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

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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.

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

<table>
<thead>
<tr>
<th>Digital &amp; rain monitoring Tools</th>
<th>Items</th>
<th>How Should it be design?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WeatherApp</strong></td>
<td>Images</td>
<td>Contained consensus visual &amp; symbolic pictures on local forecast indicators, rain gauge measurement levels</td>
</tr>
<tr>
<td></td>
<td>Symbols</td>
<td>Visual and simple to use after training</td>
</tr>
<tr>
<td></td>
<td>Text</td>
<td>Sort and concise but optional (non-essential) to describe local indicators</td>
</tr>
<tr>
<td></td>
<td>Manipulation of the App</td>
<td>Should be easy to scroll, select and submit/send with confirmation message.</td>
</tr>
<tr>
<td><strong>WhatsApp</strong></td>
<td>Forecast graphs with uncertainty</td>
<td>Illustrate the simple probabilistic (uncertainty) charts of forecasts (e.g. pie chart)</td>
</tr>
<tr>
<td></td>
<td>Text /Emojis</td>
<td>Texts and/or emojis was used to facilitate interactions within the WhatsApp group</td>
</tr>
<tr>
<td></td>
<td>Manipulation of the App</td>
<td>Farmers who used the mobile app for the first time were trained to use it.</td>
</tr>
<tr>
<td><strong>Internet</strong></td>
<td>Setup and handling</td>
<td>Considering the amounts and remote location of farmers and extensions agents, the use of internet was essential to have instant (real-time) data</td>
</tr>
<tr>
<td><strong>Rain gauges</strong></td>
<td>Setup of the manual rain gauge</td>
<td>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</td>
</tr>
</tbody>
</table>
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
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.
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.
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

<table>
<thead>
<tr>
<th>Improvement</th>
<th>1-Highly Improve</th>
<th>2-Somewhat Improved</th>
<th>3-Not Improved</th>
<th>4-NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decisions making</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Forecast uncertainty understanding</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Rainfall distribution understanding</td>
<td></td>
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</table>

Total number of farmers with whom the forecast information and data were shared.

<table>
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<tr>
<th>Reach</th>
<th>By farmers</th>
<th>By extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of farmers</td>
<td>340+</td>
<td>540+</td>
</tr>
</tbody>
</table>
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


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