

**AICCRA Senegal**  
**Building resilient crop-livestock  
farming systems in Senegal**

NOVEMBER 2022



**AICCRA**  
Accelerating Impacts of CGIAR  
Climate Research for Africa



# The challenge

The Senegalese agricultural and livestock sector is the main economic activity representing approximately 17% of the gross domestic product (GDP) and employing 70% of the population. Around 350,000 families nationwide carry out livestock breeding activities, representing nearly 30% of Senegalese farmers<sup>1</sup>.

Limited agricultural production conditions, characterized by poor soils and weather conditions, limited access to advisory services, and poor-quality agricultural inputs and insufficient infrastructure contribute to Senegal's inability to satisfy its food needs. Consequently, the country depends on food imports<sup>2</sup>.

The effects of climate change, such as rising temperatures (Figure 1) are significant concerns for agricultural producers in Senegal, and projections indicate a +2.0°C warming trend will lead to lower productivity<sup>3</sup>. As a consequence, the expected 30–60% reduction in key crop yields (including sorghum and millet) will put pressure on rural livelihoods while increasing rural poverty and food insecurity, which are reported for all agricultural zones.

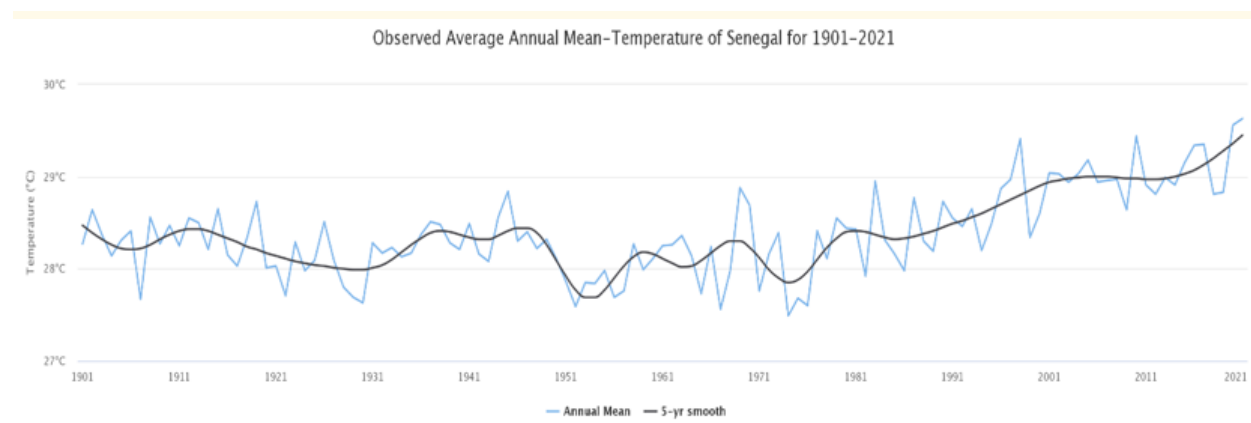


Figure 1: Senegal's climate context for the current climatology, 1991–2020, derived from observed, historical data.

Source: [climateknowledgeportal.worldbank.org](https://climateknowledgeportal.worldbank.org)

Climate-related shocks—such as droughts and floods—affect the ability of households to meet their food requirements and can lead to food insecurity. Aggravating factors have been identified<sup>4</sup> as:

- Over the last 25 years, heavy rainfall and floods occurring during the rainy season (normally between June and August) have become more frequent.
- Areas with high frequency of poor growing seasons are concentrated in the northern parts of Senegal, creating a dependence on livestock over crops in these areas. Moderate frequency in poor growing seasons indicates potential influence of climate on crop production.
- High variability in the start of the rainy season means that farmers with no access to irrigation are highly vulnerable to climatic variability, because they are unable to plan the timing of planting and harvesting crops.

1. CIAT; BFS/USAID. 2016. Climate-Smart Agriculture in Senegal. CSA Country Profiles for Africa Series. International Center for Tropical Agriculture (CIAT); Bureau for Food Security, United States Agency for International Development (BFS/USAID), Washington, D.C. 20 p.

