

## Catalyzing the use of climate information in agriculture decision-making through datahubs

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### Introduction

Climate variability and adverse weather conditions have emerged as vital and pertinent risks to agricultural production and livelihoods. Nowhere are these risks more heightened than in the semi-arid tropics of the world, which are home to about 2.5 billion people, including some 644 million of the world's poorest population (Gitz et al. 2016; Woldearegay et al. 2018). There is emerging evidence which suggests that the provisioning of climate information services (CIS) can help decision-makers, value chain actors and farmers cope with climate- and weather-induced risks (Carr et al. 2018; Simelton and Le 2018). Location and context-specific climate information services that are data-driven have the potential to significantly enhance the ability of smallholder farmers to respond to the uncertainties of highly variable climates. Pilot studies across the world have established the value and usefulness of climate information. For example, the analysis of historical data and short-term, medium-term or seasonal forecasts assist in planning and conducting farm operations with reduced risk and improved profitability (Tall et al. 2018, 2014). While insights from analysis of historical climate data serve as a

basis for better interpretation and use of current observations, climate and weather forecasts support tactical decision-making with due consideration to the expected conditions over timeframes ranging from a few days to an entire season. Improving accessibility and timeliness of weather and market information dissemination can help farmers adapt their management to climate change impacts and build their resilience (Simon et al. 2021).

### Climate information services

Agricultural-based decision-making spans multiple administrative levels from the national, sub-national, regional and sub-regional to village/farm levels. While policymakers engage in decisions which influence agriculture production processes, value chains, incomes and outputs at national, sub-national and regional levels, extensionists/district agricultural officers engage in more tactical and operational decision-making at district/sub-district levels. Farmers make key decisions relevant to their farms, a combination of pre-season

planning through to in-season tactical decision-making. Climate science and data can offer critical inputs to decision makers at all administrative levels and at different timescales (climate to weather scale). One of the challenges, however, has been the creation and operationalization of climate information service tools and systems that can package climate and weather data to support varied information and decision support needs of all concerned stakeholders. Further, such climate information service (CIS) tools should work harmoniously with innovative e-extension and farmer engagement platforms to ensure broader reach and adoption.

## **CIS data value chain**

The institutional and human capabilities needed to produce CIS relevant to farmers and other actors in the agricultural value chain are distributed across multiple institutions and span different scientific disciplines. Translating meteorological data, information and insights into an actionable and localized advisory for farmers calls for a multi-disciplinary approach (Ahmad et al. 2017). The process or workflow begins with the production of climate and weather data, measurement and translation to an agriculture advisory through to dissemination. It resembles a value chain where the final advisory received by a farmer has inputs from all actors upstream in the CIS value chain. Further, visualizing and analysing CIS production and the dissemination workflow in the form of a value chain helps to increase understanding of the institutions, people and process linkages that enable the functioning of the CIS value chain. The value chain analysis also helps identify missing links (information, data, institutional) required to configure the value chain to produce contextualized and crop-specific advisories tailored to the location-specific weather and climate information.

In Senegal, the National Agency of Civil Aviation and Meteorology/*Agence Nationale de l'Aviation Civile et de la Météorologie* (ANACIM) is the national civil aviation authority as well as the country's meteorological organization (NMO). ANACIM is

responsible for managing and maintaining climate data and measurements, generating weather forecasts like nowcasts, short-, medium- and long-range forecasts, plus seasonal forecasts. ANACIM is responsible for producing this data and information, as well as maintaining these at a national, regional and sub-regional levels. Various forecast products of ANACIM are relevant for different sectors of the economy and civil society. In the case of agriculture, there are examples to demonstrate the usefulness of historical climate data, current season observations, and seasonal, sub-seasonal, short- and medium-range forecasts. Apart from catering to decision-making at various spatial scales, such data is also pivotal for the financial services industry (mainly insurance) that can underwrite the climate and weather risks of farmers and other value chain actors.

