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Strengthening climate services in Africa by incorporating local knowledge

Local knowledge is currently attracting growing interest on the international stage, in particular for its contribution to biodiversity conservation and climate change adaptation. An increasing number of development projects are now opting to incorporate it in scientific knowledge. Based on a review of the literature on Africa and a field survey financed by AFD among 285 farmers in northern Côte d'Ivoire, the purpose of this document is to identify the potential of local forecasting knowledge (LFK) in the field of climate services for farmers.

I. Why promote climate services in Africa?

Climate services (CS) are defined as "any service (applications, radio bulletins, text messages) comprising short-term weather forecasts (1 to 15 days), seasonal forecasts (3-month trend) and climate projections (one century) to guide users in their decision-making". CS allow farmers to anticipate weather shocks and adapt their decisions accordingly. These climate risk management tools have a positive effect on agricultural incomes and productivity (Roudier, 2019). They are also increasingly important for the adaptation of practices to climate change. In this respect, CS have been set out in the international development agenda (Paris Agreement – Article 7(7c), SDGs – Target 13.7, etc.).

In Africa, the provision of CS is still often insufficient. It primarily involves weather forecasts and early warning systems (EWS), mainly provided by National Meteorological Services (NMS). In addition to the lack of technical means for the collection and processing of data, the mismatch of information with user demand (variables, dissemination formats, accessibility, etc.) sometimes prevents CS from fully playing their role as an adaptation tool. For example, women benefit from weather information less frequently, as they have more limited access to mobile phones in rural households.

Furthermore, the information disseminated must be perceived as credible, relevant and legitimate by users. But the arrival of imprecise scientific forecasts in certain areas in the past, combined with a low provision of training in uncertainty management, may have undermined people's confidence in this information. In this context, the incorporation of LFK, which rural people still use in addition to scientific forecasts, could contribute to increasing the acceptance of CS among users.

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II. What is local forecasting knowledge?

LFK is defined as environmental indicators that people observe locally to make weather forecasts. They may be linked to biodiversity (phenological stage of plants, behavior and presence of animals) or abiotic (observations of clouds, stars, temperatures, etc.). The forecasts cover short term weather events (1 to 3 days) or the characteristics of the next season. For example, in several areas of West Africa, when people see columns of army ants with their eggs, they commonly interpret it as a sign of rain in the coming days.

LFK can also act as an early warning by increasing people's ability to predict extreme events. It mainly allows people to predict:

- Rain in the coming hours and days
- The volume of seasonal rainfall
- Periods without rainfall
- The beginning and end of the rainy season

As with all local knowledge, LFK is part of the legacy of a generation and is specific to a given geographical area, but it is not static. It is transmitted and renewed by each succeeding generation. Knowledge may also differ in the same territory, depending on the gender, in relation to the transmission practices and the type of decisions requiring the use of LFK. Indeed, knowledge is used in everyday tasks, but these tasks may differ depending on the gender.

The study financed by AFD among 285 farmers in northern Côte d'Ivoire shows a relative scarcity of this local knowledge (see Table 1). For example, short-term knowledge (1 to 3-day forecast) is more common than knowledge related to seasonal information or to a period without rainfall. Many people do not know how to interpret the indicators related to LFK themselves and ask external persons, "local experts" recognized by their community, to have information from LFK.

III. What is the potential input of LFK for climate services?

In addition to giving people confidence in CS, the incorporation of LFK helps better contextualize the services and improve their performance through its complementarity with CS.

Improving the performance of weather forecasts

Despite technological progress in modeling (more accurate downscaling, for example), scientific forecasts are not always able to grasp all the variations in a small area. Some scientific research shows that the incorporation of LFK could make it possible to refine the accuracy and contextualization of scientific models. For example, Masinde, Mwagha and Tadesse (2018) have built an integrated and participatory system in Kenya to forecast periods of drought, indicating a forecast accuracy rate of between 75 and 98% for various time steps.

However, changes in practices and land use, coupled with the effects of climate change, tend to reduce the reliability of some LFK. The decline in the animal and plant species present in the local area directly affects the number of indicators. Yet their diversity makes it possible to compare the interpretations to ensure that the forecasts are reliable.

Strengthening people's acceptance of climate services

Rural people point out that LFK has "proved its worth" over time and has a better reputation of reliability than scientific forecasts in many territories. The incorporation of LFK in climate services can therefore increase people's acceptance of these services by giving them credibility. Furthermore, understanding the use of LFK also helps to identify more clearly the complementary scientific information that could be of priority interest to producers. Indeed, there is a complementarity between scientific forecasts and forecasts from LFK, as certain variables useful for decision-making may be inaccessible for local knowledge (precise temperature, for example).

