Success of the co-production and delivery of local and scientific weather forecasts information with and for smallholder farmers in Ghana

Talardia Gbangou (1), Rebecca Sarku (1), Erik Van Slobbe (1), Fulco Ludwig (1), Gordana Kranjac-Berisavljevic (2), Spyridon Paparrizos (1), and Art Dewulf (1)

(1) Wageningen University and Research, Wageningen

(2) University for Development and Studies, Tamale

WAGENINGEN UNIVERSITY & RESEARCH

WATER APP

Introduction

In Ghana, high climate variability hinders small scale farming which relies largely on rainwater

There is also a limited access to credible & tailored-made weather and climate services (WCS)

Harnessing local knowledge and sharing both local & scientific forecasts using ICTs can help improve WCS and decision-making

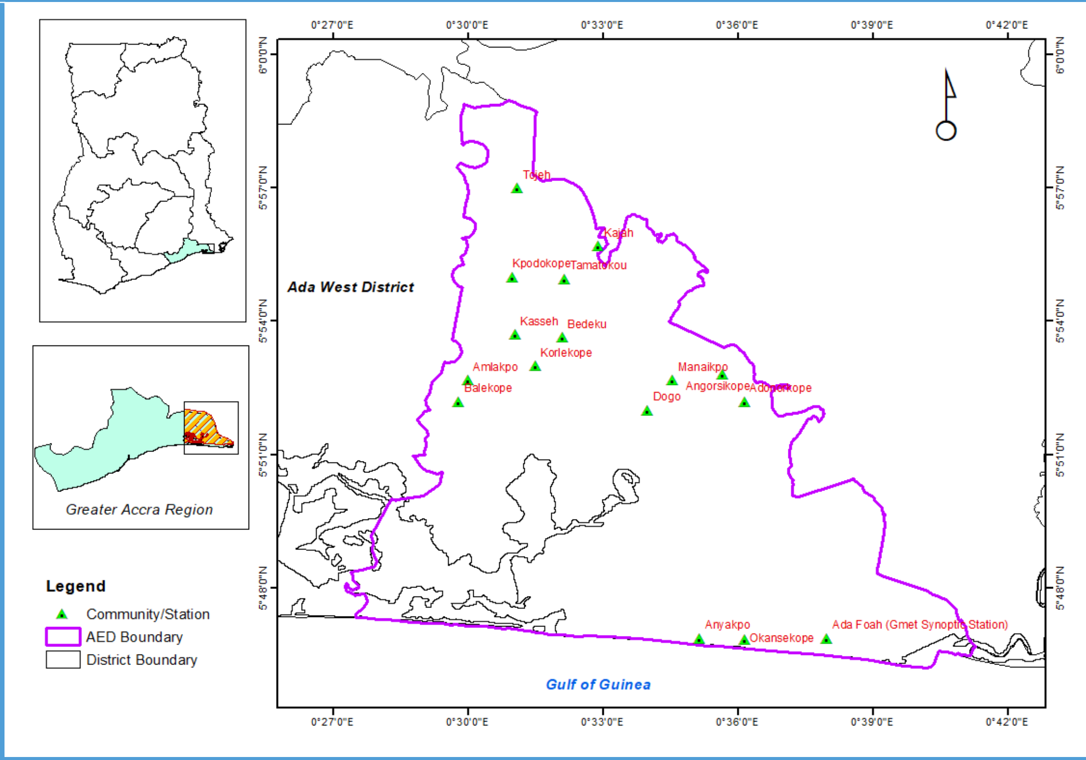


Fig.1: Study area: Ada East District, Ghana

We aim to improve the **design** of **weather and climate information systems** for **small scale farmers** in Ghana.

We show the **design process** and the **lessons learned** from an experimental **co-production** of **weather forecasts information** using **digital and rain monitoring tools**.