ANACIM's observation network comprises twenty-five (25) manual weather stations and 100 automated weather stations (AWS). The daily observed data from these stations (manual and automated) is transmitted to ANACIM which is then put through a quality checking process. After this, the data is entered into various information technology (IT) systems, and information and weather forecast products subsequently generated. ANACIM uses IRI's Maprooms for data management as well as to generate forecast and weather data products. To improve the use of climate and weather data in agricultural decision-making, ANACIM created an institutional framework in the 1990s, dubbed *Groupe de Travail Pluridisciplinaire* (GTP) which in English translates to 'multi-disciplinary working groups'. The primary aim of these groups is to engage relevant institutions at the administrative level of a department to monitor climate conditions, translate weather and climate information into advisories, and communicate this information. Since 2011, ANACIM and the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) have established 29 GTPs in different departments. Apart from GTPs, Senegal also has strong National Agricultural Research and Extension System (NARES) institutions such as CERAAS, ANCAR and ISRA. While ISRA and CERAAS

(a regional centre of excellence on drought research for WCA) are primarily research institutions, ANCAR is the national agency for agriculture and rural advisory in Senegal. ANCAR has published an android mobile app dubbed Saida, with support from FAO, to disseminate agricultural advisories. The NARES institutions also contribute to agricultural advisory and extension services through partnerships with various farmer as well as producer organizations. Figure 1 below depicts the CIS data value chain and represents the role of all public and private sector institutions that connect farmers to science-informed advisories.

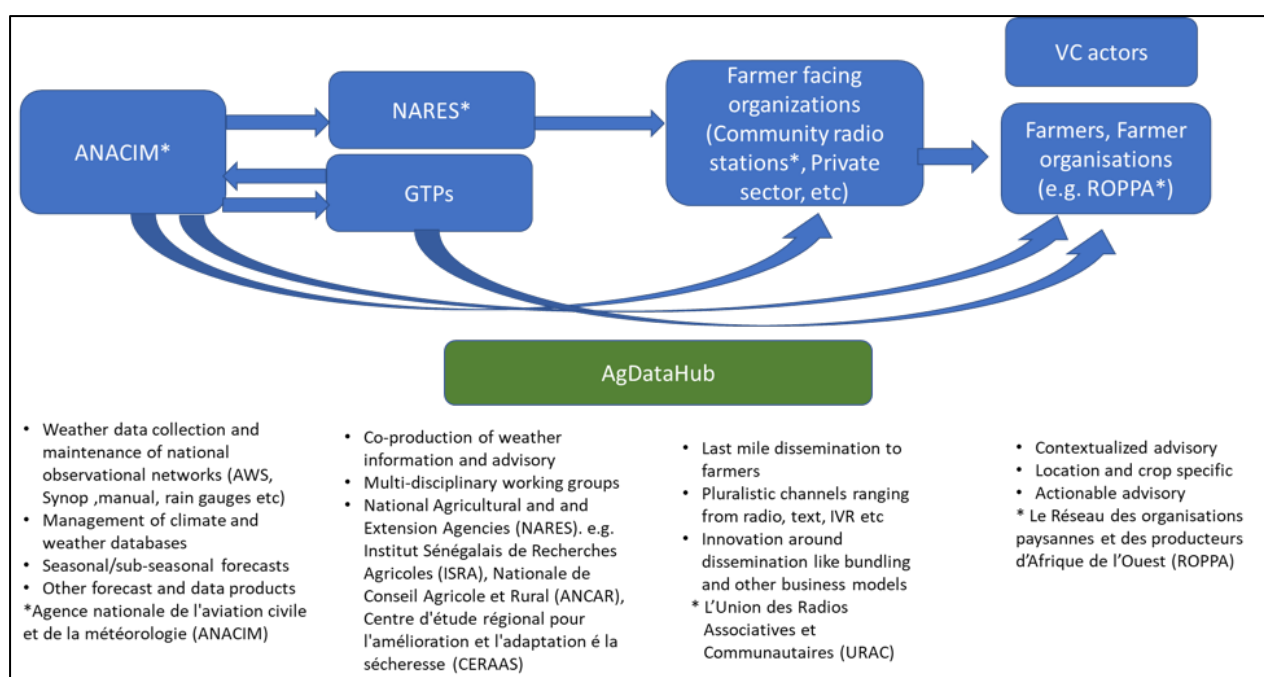
## AgDataHub

The AgDataHub platform is a digital CIS that aims to create an ecosystem of data and information at a single source to support various actors in the CIS data value chain. The AgDataHub will be accessible through a web browser and will be docked on the GTP portal (<https://gtp.cnsc.anacim.sn/index.html>). As depicted in figure 1, the AgDataHub could support the GTPs, NARES and other farmer-based organizations. In some cases, private sector and other farmer organizations willing to contribute