Table 1 — Results taken from the survey on "The needs for climate services of producers in cotton areas" financed by AFD in northern Côte d'Ivoire in May 2022 among 285 farmers

Possession of local forecasting knowledge	As % of the study population
Possesses at least one element of local forecasting knowledge	51%
Possesses at least one element of local knowledge on short-term rain forecasting	49%
Possesses at least one element of local knowledge on seasonal forecasting for the rainy season	12%
Possesses at least one element of local knowledge on forecasting a period without rainfall	9%
Possesses more than one element of local forecasting knowledge	20%

The results of the survey conducted in Côte d'Ivoire show that farmers with knowledge of LFK are willing to pay about FCFA 500 more to have access to a climate service that includes local knowledge. Furthermore, the creation of platforms for exchanges between scientists and "local experts" strengthens mutual understanding between the various groups of actors, allowing them to jointly build services tailored to users' needs. It also allows "local experts" to advocate for climate services within their community.

IV. How to incorporate LFK in climate services?

The incorporation of LFK in CS contributes to the contextualization of services in terms of accuracy and people's acceptance. However, the willingness to contribute LFK and the scientific validation of the reliability of its forecasts are a prerequisite for any incorporation.

The issue of willingness to contribute

The possibility of incorporating LFK in CS depends above all on people's willingness to share their knowledge. People who are considered "experts" by their community must be willing to share their knowledge with other people, or regularly report their forecasts to scientists so that they can incorporate it.

The question of introducing an economic incentive for contributors of local knowledge to the final service delivered is also not stated.

Identifying "local experts" and documenting LFK

Across Africa, documentation on LFK is more developed in East Africa and generally less so in French-speaking countries (Nyadzi, 2021). This documentation of knowledge must also take gender into account. This identification is especially necessary as the transmission of LFK would sometimes appear to be on the decline:

- Beyond its functional role, LFK is part of people's cultural heritage. The arrival of new monotheistic religions sometimes results in an outright rejection of learning ancient practices, including LFK. Similarly, it would appear that school-related lifestyle changes, for example, reduce the number of spaces available for the transfer of this knowledge between generations (Salite, 2019). "Modern" education could also sometimes contribute to reinforcing a hierarchy of the authority of knowledge among the population, in favor of science legitimized by State institutions and to the detriment of local knowledge
- "Local experts" lay their reputation on the line when they make a forecast or transfer their knowledge. Consequently, these experts are sometimes afraid of transferring LFK to their children due to the growing risk of errors related to environmental changes. The knowledge base passed from generation to generation is also reduced due to the loss of biodiversity

Screenshot of the FarmerSupport application available free of charge in Ghana

Scientifically validating and selecting LFK

The use of LFK by institutions requires a scientific validation of the reliability of the forecasts produced from it, especially as environmental changes would appear to reduce its performance.

Scientific protocols have been developed, in particular in Ghana, to quantify the reliability of the indicators, using rainfall records, for example. They result in a selection of indicators whose accessibility and effectiveness still seem relevant. This scientific validation is essential because when scientists are attentive to local knowledge, it gives greater legitimacy to the "local experts" among their community.

Establishing a framework for regular information-sharing

The forecast collection system can be automated with participatory applications (see example on previous page). It can depend on intermediaries (rural leaders, for example) or take the form of meetings or workshops involving both meteorologists and "local experts" to discuss seasonal forecasts in advance.

The distribution format can subsequently pool the scientific forecasts and LFK forecasts on a comparative basis, or directly provide single "reconciled" forecasts incorporating the two sources of information.

Training or educating in LFK

The transmission of LFK can be facilitated by its incorporation in existing learning environments, whether in school or through agricultural and rural training, for example. This knowledge would complement an existing climate service by directly giving people greater access to weather information and making them aware that forecasts, as a general rule, are based on probability.

Conclusion

LFK offers great co-construction potential for climate services. Its incorporation in these services brings prospects for greater acceptance by people, mainly through the confidence rural people have in LFK and the accuracy provided at a very local level. Its incorporation depends primarily on: I) the willingness of "local experts" to contribute; II) the documentation and scientific validation of indicators from LFK and III) the creation of appropriate systems for the collection and regular provision of forecasts.

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