WAGENINGEN UNIVERSITY & RESEARCH

Methodology

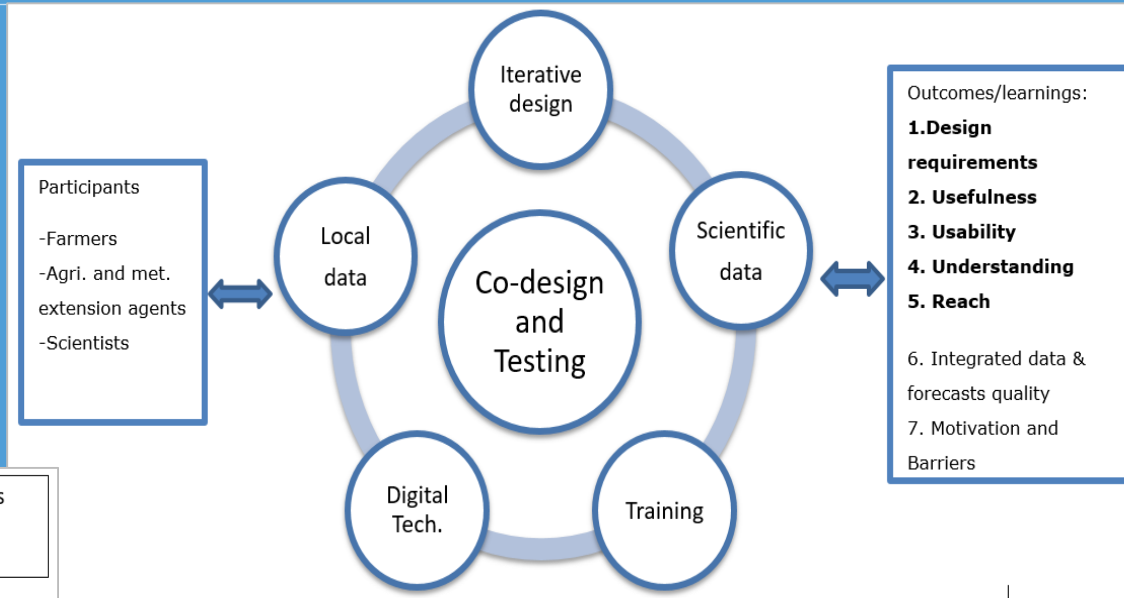
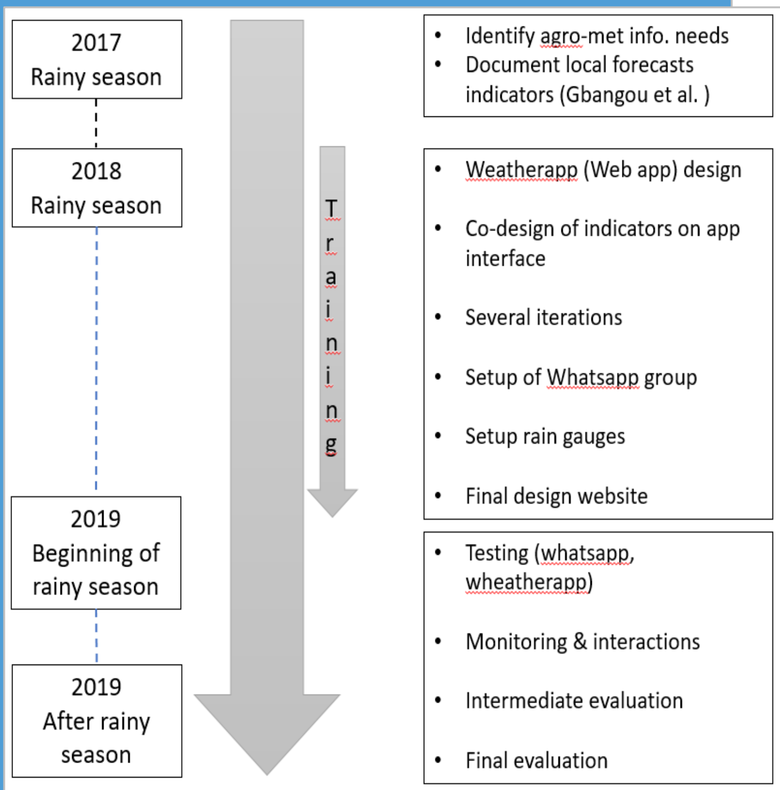


Fig.2: Co-design and testing: cyclical & iterative process



Methods: Design and training workshops & interviews

Analysis: documentation of design principles and ex-post evaluation of behavior change & impact