2. Blundo-Canto, G., Andrieu, N., Adam, N.S., Ndiaye, O., and Chiputwa, B. 2021. Scaling weather and climate services for agriculture in Senegal: Evaluating systemic but overlooked effects. Climate Services. 100216, ISSN 2405–8807

3. GMIP West Africa Region - agmiporg

4. Climate risk and food security in Senegal Analysis of climate impacts on food security and livelihoods. Senegalese National Agency for Civil Aviation and Meteorology of Senegal (ANACIM), WFP, Columbia University's International Research Institute for Climate and Society (IRI), CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), Cooperation of the Luxembourg Ministry of Foreign Affairs and the Government of Sweden.

- Dry spell length is another useful indicator of vulnerability to climate. Moderate dry spell length during the growing season (four days) could have implications for crop production, and potentially for food prices. Long dry spells render agriculture unviable (such as in northern Senegal).

At the same time, silvopastoral zones—where trees and forage are integrated with the grazing of livestock for mutually beneficial outcomes—are likely to be most impacted by climatic variability. In the Sudano-Sahelian zone, the impacts indicate an increase in the migration of youth and men from rural areas, a reduction in the biodiversity of woody plants, a shift of some plant species to the rainier south, along with a reduction in forage production.

The agricultural sector contributes approximately 49% of the country's total greenhouse gas (GHG) emissions. Most emissions are associated with enteric fermentation and manure management, agricultural soils, and to a lesser extent, rice cultivation and the burning of crop residues<sup>5</sup>.

According to the World Bank (2020), 38.5 % of the Senegalese population is living in poverty. And malnutrition is still a challenge in Senegal. From 2011 to 2019, the prevalence of stunting decreased from 26% to 17.9%.



Farm demo at Meouane cluster  
Credit: AICCRA Senegal

During the same period, acute malnutrition decreased from 9% to 6% in children under five before rising again to 8.1%.<sup>6</sup>

In terms of nutrition, moderate but chronic malnutrition with deficiencies of micronutrients and protein is common, contributing to relatively high child and maternal mortality rates<sup>7</sup>. Senegal has been ranked 168 out of 189 in the 2019 Gender Inequality Index (GII).

## The opportunity

- Evidence of strong demand among farmers suggests that the provision of locally scaled climate information, through a process that engages rural communities in meaningful dialogues with climate and agricultural experts is needed<sup>8</sup>.
- The agric-tech ecosystem in Senegal provides additional pathways for creating and distributing targeted, context-specific agro-advisories to farmers and key value chain players at scale, through various dissemination pathways that consider language, literacy, demographics, and gender. In addition to efforts by National Agricultural Research and Extension Services (NARES) to use traditional extension services, the private sector is providing services that reach thousands of farmers with digital tools.

5. CIAT; BFS/USAID. 2016. Climate-Smart Agriculture in Senegal. CSA Country Profiles for Africa Series. International Center for Tropical Agriculture (CIAT); Bureau for Food Security, United States Agency for International Development (BFS/USAID), Washington, D.C. 20 p.

6. Nutrition International, Senegal Brief [www.nutritionintl.org/our-work/our-global-projects/africa/senegal-and-sahel/](http://www.nutritionintl.org/our-work/our-global-projects/africa/senegal-and-sahel/)

7. Demographic and Health Survey (DHS)

8. <https://research.reading.ac.uk/PICSA/>

- Through the ‘Climate information services for increased resilience and productivity in Senegal (CINSERE)’ project (USAID-funded 2017–2021), more than 500,000 farmers and fishermen (33% female) have direct access to weather and climate information services (WCIS) via SMS, IVR and USSD to inform their decision-making; 32 multi-disciplinary working groups (MWG’s) were formed; infrastructure was upgraded to include a supercomputer; the private sector was engaged and the meteorological service was strengthened with ACToday-Senegal by the International Research Institute for Climate and Society (IRI) in climate services provision.

