basal dressing fertilizer at planting for vigorous crop emergence and good root development to better exploit water and nutrient resources in the soil. The seasonal forecast issued by ZMD indicates that the expected good seasonal conditions can be better utilized by growing medium-maturing varieties in agro-ecological regions I and II while farmers located in agro-ecological region II are advised to plant medium and late-maturing varieties. Among the other problems that can be expected during this type of season are high weed growth and the incidence of pests and diseases. Therefore, farmers are further advised to be alert of pest and disease outbreaks and report unusual strange insects or diseases on crops to their nearest Agricultural Office.
- Considering the good rainfall potential, it is suggested to grow an intercrop. Pigeonpea is a good choice since it is slow growing, deep rooted with little competition with main crop. Besides providing protein-rich grain, it contributes to improving soil fertility. The sticks can be used as fuelwood.

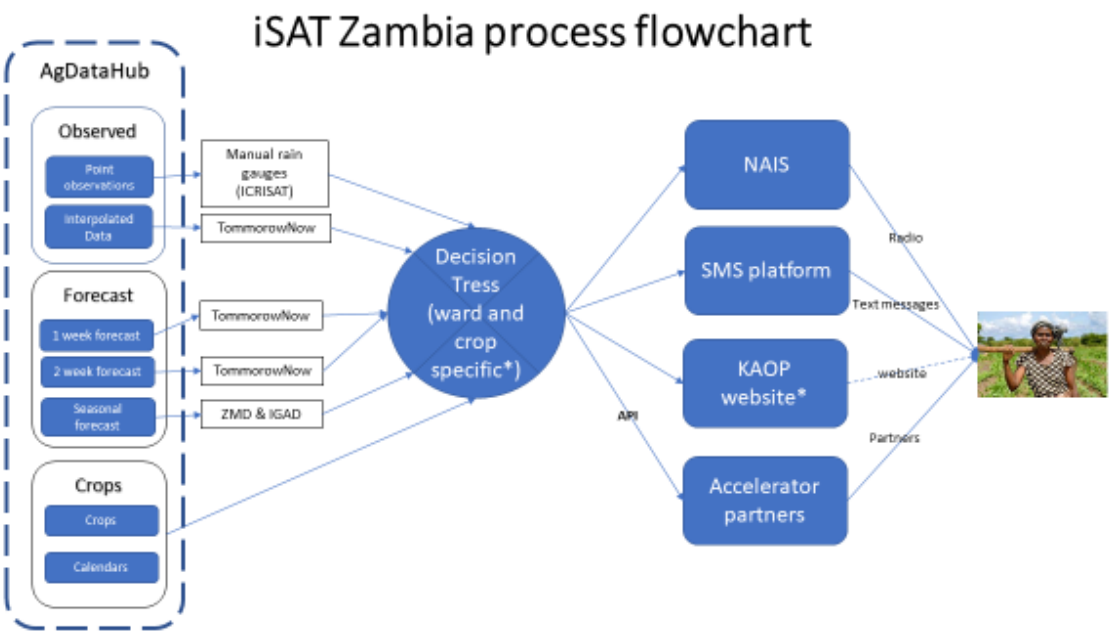


Figure 1: iSAT Zambia process flowchart

(iii) Establishment of demonstration farms by COMACO

COMACO in partnership with Farmer Federation and ICRISAT are implementing demonstration plots with the overall aim to showcase the best options for the management of maize, groundnut and soybean under the agroforestry alley cropping system using *Gliricidia sepium* as climate-smart agriculture technologies and

practices. Climate-smart agriculture (CSA) is an integrated approach to managing landscapes—cropland, livestock, forests, and fisheries - it addresses the interlinked challenges of food security and climate change. The demonstration fields consist of integrated plots where farmers have an opportunity to practice a number of CSA interventions including composting, minimum tillage, planting and management of Gliricidia and its biomass application, crop residue management and crop rotation among others. These technologies and management practices help increase crop productivity and improve the resilience of the production systems thereby reducing the vulnerability of households to the negative impacts of climate change and therefore improving food security and nutrition.