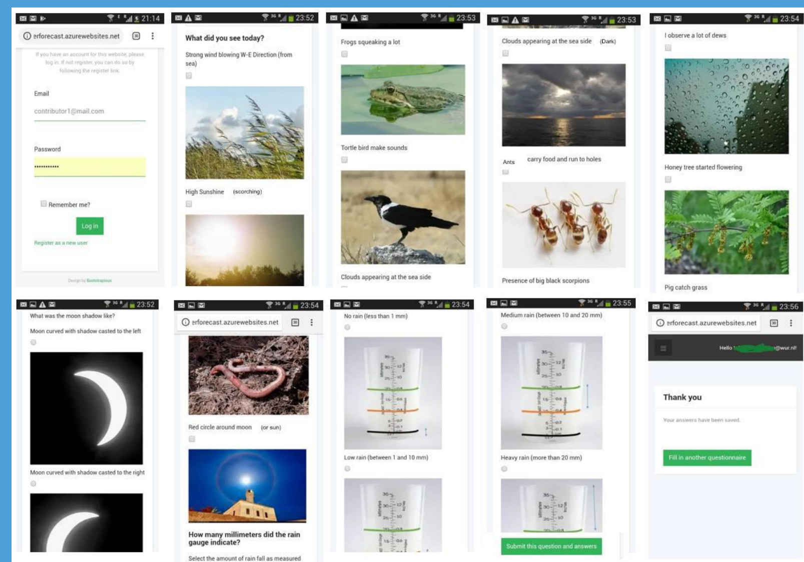
Fig.3: Chronological flow the co-design and testing of agro-met services

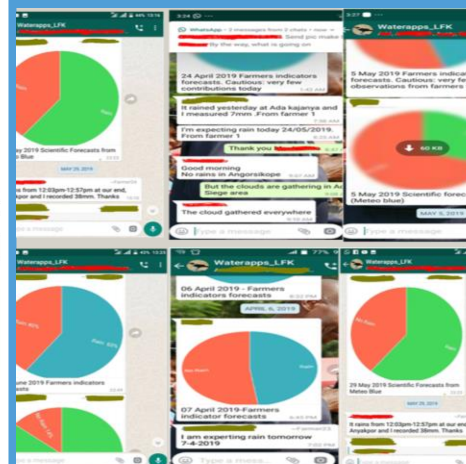
WAGENINGEN UNIVERSITY & RESEARCH

Results: Design characteristics of the digital and rain monitoring tools for farmers

Digital & rain monitoring Tools	Items	How Should it be design?
WeatherApp	Images	Contained consensus visual & symbolic pictures on local forecast indicators, rain gauge measurement levels
	Symbols	Visual and simple to use after training
	Text	Sort and concise but optional (non-essential) to describe local indicators
	Manipulation of the App	Should be easy to scroll, select and submit/send with confirmation message.
WhatsApp	Forecast graphs with uncertainty	Illustrate the simple probabilistic (uncertainty) charts of forecasts (e.g. pie chart)
	Text /Emojis	Texts and/or emojis was used to facilitate interactions within the WhatsApp group
	Manipulation of the App	Farmers who used the mobile app for the first time were trained to use it.
Internet	Setup and handling	Considering the amounts and remote location of farmers and extensions agents, the use of internet was essential to have instant (real-time) data
Rain gauges	Setup of the manual rain gauge	Farmers were trained to setup manual rain gauges, record and report daily rainfall near their house or farm, these data could be reported using the apps and/or notebooks
	Recording of daily rainfall	
	Reporting of daily rainfall	

Results: Examples of digital and rain monitoring tools designed with and for farmers





Rain gauge setup:
Data used to check the quality of Local/farmers forecasts

Interfaced of WeatherApp:
Used to collect real-time local farmers indicators/forecasts and data at remote locations

Interface of WhatsApp :
Used to interact to share local & scientific forecast and interact with participants

Results:

Engagement

Participants (farmers)' engagement has increased over time.