## AICCRA’s objectives in Senegal

Building on previous outcomes from the CINSERE project, AICCRA Senegal aims to build multi-actor partnerships of existing scientific and educational networks to achieve outcomes that cannot be achieved easily—if at all—by engaging with individual partners at country level.

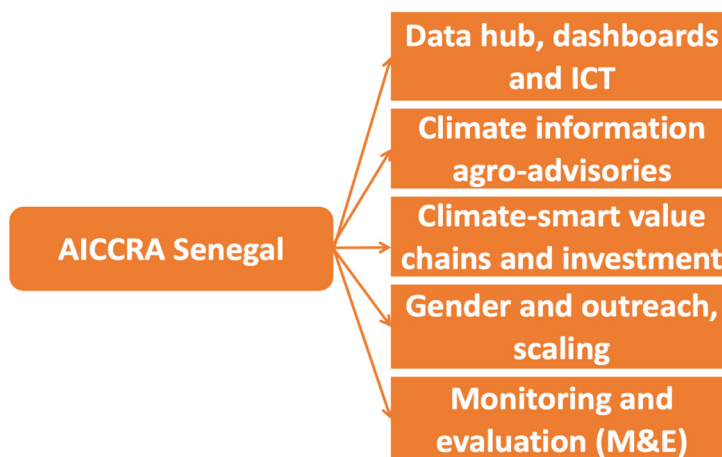


Figure 2: Main activities of AICCRA Senegal.

This project specifically aims to build the capacity of regional public institutions e.g., the Centre Régional d’Excellence sur les céréales sèches et cultures associées de l’Institut Sénégalais de Recherches Agricoles (CERAAS/ISRA), the Agence Nationale de l’Aviation Civile et de la Météorologie (ANACIM), a the National Agency for Agricultural and Rural Council ANCAR, and private enterprises (e.g., input providers, ICT companies, media) to develop delivery models for climate services and for climate-smart agriculture (CSA) through knowledge, approaches and tools that support effective intra-regional and South-South adoption in various value chains.

**AICCRA Senegal aims to benefit over 275,000 farmers and value chain players with climate-informed agro-advisories and new CSA packages and technologies.** It has generated training products and set up agritech innovation platforms for sustained regional promotion of climate services and climate-smart agriculture.

## Systemic development programs for small producers

- Based on the food crop production pattern in Senegal , AICCRA has identified five (5) priority value chains, namely groundnuts, millet, cowpeas, meat and dairy on which the project focuses. This allows the diversification of livelihoods and greater climate risks resilience. In our approach, the economic, social, and ecological dimensions of sustainability are all interdependent and considered equally important outcomes.
- We acknowledge the multiple interrelated needs and risks affecting small producers' livelihoods, and follow a multi-sectoral approach that combines agricultural value chain development with (for example) climate risk mitigation and adaption.
- Reflecting our understanding of the literacy levels and access to information of vulnerable (male and female) rural populations—including (agro) pastoralists—we use targeted capacity building and awareness creation methodologies. This includes the use of radio, social media and culture/religion-based social structures.
- We work to enable lasting, private sector-led economic growth by assigning a key role to (women and/or youth-led) micro and small enterprises active in value addition and the provision of products and services to rural populations.
- We bring an integrated approach to applied research in private sector led development efforts, including automatic tools for forecasting, and methodologies like farm-based demonstrations, farmer field schools, and practical extension services.

# Climate-smart agriculture in Senegal

## Regions

Our primary focus is on three regions, namely Thies, representing the old peanut basin zone; Kaffrine, representing the new peanut basin zone; and Louga representing a transition zone between agriculture and pastoralism.

These focal regions have been selected for direct intervention and engagement with partners and farmers using the existing national agencies' networks (esp. ANCAR and CERAAS) and the private sector (e.g. Jokalante). In future years (2023) and phases of the project, these regions will be expanded by adding the Eastern Senegal zone, namely Tambacounda, which is a government priority region.