Full protocol that guides implementation of demonstration plots is appended here

Protocol for on-farm demonstration plots r

Governance mechanisms and stakeholder engagement to host Agdatahub

AICCRA organized a number of meetings with stakeholders with the following aims to identify key champions, roles and responsibilities and how these could lead to co-designing of the Agdatahub. AICCRA Zambia also engaged AGRICOM to create awareness about the need for strong partnerships in co-developing and co-creating Agdatahub. Key outputs of these engagements include: (i) identification of Government Departments and Ministries to contribute data to Agdatahub (ii) identification of Secretariat and host of the Agdatahub (iii) development of draft letters of agreement for Smart Zambia to host the Agdatahub

Smart Zambia and ICRISAT Agreement.pd

(iv) drafting of Terms of Reference for Ministry of Agriculture to be Secretariat of the Agdatahub

ToRs of MoA to coordinate operationa

The following sections describe the various engagements of hosting Agdatahub in Zambia.

(a) Identifying stakeholders

A meeting was organized with stakeholders in Zambia on 7 March 2022, Latitude 13, Lusaka, Zambia, with the aim to identify key champions, roles and responsibilities and how these could lead to co-designing of the Agdatahub. The meeting was attended by 11 participants (9 males and 2 females) (See Figure 1). The meeting noted that the AgDataHub will build upon already existing work on collating information from various projects that have already started working on similar work. One of the concerns is that although there is good information in Zambia, however the issue is that most farmers do not have access to the information. The group was informed that the following channels could be the most effective to be utilised by AICCRA

- Radio (local languages)
- Web based (iSAT, SMS, USSD etc)
- Shamba Shape Up (radio and TV)
- Disaster Community Champions (Lead farmers within the communities)

The team noted that there has to be a 2-way communication channel for the information to be effective.

Figure 2: The meeting proceedings

Ag Data Hub data sources

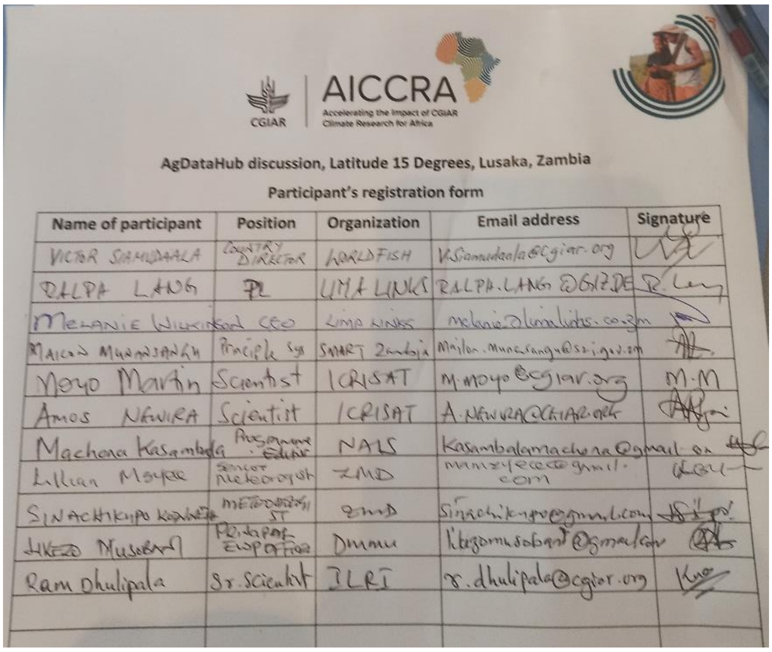
To map out who could really provide the AgDataHub with data, we requested for key stakeholders in providing data and the following were indicated to be the major sources;

- Zambia Statistical Agency-contact the Interim Statistician General
- ZARI for crop yields
- Smart Zambia Institute
- Lima Links-market data
- World Fish and Department of Fisheries
- Agrometeorological bulletins (have combined ZMD and Ministry of Agriculture data)

In terms of the Maproom, the meeting was informed by ZMD that there are 102 automated weather stations contributing data. However, the meeting was also informed that the Maproom only has historical data and is yet to have forecast data.

