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Does co-producing Climate Services with farmers lead to higher usability?

Climate Services for farmers are essential tools to assist decision-making. They help users to better understand weather risks, which are becoming increasingly hard for farmers to predict in the context of climate change. Drawing on a literature review and concrete examples, we demonstrate the benefits of genuine co-production of Climate Services by scientists and farmers.

Why promote Climate Services in Africa?

Climate Services (CS) are part of the international development agenda[1] and are defined as all services (including apps, radio bulletins, and SMS) providing short-term (one to fifteen days) or seasonal (three-month trend) weather forecasts or climate projections (up to a century) intended to provide users with guidance when making decisions. CS are essential tools for farmers to help them anticipate weather shocks and adapt their decisions accordingly. Research has shown that improving smallholder farmers' access to information enables them to set up more resilient farming systems, particularly in the face of rainfall variability.

In Africa, CS provision often remains insufficient for two main reasons: i) the lack of technical resources for collecting, processing, and producing data, and ii) the mismatch between provision and user demand (in terms of variables, dissemination formats, accessibility, and so on). While the lack of infrastructure is more visible, the mismatch between the CS provided and both the context and user preferences nevertheless constitutes a significant barrier to usability. For example, dissemination which is limited to official languages may restrict access to information for communities that do not use these languages.

The effectiveness of CS depends on how they are designed

Special care is therefore needed to design CS so that they meet user needs. The Weather Service Chain Analysis method, for example, makes it possible to build the link between information production and the effectiveness of a given CS in helping users to make decisions (Bacci *et al.*, 2023). According to this method, the evaluation of the process must be divided into the following stages:

1. **information quality**,
2. **acces**,
3. **use**
4. **ability to act**.

Using this model makes it easier to check with users that each stage is working properly and take corrective action if required.

[1] See the Paris Agreement, article 7, paragraph 7, part c; Sustainable Development Goal 13, target 13.3.

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Figure 1. The process of creating a Climate Service – adapted from Bacci *et al.* (2023)

Systemic data		Intervention process				Impacts
Using forecasts Which practices may be affected?	**Climate risks** Types of major risk	**CS Development** Farming forecasts and advice	**Access** Media for dissemination	**Adaptation** Choice of languages, frequency, scale	**Action** Adaptation of farming practices	**Socio-economic impacts** Productivity, costs, investments
Decisions Possible adaptive practices		› Information quality	› Availability	› Comprehensibility, credibility	› Ability to act	**Environmental impacts** Reducing chemical inputs, erosion etc.

It is essential that communities using the CS are able to obtain **high-quality** information, i.e., information that reflects the physical risks to which they are exposed, and is as accurate as possible, so that they can incorporate this information into their decision-making with confidence. However, there is a lack of meteorological network coverage in Africa. It is estimated that only 10 percent of the world's surface-based observation networks[2] are located in Africa, and that 54 percent of these stations are unable to capture data accurately. Information obtained from satellite data could compensate in part for this infrastructural deficit, if meteorological services master the associated forecasting models.

Moreover, **access** to weather information is often difficult to obtain. For example, a study carried out by the Agence française de développement (French Development Agency) in May 2022 showed that only 20 percent of cotton growers in northern Côte d'Ivoire had access to it (Bompas, 2023). Inequalities in access are often related to existing inequalities linked to gender, education, or access to means of communication. For example, Diouf *et al.* (2020) point out that in Senegal, women are less likely to own telephones, and their reading skills are on average more limited than men's. They therefore recommend using existing social organizations, such as village associations, to transmit weather information by oral rather than written communication methods.

However, it should be noted that access to CS information does not guarantee its use if it is not comprehensible, does not arrive in a timely manner, or is considered unreliable.

Finally, farming communities are not always **in a position to change their behavior** as a result of the information they receive, particularly because of issues around the availability of farm labor and their ability to mobilize the appropriate means of production (seasonal labor, draft animals, the appropriate farming tools, etc.) at a given moment. For example, in Zimbabwe, farmers who owned fewer than two draft oxen felt that the proposed service would be useless to them, as they would not have the time to act before the weather event occurred (Makaudze, 2005).