data from their private networks as well as data collected from the field by human agents can also be aggregated into this platform. Data from the networks of private rain gauges, crop acreage, crop health as well as yields, etc. could make up such datasets. All this data could be useful for agricultural decision-making. The platform is meant to be a national-scale agricultural and climate data hub, and aims to become a digital aid for the integration of climate and weather data which supports agricultural decision-making at various administrative, as well as at the farm level.

It is important to also underscore that the AgDataHub is not a new agricultural data collection or statistical system. Rather, it acts as a brokering platform between the producers and users of data. The AgDataHub, through APIs and other software communication, will connect databases and data collection systems of the agricultural departments, non-governmental organizations (NGOs), agricultural research institutions (ARIs), and statistics departments. The agricultural, weather and climate data entered into the AgDataHub will need to be accessed from the NMOs databases/ systems.

Figure 1: Senegal CIS value chain



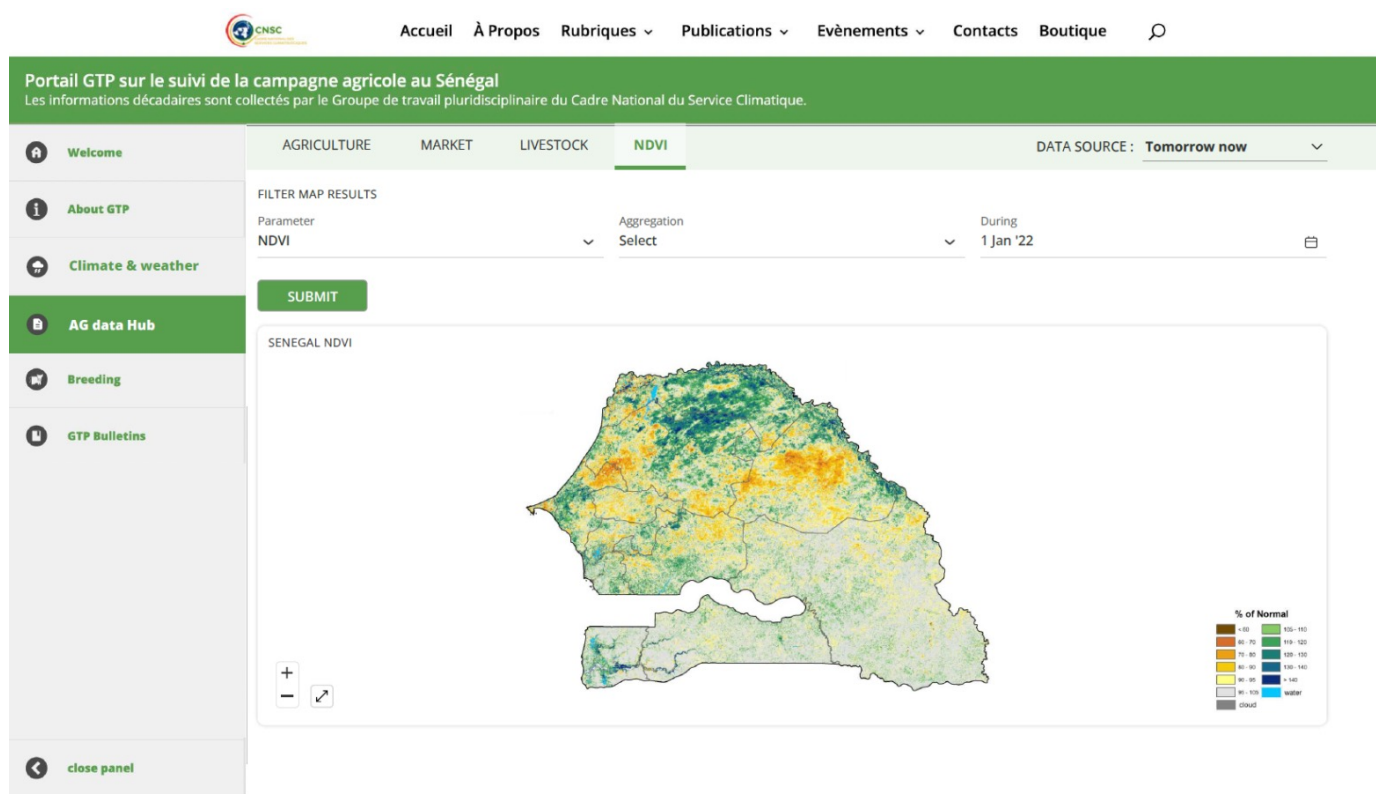
The AgDataHub will also be embedded with a mobile application that can be configured to assist GTPs in data collection (agriculture, livestock, weather, etc.) and management. The platform, through various processing and data visualization methods, will mesh agricultural and allied sector data with climate and weather data to produce dashboards as well as decision support tools catering to the various information needs at different administrative levels and spatio-temporal resolutions. With systemic training on the use of AgDataHub data and dashboards, plus more intentional development and deployment of pilots, this digital CIS platform could result in greater and more consistent use of climate data and science in agricultural decision-making. Through this pathway, AgDataHub will become a means to forge partnerships across the spectrum of public and private sector organizations to enable impactful and transformational CIS at scale.