Potential activities and way forward

- SMART Zambia agreed that the AgDataHub will eventually be hosted by them. For now, it will be hosted on the cloud. It is government policy that SMART Zambia provides ICT services for all government related programmes.
- DDMU to capture information on disasters. A mobile app to be developed and deployed from the field and hosted on the AgDataHub.
- ZIAMIS to work with them to ingest data and get it on the AgDataHub (no mobile app needed to design a mobile app as data is already being collected via tablets).
- LimaLinks to get forecast information from ZMD for dissemination
- Department of Fisheries already collecting data and to be assisted
- NAIS to get video content and the AgDataHub will be used to create space for this content.
- ZMD already creating a bulletin forecast, so an interface will be created so that the bulletin can be uploaded onto the AgDataHub. Also add in some analytics forecasts to be added onto the AgDataHub.
- ICRISAT to identify crops and create tables into the weather analytics dashboard. ICRISAT to also develop the decision trees (through identification of crops and locations). This will be validated and endorsed through collaboration with Ministry of Agriculture. Once the decision trees are ready, we will set up iSAT and this will be linked up with the already existing LimaLinks platform
- World Fish to work on the decision tress for aquaculture.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Accelerating the Impact of CGIAR Climate Research for Africa

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AgDataHub discussion, Latitude 15 Degrees, Lusaka, Zambia

Participant's registration form

Name of participant	Position	Organization	Email address	Signature
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Figure 3: List of Participants

(b) Awareness raising of the Adgatahub through AGRICOM

AICCRA Zambia engaged AGRICOM to create awareness about the need for strong partnerships in co-developing and co-creating Agdatahub. This was informed by the existing challenge of data and knowledge sharing between and among Government Departments and Ministries. Experience shows that there is limited interaction among Government Departments and Ministries leading to duplication of effort and wastage of resources and time and in some instances undermining the benefits of complementarities. Lack of interaction means limited scope to share and harmonize data that is sitting in various Ministries and Departments to benefit end users. Therefore, this gap in terms of data sharing and absence of data linkages/integration calls for the need to develop, Agdatahub to facilitate data access, sharing and analysis and make knowledge-based informed decision making. This builds on the data that is already available in different Government Ministries and Departments to develop a framework that can link and harmonize those datasets to benefit from the analysis using the tools embedded in the Agdatahub. AICCRA Zambia organized a series of internal meetings between SMART Zambia and other Government Ministries and Departments to elucidate the needs and data requirements and partnerships for creating and sustaining Agdatahub establishment as well as enabling environment for data access and sharing. These gatherings ensued formation of advisory and technical teams from different organizations to discuss the objectives and plans to develop Agdatahub and co-create guiding framework for its implementation. Some of the issues discussed included the following: (i) infrastructure (both hardware and software) (ii) human capacity (assessment of skill sets and gaps) (iii) partnership and governance and (iv) data quality and standard. Subsequent advisory and technical meetings will continue to document data availability from Government Ministries and Departments and in what formats as well as establish existing platforms/data centers and databases of data sharing and build on the previous experience than starting from scratch. In the end for policy and governance, there will be need to engage high-level government officials from different ministries and departments to provide guidance and direction. There is also need to define a set of activities to be pursued in sequential order to be used as overarching guidance for Agdatahub development.

AgdataHub will bring together the data eco-system necessary to support blending of climate science and agriculture through technology and partnerships. It will be co-created and co-innovated with end users, agricultural technology companies and agribusiness together with all value chain actors. It will be hosted by Zambia Integrated Agricultural Management Information Systems (ZIAMIS) housed by Smart Zambia Institute (SZI) under the Office of the President. The work is based on successful research in other countries

e.g. ICRISAT in India. Smart Zambia Institute (SZI) have been running ZIAMIS for quite a long time and realigning it to new Government Republic of Zambia mandate.