Within these regions, selected clusters consist of several villages within a 20 km radius of the central villages and represent some 10,700 farmers within each cluster. Within a cluster, six villages have been selected for direct interventions and represent approximately 700 farmers/village.

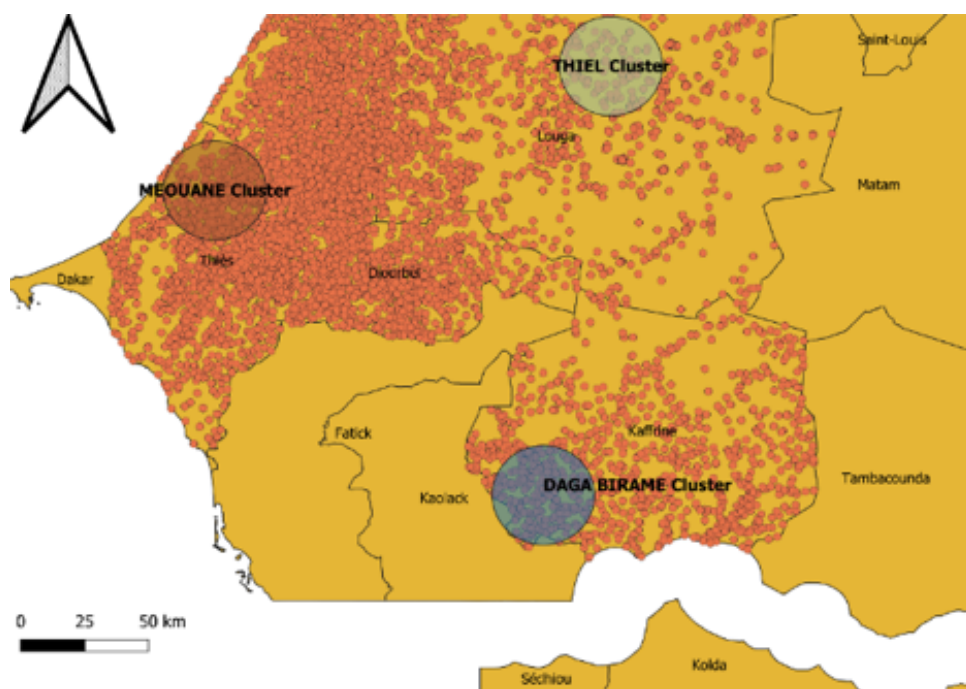


Figure 3. Three clusters of AICCRA intervention in 2022.

# Key characteristics of target areas

- Agriculture is the predominant activity in the study area. Households devote most of their time to it (72%) and derive most of their income from it (67%).
- Livestock breeding is the second most common activity practiced, which is the primary source of income for more than 21% of households.
- The main products grown in the survey areas are millet, peanuts, cowpea and maize. Millet and peanuts are grown by more than 90% of farmers. Half of the producers grow cowpeas. Maize is also a significant crop. It was grown by 46% of producers during the 2021 rainy season.
- Men in households are better represented throughout the production process, with a participation rate generally above 90%. Women make a contribution of 15% to 16% for the preparation of the land; 22% to 28% for sowing, 37% to 42% for weeding; 41% to 55% for harvesting and 49% to 55% for shelling.
- Average yields are very low for all intervention households at 339 kg/ha for millet, 360 kg/ha for groundnut and 597 kg/ha for cowpea.
- About 90% of the sample population have heard of climate change and recognize that it is a reality, while 87% understand what climate change means. Of all perceived effects, scarcity of water has led to a drop in production yields, a loss of income from agriculture, a drop in the quality of agricultural products, an early interruption of the rainy season. There is also more conflict between farmers and livestock breeders, a decline in the quality of fodder for animals, and an increase in bovine diseases.
- More than 8 out of 10 producers have access to climate information. There are many channels for receiving climate information, the most widespread of which is radio, through which more than 85% of households' access information.

# Selected innovations promoted

a.



b.