A large share (77%) of farmers stayed from the beginning to the end

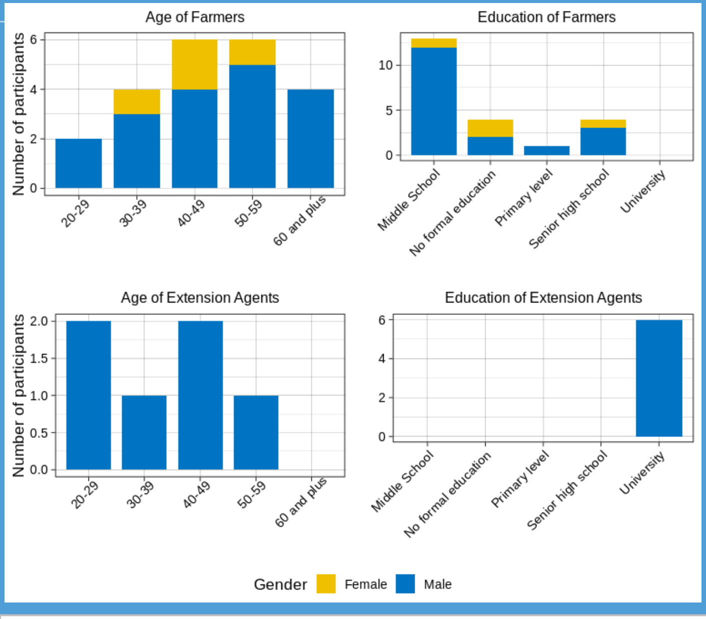


Fig.4: Demographic information

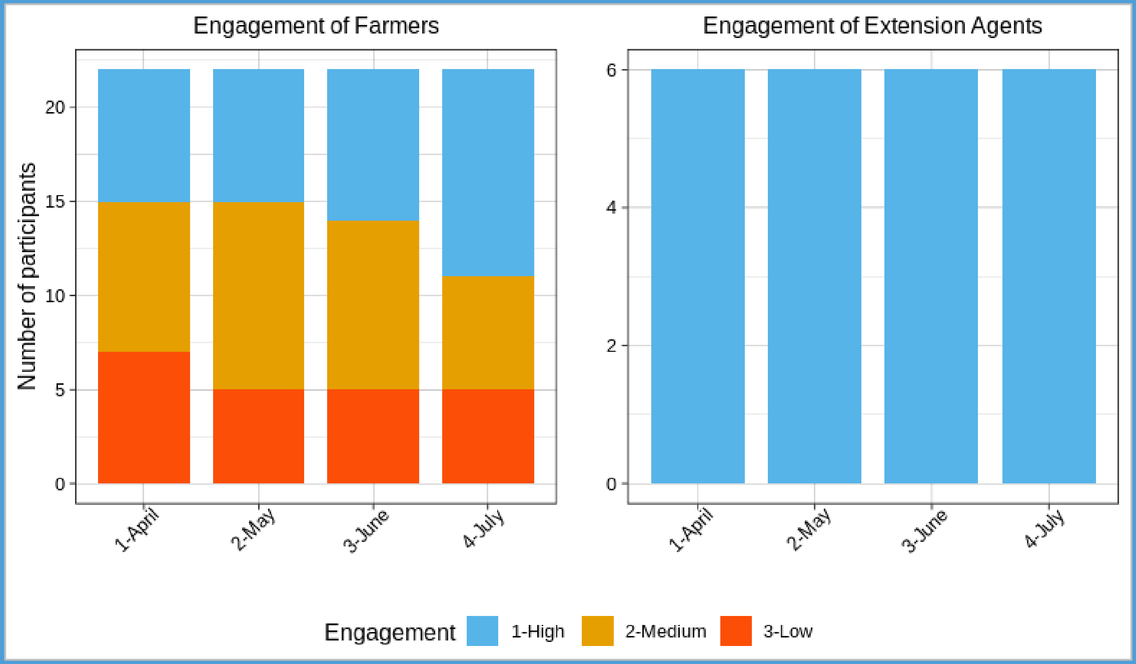


Fig.5: Participants engagement evolution in terms of frequency data collection

WAGENINGEN UNIVERSITY & RESEARCH

Results:

Usability

Farmers' ability to use the digital and monitoring tools has increased

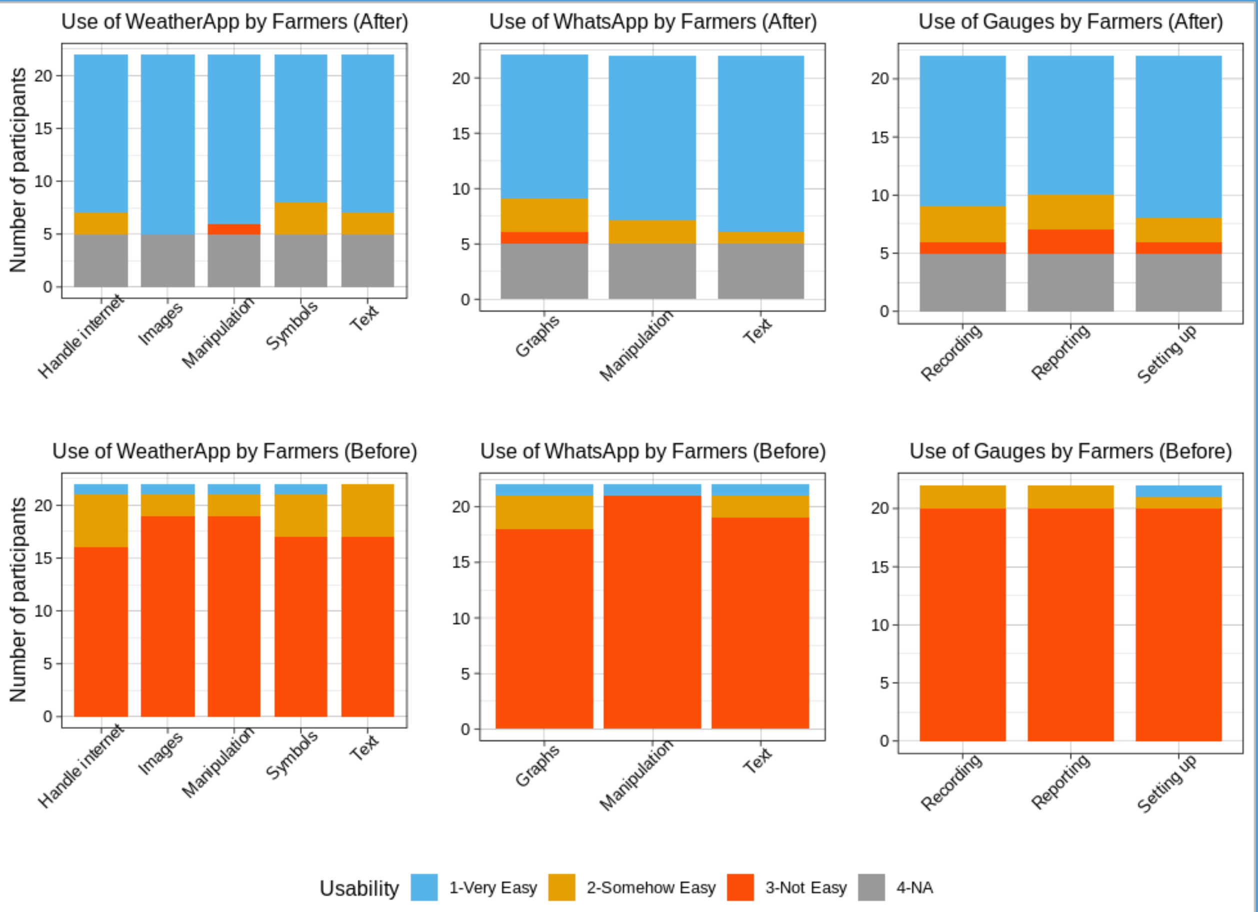


Fig.5: Evaluation of the usability of the digital and rainfall monitoring tools

WAGENINGEN UNIVERSITY & RESEARCH

Results:

Usefulness

The relevance of the digital tools and information co-produced is confirmed by the majority of participants