The main objective of the AgdataHub will be to develop and disseminate CIS and agro-advisories to farmers. It is envisaged that the hub will be valuable to a number of stakeholders and end users. AgdataHub consolidates information from multiple players, processes into format to be shared with target end users. Main players to provide data for the AgdataHub include Zambia Statistical Agency, Smart Zambia, ZARI, Department of Fisheries, ZMD and DMMU among others. Once the data is processed, its output will be shared with intermediaries (accelerator partners such as Limalinks, Agova, COMACO, etc) using a webportal where they will be able to tap and adapt it to the local languages and shared with end users/farmers. A number of channels can be used to broadcast such messages to farmers such as SMS, radio, mobile apps etc. Our primary audience are the high-level stakeholders, farmer facing organizations etc. for corporate buy in, contribute data and validation of messages coming out of Agdatahub as well as ownership beyond the lifetime of AICCRA.

Government Ministries and Departments will benefit from AgdataHub through information for better planning in case of disasters, better penetration into hard-to-reach places, access new ICT to disseminate information more effectively in preparedness of the forecasted weather. Accelerator partners and farmers will be the secondary intermediaries and will benefit from access to business networks, improved productivity and profits through receipt of real time data, better market information on when, what and where to sell. The AgdataHub is expected to complement the gaps in extension systems.

The messages from decision trees are organized in a manner to empower farmers to make informed decisions in planning of farm operations (selection of crops and varieties, investment decisions). The output of the AgdataHub will allow extension services to plan technical and market messages while managing emerging challenges within seasons. The weather forecast will also allow input suppliers to better target and plan delivery of inputs and information. The most benefit will be for the Government Ministries and Departments to plan better and have more robust extension system. Farmers will make informed decisions instead of being prescribed. Input sellers will be better informed on geographical and seasonal demand for inputs. The readers should use this communication for better planning and preparedness, across the board, with accurate scientific information, leading to reduced costs for addressing seasonal and disaster response.

Also the information will be important for better business decisions, with government and research backed up projections for seasonal and disaster planning

Stakeholder buy in: ZIAMIS, Smart Zambia should understand the importance of the Agdatahub and take a leading role in organizing meetings with all other policy makers. Smart Zambia will also be responsible for collating data from Government Ministries and Departments for use in the Agdatahub. AGRICOM put Newspaper advert in the Zambia Daily Mail of 25 July 2022 on the thinking behind the Agdatahub, how different stakeholders can benefit from it

Daily Mail Zambia.pdf

Acknowledgement

The Accelerating Impact of CGIAR Climate Research for Africa (AICCRA) project is supported by a grant from the International Development Association (IDA) of the World Bank. IDA helps the world's poorest countries by providing grants and low to zero-interest loans for projects and programs that boost economic growth, reduce poverty, and improve poor people's lives. IDA is one of the largest sources of assistance for the world's 76 poorest countries, 39 of which are in Africa. Annual IDA commitments have averaged about $21 billion over circa 2017-2020, with approximately 61 percent going to Africa.

Appendix 1. Names of organizations identified to contribute data to the Agdatahub

Stakeholders	Importance	Contributions
Ministry of Agriculture	High priority	• Crop forecast, crop data, with ZamStats • Agronomic data • Geospatial data • Land use data • Soil data • Maintain farmers register, contacts for targeting • Secretariat
Ministry of fisheries & livestock	High priority	• Livestock population data • Livestock productivity, production data • Consumption data • Farmer register • Extension services • Secretariat
Smart Zambia Institute	High priority	• Connectivity, infrastructure (house is there, but not enough) • Software • Storage procurement • Human resources (idle personal)
Ministry of Green Economy	High priority	• Mandate holders • Climate data, mostly digitized • Expertise • Secretariat
ZMD	High priority	• Forecast, connecting the dots • Real time data • EWS • Host the website • Expertise • Existing platforms
DMMU	High priority	• Disasters • Nr people affected (floods, droughts) • Gender disaggregated data to inform response • Agricultural damage
Ministry of Water / WARMA	High priority	• Hydrological information • Water quality • EWS – river flooding data
Zamstat	High priority	• Human population data • Market price information
Farmers unions	High priority	• Part of the conversation, design specification, ensure inclusiveness • Farmers that validate relevance of information
AICCRA	High priority	• Prototype of the system • Expertise • Platforms & Capacity building • Development of knowledge products • Resources

		• Links to private sector, MSMEs for scaling CIS