## How AICCRA supports the Senegalese Meteorological Department

The national AgDataHub functional prototype Minimum Viable Product (MVP) is built on an existing GTP digital portal hosted by ANACIM. It will be integrated into ANACIM's Data Library and gridded climatology, and will incorporate a basic set of new information/visualization products that target agricultural advisories, informed by intermediaries and GTP partners.

The primary users of the AgDataHub are GTPs, NARES as well as farmer-based organizations comprising public, private and not-for-profit entities. The AgDataHub and some of the analytics it offers can also be utilized by senior bureaucrats and policy makers in agriculture, rural development and other allied ministries.

Figure 2: The AgDataHub in the GTP portal



Increasingly, however, Agriculture Advisory Services (AAS) in most countries are beginning to recognize the growing role of the private sector in the provision of advisory services as well as decentralization (Fleming et al. 2021; Ingram 2008; Klerx et al. 2017). The AgDataHub can therefore, also support beginners, especially from the private sector, in the use of climate and weather data. Banks, insurance and financial institutions are another category of users who could utilize AgDataHub to underwrite and quantify agricultural risk on account of weather and adverse climate events. Given the immense benefits of such a hub to a wide range of actors, the system should ideally be anchored and hosted by government institutions. The AgDataHub, when coupled with appropriate capacity-building interventions as well as financial and mentoring support to strategic pilot projects in public-private partnership (PPP), can catalyze the eventual adoption and use of climate science and data in agricultural decision-making. A multi-pronged and holistic approach can prevent the potential of market failures in the case of climate information services.

#### *AgDataHub, an essential legacy for Senegal*

“At the level of the AICCRA project, ANACIM’s main mission is to develop weather-climate products and information for users. However, data is required in the development of weather-climate information. On this basis, the project intervenes to provide ANACIM with all the necessary infrastructure to acquire the data needed to develop these products. AICCRA Senegal has therefore invested to ensure that there is enough data to develop useful products. To do this, a web and android application was developed where all the information necessary for decision-making at the local level is stored. Some of the information stored in this application include agricultural data (examples: variety of species available in project areas, at ISRA or the Ministry of Agriculture, Rural Equipment and Food Sovereignty), and information related to mineral resources, diseases and rural agricultural markets. We are building a wealth of knowledge that will be integrated into an



application, which once available, will allow users to consult this information, cross-reference it and find the correct answers to their needs.”

*Mr Oumar Konte, ANACIM*



Photo 1: Oumar Konte (ANACIM) explains the workings of AgDataHub and its functionalities for local GTPs (credit: AICCRA, 2022).

In addition, he also recognized that as part of the development of this AgDataHub project, the GTPs will play a key role in the reporting and collection of data. He noted that local GTPs will also play a key role in the operationalization and supply of the AgDataHub by collecting and reporting data. Ultimately, it should be remembered that once this application is developed and launched, it will be an important legacy from the AICCRA project for Senegal.

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## About AICCRA INFONOTES

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