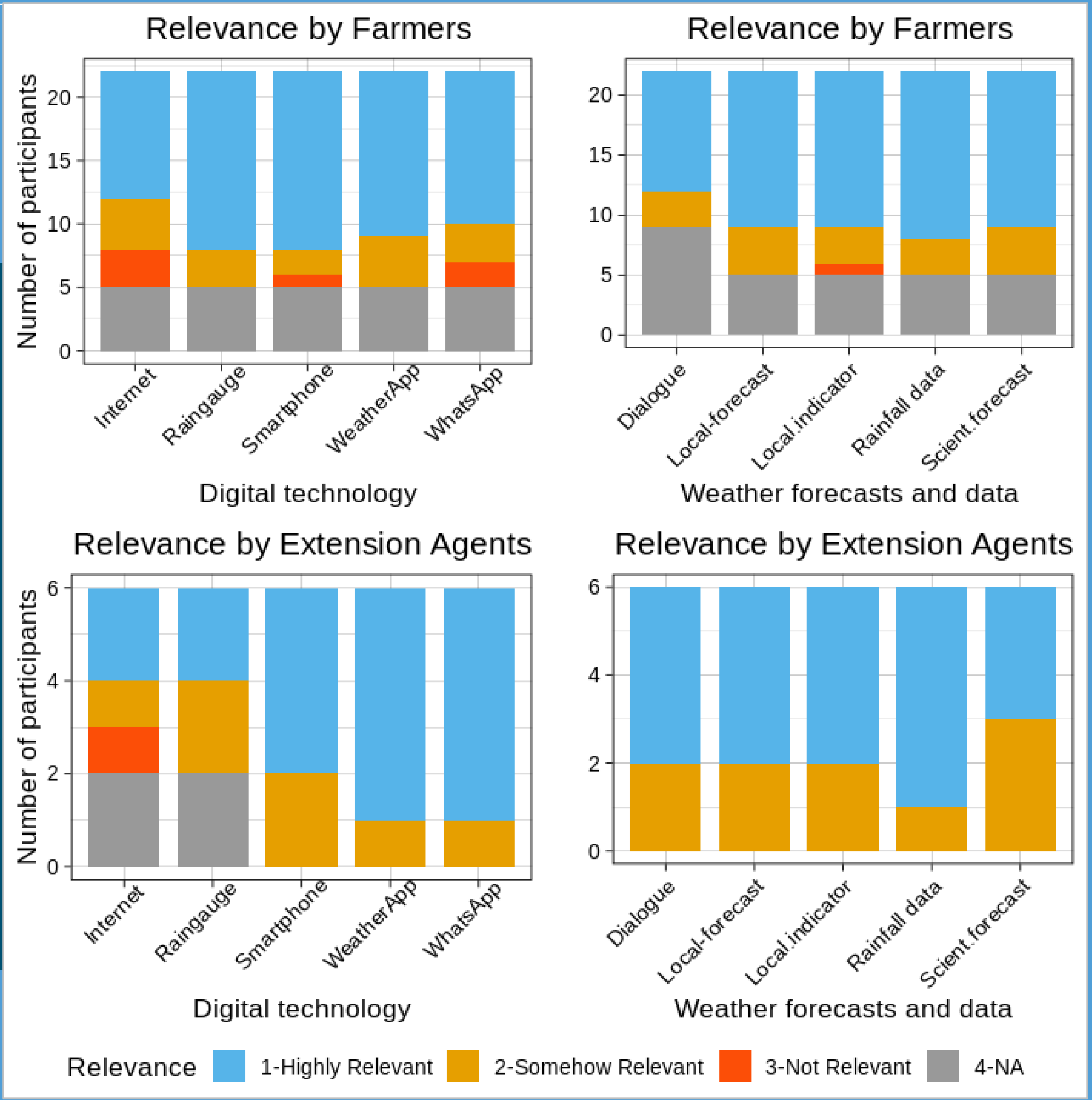


Fig.3: Usefulness of the digital and rain monitoring tools and the co-produced weather information

WAGENINGEN UNIVERSITY & RESEARCH

Results:

Understanding, decision-making & reach

A large share of participants confirmed the improvement in their decision making and their understanding of rain distribution and forecast uncertainty

