

Local Community Network, Réseau Local or Radio: A Decentralised, Autonomous Infrastructure for Climate Change Adaptation in Rural West Africa

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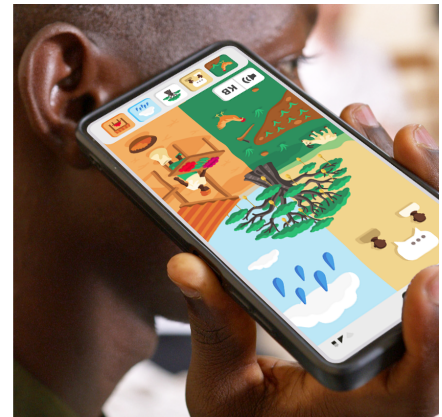
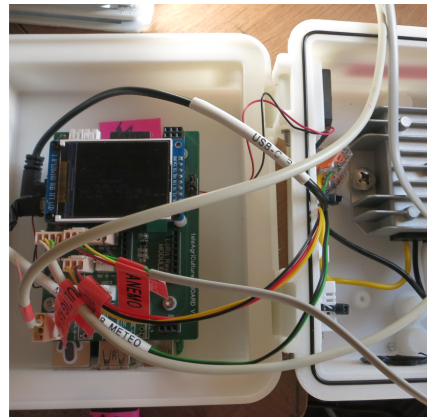


Figure 1: Details of the Demonstrator: (a) Weather sensing components, (b) Protective case with computing unit, (c) Digital Interface.

Abstract

The Local Community Network (LCN) is a decentralised, solar-powered infrastructure co-designed with rural farming communities in Togo to support local climate change adaptation. Operating as an autonomous, offline-first system, the LCN provides access to weather data, a community forum, a digital marketplace, and

an audio-based repository of agricultural knowledge. The demonstrator invites participants to explore how environmental data can be translated into accessible, actionable knowledge within low-literacy contexts. By interacting with the system through visual and audio-based interfaces, participants experience how locally deployed infrastructure supports the interpretation and application of climate information in everyday agricultural practices. This work contributes a real-world, field-deployed multimodal and decentralised system that bridges scientific and situated knowledge practices.



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CCS Concepts

• **Hardware** → **Networking hardware**; • **Human-centered computing** → **Accessibility design and evaluation methods**.

Keywords

community networks, low literacy, participatory design, climate adaptation, rural West Africa

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1 Introduction

This demo presents the *Local Community Network (LCN)*, a decentralised infrastructure co-designed with students from the University of Kara and rural farmer communities in Togo, who refer to it as *our radio*. We contribute a field-deployed system that bridges academic and local knowledge about agricultural adaptation to climate change. It deploys a graphical and audio-based interface tailored to low-literacy contexts informed by local cultural semiotics [1, 2, 12]. The LCN enables farmers to access relevant information to adapt their cultivation practices [6]. Through iterative co-design sessions, we identified the need for a locally operable infrastructure that enables communities to interpret scientific and meteorological data and translate it into actionable knowledge [5, 9–11]. The result is the decentralised, solar-powered LCN, built to overcome limited access to electricity and the Internet [3, 4, 7, 8].

2 Local Community Network

Users interact with the system using their smartphones to connect to the LCN over Wi-Fi, navigate the interface, and explore how local knowledge and data become accessible and applicable. The application's home screen is subdivided into four sections (Figure 1(c)). Users can explore live weather data translated into visual metaphors, receive recommendations for agricultural practices in the local Kabiye language and French, share text, photos or audio recordings in the forum, and see product requests on the market-place. Auditory guidance for interactions is provided in Kabiye and French.

The LCN's hardware is designed for robustness and long-term deployment in low-infrastructure and high-temperature environments (see Figure 1(a)). Weather sensing components are housed in a 3D-printed Stevenson screen (Figure 1(a)), mounted on a pole. The computing and networking unit is mounted in a protective case (Figure 1(b)) below. The system operates without internet access and is powered entirely off-grid using solar power. It provides access through a captive portal to a browser-based GUI (Figure 1(c)). By transforming data into symbols and audio transcriptions, the software reduces reliance on text and thereby improves accessibility. The system also incorporates a locally hosted Large Language Model (LLM) that supports the interpretation of weather data and facilitates access to a knowledge database of agricultural practices.

3 Conclusion and Future Work

Three prototypes were installed in three communities in March 2026. Three months after deployment, all installations remained operational despite prolonged exposure to intense sunlight, strong winds and heavy rains. The installation was accompanied by usability testing, such as a context-adapted SUS and user stories. These will be published in future work. We see potential to improve the performance of the LLM as well as the interface based on learned insights from deployment. To ensure that LCN can be accessed by community members who do not own a smartphone, an issue that disproportionately affects women in the participating communities.

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Project resources: <https://minodulcn.github.io/>

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