Incorporating farming advice or training dedicated to meteorological services also makes it possible to place climate information at the heart of adaptation strategies. In Burkina Faso and Ghana, a CS was co-produced in farmer field schools on climate-smart agriculture that also offered workshops on adaptation options (Sanfo *et al.*, 2022). Involving farmers in the development of CS is therefore a prerequisite for their acceptance.

Co-production of CS ensures a higher-quality product

Co-production of CS is defined as an integrated, collaborative, and iterative approach that draws on the expertise of a range of stakeholders to ensure that climate science is included in services that meet end users' needs (Bojovic *et al.*, 2021). There are different levels of co-production, ranging from consultation to the immersion of CS user communities, the latter being described as "co-creation." The aim is to move from the production of "useful" information to that of "usable" information, by creating spaces for discussion between stakeholders where the relevance of the information is debated. The discussion spaces also serve to legitimize the CS by developing a **partnership based on trust** between the parties involved. The meteorological working groups (MWG) in Senegal are a case in point. Driven by Senegal's National Agency for Civil Aviation and Meteorology (Agence Nationale de l'Aviation Civile et de la Météorologie or ANACIM), these MWG are made up of farmers, climate scientists, agronomists, agricultural advisers, representatives of the media, NGOs, women's organizations, and other relevant local bodies.

Co-production elicits a **shared understanding** of what farmers need from climate science and what is scientifically feasible. For scientists, the goal is

[2] Observing Systems Capability Analysis and Review Tool (OSCAR) is the official repository of the World Meteorological Organization for metadata from all surface-based observing stations and platforms.

understanding farming decisions and the context in which they are made, for example, by explaining in detail the chronology of farming calendars and the decisions associated with them, or by documenting people's use of local forecast knowledge (LFK; see Bompas, 2023). For farmers, the goal is gaining a better understanding of the production of CS, and in particular taking on board the limitations of scientific responses to their needs, such as managing the uncertainties linked to forecast accuracy.

The **iterative** nature of the process should enable two-way communication to be established, so that the CS will be **flexible** and easily modifiable. Indeed, beyond the finished product, the literature underlines the need to treat the process as fundamental. The indirect cascading impacts in terms of learning, empowerment, and institutional capacity are noteworthy. For example, women participants in the creation of the Farmer Support application in Ghana (Paparrizos *et al.*, 2023) indicated that they felt their opinions counted in the community more than previously, primarily because they had actively contributed to the tool.

What CS co-production methods can we identify?

In 2018, the World Meteorological Organization published a best practice guide[3] to propose a participatory approach to CS development. Based on lessons learned from several field projects in Africa, the WISER[4] guide provides a method for co-producing CS that are not specific to the farming sector. The Tandem[5] method proposes a process that emphasizes collaborative learning as a defining feature of its success. The methodology described by Bojovic *et al.* (2021), based on engagement, involvement, and empowerment, is also worthy of note: it proposes selecting "champion users" to co-develop the service from among those who have expressed an interest. In a similar vein, Visman *et al.* (2022) propose a method for assessing the quality of the co-production process, at the same time as the outcomes, at every stage.

In the farming context, one of the most widespread methods is PICSA (Participatory Integrated Climate Services for Agriculture). PICSA has two guiding principles: i) "**The Farmer Decides**," in other words, helping farmers to make their own choices; and ii) "Options by Context," recognizing that each farmer operates in their own biophysical and socioeconomic context. PICSA is based on three elements:

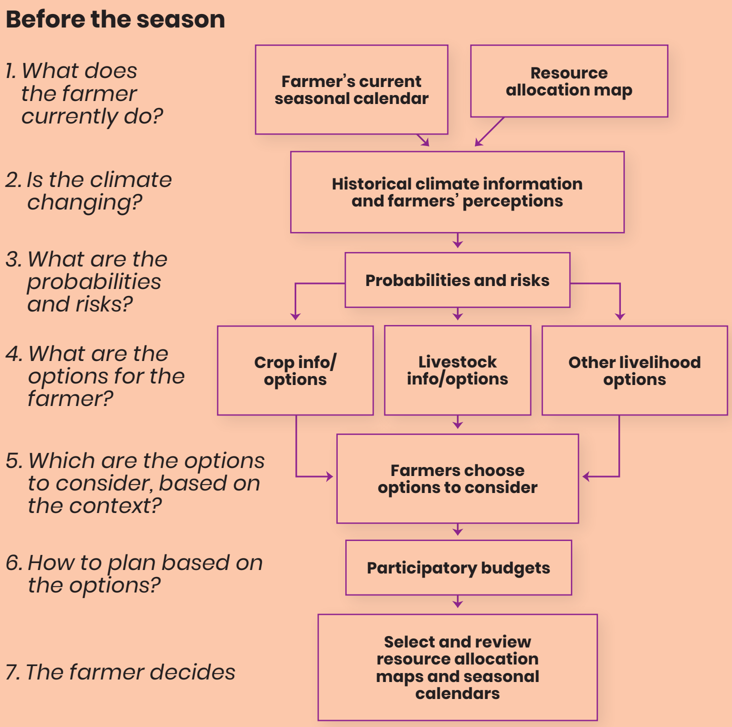
1 - making available historical and locally-specific weather and climate information and the tools to interpret these;

2 - facilitating the exploration of a range of locally-relevant crop, livestock, and livelihood options, as well as specific management practices;

3 - making participatory decision-making and planning tools available.

In PICSA, the discussion spaces are also structured chronologically around the farming season.

Figure 2. Participatory process based on the PICSA method, adapted from Dorward, Clarkson, and Stern (2015)



The options are revisited i) just before the season, based on the seasonal forecasts and ii) during the season, following short-term forecasts and early warnings. Finally, after each season, the whole PICSA process is reviewed with the farmers in order to improve it.

There are also examples of CS that include LFK. Paparrizos *et al.* (2023) describe the steps involved in creating the Farmer Support application in Ghana, including an inventory of LFK and its relevance.

[3] *Guidance on Good Practices for Climate Services User Engagement* (WMO-No. 1214) https://library.wmo.int/viewer/55946?medianame=1214_en_#page=1&viewer=picture&o=bookmark&n=0&q=

[4] *Co-production in African Weather and Climate Services* https://futureclimateafrica.org/coproduction-manual/downloads/WISER-FCFA-coproduction-manual.pdf

[5] "The Tandem Framework: A Holistic Approach to Co-Designing Climate Services" (SEI Brief, May 2019) https://www.sei.org/wp-content/uploads/2019/05/tandem-framework.pdf

[6] Peter Dorward, Graham Clarkson, and Roger Stern (2015). *Participatory Integrated Climate Services for Agriculture (PICSA): Field Manual.* Walker Institute, University of Reading. https://research.reading.ac.uk/picsa/wp-content/uploads/sites/76/Manuals-Resources/PICSA-Manual-English.pdf

Co-production improves service impact and effectiveness

By improving their impact, co-production makes it possible to give CS a core role in strengthening farmers' capacity to adapt. The participation of communities that use CS makes it possible to incorporate their knowledge and take account of their contexts to produce better-quality, more accessible, intelligible, and relevant information that increases communities' capacity for action. In some cases, it also enables empowerment by helping to reduce inequalities in access to information and knowledge about adaptation to climate change. This involves paying particular attention to identifying and including stakeholders (including influential individuals and the most vulnerable), and incorporating into the process farmers sharing local adaptive practices with each other, with agricultural advisers already on the ground and, where necessary, with external stakeholders (particularly government agencies and NGOs). To be effective, co-production must therefore pay close attention to the methods it uses and to existing power structures, in order to ensure that participants' ability to express their views is balanced. Continuing interaction between service providers and users also ensures the service's adaptability over time. Ultimately, the service development process is just as important as the end product and must ensure its flexibility.

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