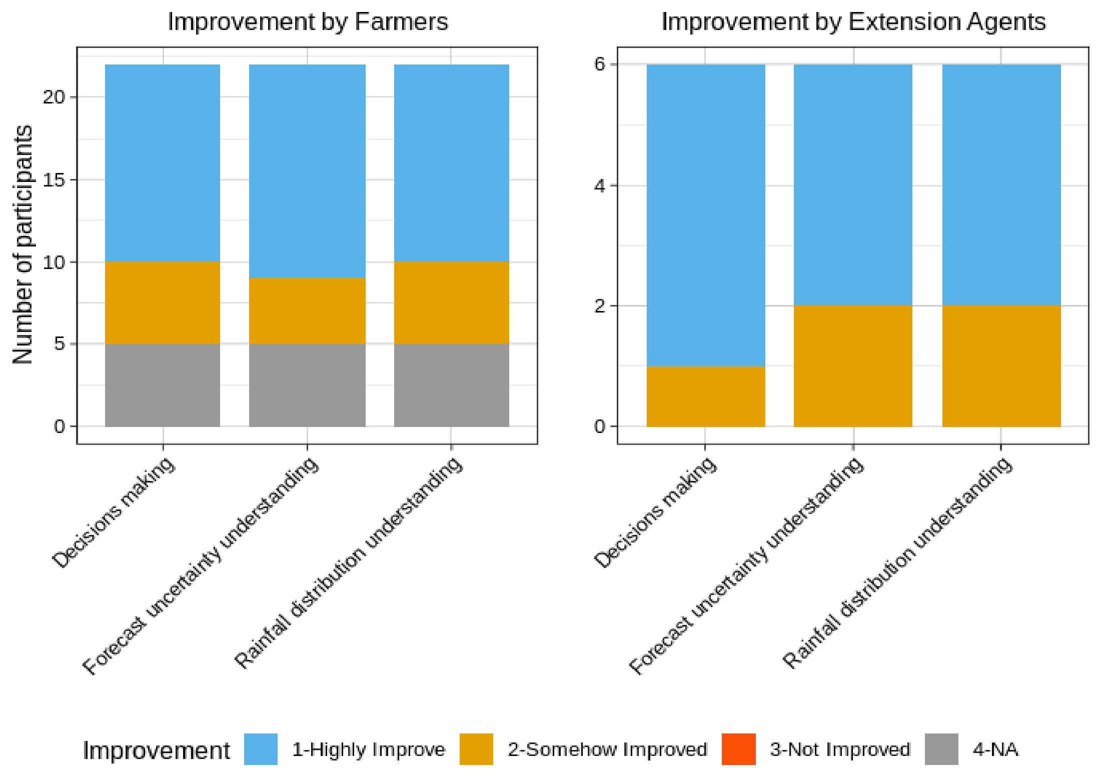


Fig.3: Perceived improvement in understanding rainfall uncertainty, by farmers

Reach	By farmers	By extensions agents
Total number farmers with whom the forecast information and data were shared.	340+	540+

WAGENINGEN UNIVERSITY & RESEARCH

Summary and Conclusions

- The engagement of farmers who remained (77%) from the beginning to end of the co-production tend to increase
- The majority of participants believed that the modern digital and rain monitoring tools were very easy thanks to the training and practice.
- Also a large share of participants believed that their understanding of rain distribution, forecast uncertainty and decisions has improved
- These results suggest that the use of modern technology in a co-production process, with targeted training, can help improve the access and use of weather forecasts information

References

GBANGOU, T., LUDWIG, F., VAN SLOBBE, E., HOANG, L. & KRANJAC-BERISAVLJEVIC, G. 2019. Seasonal variability and predictability of agro-meteorological indices: Tailoring onset of rainy season estimation to meet farmers' needs in Ghana. Climate Services, 14, 19-30.

GBANGOU, T., VAN SLOBBE, E., LUDWIG, F., & KRANJAC-BERISAVLJEVIC, SPYRIDON PAPARRIZOS (Forthcoming). Harnessing local forecasting knowledge on weather and climate in Ghana: documentation, skills and integration with scientific forecasting knowledge

INGRAM, K., RONCOLI, M. & KIRSHEN, P. 2002. Opportunities and constraints for farmers of west Africa to use seasonal precipitation forecasts with Burkina Faso as a case study. Agricultural systems, 74, 331-349.

Rebecca, S., Gbangou, T., Dewulf, A., Slobbe, E. (forthcoming). Beyond 'experts knowledge': Locals and experts in a joint production of weatherApp and weather information for farming in the Volta Delta, Ghana

TALL, A., COULIBALY, J. Y. & DIOP, M. 2018. Do climate services make a difference? A review of evaluation methodologies and practices to assess the value of climate information services for farmers: Implications for Africa. *Climate Services,* 11**,** 1-12.

VAUGHAN, C., HANSEN, J., ROUDIER, P., WATKISS, P. & CARR, E. 2019. Evaluating agricultural weather and climate services in Africa: Evidence, methods, and a learning agenda. *Wiley Interdisciplinary Reviews: Climate Change,* 10**,** e586.

VEDELD, T., MATHUR, M. & BHARTI, N. 2019. How can co-creation improve the engagement of farmers in weather and climate services (WCS) in India. Climate Services, 15, 100103.

WAGENINGEN
UNIVERSITY & RESEARCH