Photo 2:

a. Automatic weather station

b. Technology parks at Daga Birame (2022)

Overall, AICCRA Senegal focuses on the following areas:

- Providing technical advisory to farmers on improved millet, groundnut and cowpea seeds and farm inputs
- Soil fertility management
- Pest and disease management (pest alerts, safe use of agrochemicals),
- Crop production techniques (site selection, land preparation, planting, weeding, water harvesting, good agronomy etc.),
- Incorporation of climate information (onset of rains, cessation of rains, dry spells, amount of rains expected, daily/ weekly forecast, temperature, etc.) into climate informed agro-advisories.
- Livestock production (dairy and meat).

**Table 1 | Breakdown and specific details of proposed CSA/climate information services (CIS) innovation technologies for each value chain selected for pilot activities.**

Value chain	CSA/CIS innovations/technologies
<b>Millet</b>	At Daga Birame: drought and disease-tolerant varieties ICMH177111 and dual-purpose millet Thialack 2, SL 28, SL 169 vs traditional millet Souna 3
<b>Groundnut</b>	Thiel and Daga Birame clusters: Rafeet Caar; 73–33; Fleur 11 and Komkom Meouane cluster :78–936; 55–437; Raw Gadu, Jaambar
<b>Cowpea</b>	For all the clusters: short duration and dual-purpose cowpea varieties (Sam, Kelle, Leona, Lizard and Thieye)
<b>Milk</b>	In Thiel and Méouane: feed conservation and feeding strategies
<b>Meat</b>	Thiel, Meouane and Daga Birame: feed conservation and feeding strategies

Another key pillar of AICCRA Senegal is an integrated AgDataHub that supports extension organizations (public and private), farmer-facing organizations and other entities engaged in creating agro-advisory content for farmers. The AgDataHub aggregates key agriculture and allied sector data with weather and climate data on a single platform. It further harmonizes all these different datasets to match the spatial and temporal resolutions of these different datasets to match the administrative hierarchies and needs of the user organizations.

The AgDataHub is to be a national-scale agriculture and climate platform that becomes a digital aid for the integration of climate and weather data into agriculture decision-making at various administrative and farm levels.

The AgDataHub also features the innovation called intelligent Systems Advisory Tool (iSAT) which, through a decision tree algorithm, automates the generation of crop and location specific advisories at village or cluster level based on weather inputs.

The iSAT application has interfaces to access the needed weather data inputs through automated programming interfaces (APIs) and, therefore, further minimizes the need for manual inputs. The iSAT, therefore, overcomes one of the biggest challenges in providing context-specific CIS which is the need for expert manpower to create crop and location-specific advisories.





Photo 3: Gender Acceleration Program launching in August 2022.



Photo 4: Dr Aliou faye (CERAAS) and Babacar Seck (Jokalante) appreciating millet panicles on demo plots in Daga Biram cluster.

# Where we are now

AICCRA focuses on the drylands crop-livestock systems in three regions (Kaffrine, Louga and Thiel) with NARES (ANACIM, ANCAR, CERAAS-ISRA) and the private sector (Jokolante, URAC-radios) supported by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), the Alliance of Bioversity and International Center for Tropical Agriculture (CIAT) and the International Research Institute for Climate and Society (IRI).

After little over a year of project implementation, the following has been achieved:

## 1. Progress in developing ag datahubs, higher resolution CIS, and building capacity in users and communication

- Senegal's ANACIM meteorological agency established and host the datahub via at 'GTP' multi-disciplinary working group portal.
- A working prototype of the AgDataHub for data and analytics has been built and negotiated with partners ([AICCRA Dashboard](#)). New look of GTP mockups have been co-created with ANACIM.
- ANACIM's ability to deliver higher resolution has been supported by capacity development from IRI, with accurate seasonal climate information (PyCPT) and forecasts via 'Maprooms' portals ([ANACIM Maproom](#))
- Development of a national working group for curriculum development of climate risk information for training in universities and extension agencies supported by IRI.

## 2. Demonstrating and promoting CSA linked to climate information

- A workshop was delivered and another planned for next planned in October on national processes for participatory prioritization of focus value chains for dryland target region (millet, groundnut, cowpea, dairy and meat)
- For technology parks were created (three in partnership with CERAAS and one with ANCAR) and 128 farmer-led demonstrations (108 with CERAAS and 20 with ANCAR), farmer field schools (12 installed, 307 lead farmers trained/104 women participation) in four focus regions for engagement of surrounding areas.
- Established a technology park at Meouane for livestock feeding and One Health practices
- Piloted the iSAT context-specific, climate informed agro-advisory tool for three regions  
Access iSAT here: <http://3.7.221.73/login/> (username: isat\_global; password: icris@t2021).
- Training of trainers with 30 lead extension agents facilitated the dissemination of CSA and CIS
- 32 systems agronomists from six west African countries received training course at CERAAS where they analysed and modelled climate risk in collaboration with VW and Leibniz-Centre for Agricultural Landscape Research (ZALF) Germany.

districts, the initiative develops radio program content sourced from project partners for effectively communicating content considering language, literacy, demographics and gender.

### 3. Reaching our target of 275,000 farmers in 2022 with CIS content via radio, private sector ICT and traditional extension networks

- During the wet season (July-Sept 2022), four radio stations in the focus regions broadcast a total of 60 programs on CSA and CIS, **reaching 328,104 listeners**. Impact surveys will follow. Program content is being developed to better target women and youth.
- AICCRA is supporting content upgrades of CIS within the SAIDA app (Food and Agriculture Organization of the United Nations (FAO) tool for Senegal administered by ANCAR) with a potential national reach of 84 000 producers.
- AICCRA cereal value chains are integrated into the SAIDA platform (**2049** farmers trained /752 women participated).
- Piloting, and disseminating targeted, weekly context-specific climate-informed crop based advisories using IVR (**18,994** voice messages in local languages-Wolof, Pula) to **2720** (23.5% women-led farms) registered users via agri-tech company (Jokolante).

### 4. Prioritizing CSA interventions and innovating with the private sector

- Launch of the **Gender Smart Accelerator challenge** with 50 women-led enterprises selected to engage in business development, matchmaking, domain knowledge exchange, and with access to capital seed grants (launched 26 September 2022).
- Stakeholder engagements (4) across the agriculture and livestock sectors to build entry points within value chains and inventories of relevant CSA technologies related to the focus value chains.

## Partnership

AICCRA builds on a rich legacy of partnerships and cooperation which has enhanced capacity in the national meteorological agency (ANACIM) and developed a fledgling private sector which is building business models for the delivery of inputs, advice and credit. While this previous work was across all sectors and agro-ecologies of Senegal, the AICCRA Senegal project focuses on 'dryland' agriculture, and the mixed crop-livestock systems and has strategically partnered with the ISRA Centre of Excellence for Dry Cereals at CERAAS, and the national extension agency ANCAR, in addition to ANACIM. Via this three-way partnership, for the first time these national agencies have a national mandate for climate (ANACIM), extension (ANCAR) and agronomic and crop research (CERAAS) and work together to develop integrated climate information services and CSA. An additional partnership with agri-tech companies and a community radio union (URAC) have been secured to reach audiences at scale.

### Union des Radios Communautaires du Sénégal (URAC)

Partnering with URAC, AICCRA is equipping radio stations to deliver climate information that has proved an effective and low-cost way to respond to demand, providing substantial access to local farmers. This work spans across all 14 administrative regions of Senegal and operates in local languages, utilizing an interactive format to engage listeners. Focused on target districts, the initiative develops radio program content sourced from project partners, to effectively communicating content considering language, literacy, demographics and gender.



Accelerating Impacts of CGIAR Climate Research for Africa (AICCRA) is a project that helps deliver a climate-smart African future driven by science and innovation in agriculture. It is led by the Alliance of Bioversity International and CIAT and supported by a grant from the International Development Association (IDA) of the World Bank.

Explore our work at [aiccra.cgiar.org](http://aiccra.cgiar.org)

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