

# Weather Impact

Subject AgriCoach weather forecast evaluation, March 2019  
Project G4AW Gap4All  
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To Gap4All project partners  
Date March-April 2019

## 1 Introduction

In March 2019, the Gap4All consortium visited Burundi for a week to evaluate the first applications within AgriCoach and to test ideas for future versions. One of the current existing functions is a weather forecast for the farmer's village. The forecast is updated daily and gives a forecast for temperature and rainfall for today and the next 8 days. The forecast provides information on 3 levels of understanding:

- Symbols, for those who cannot read;
- Textual weather forecast in 3 languages: English, French, and Kirundi;
- Rainfall likelihood graph, showing a probabilistic forecast of rainfall.

The current set-up of the AgriCoach weather forecast is based on farmer interviews that were conducted during a previous visit to Burundi in July 2018. The goal of the March visit was to test and evaluate if and how the farmers use the weather forecast and if they have suggestions to improve it. Evaluation was done by conducting an interview with at least the group leader and rain master (often the same person) and possibly other farmers. Interviews were conducted by Sippora Stellingwerf and Stefan Ligtenberg, both aided by a translator from AUXFIN-Burundi. To be able to compare the answers, a standardized interview form was used.

First, a short list of conclusions is presented, before the elaborate transcript of the individual interviews. At the end, the interview form that was used is attached.

## 2 Short conclusions

- The weather forecast is used daily by all interviewed farmers.
- The weather forecast is mostly checked by the group leader and/or rain master, and then shared with the rest of the group by mouth-to-mouth communication.
- Consulting the weather forecast is often done simultaneously with the rainfall measurement, which is preferably 7AM.
- Connection problems with mobile internet are a serious problem.
- All interviewed farmers use and understand the weather symbols. All rain masters and/or group leaders can read and understand the textual forecasts, as do most farmers.

- Half of the interviewed farmers is capable to explain the rainfall likelihood graph. These farmers also indicated that this graph has added value.
- The weather symbols (e.g. “sun/cloud”, “cloud + 3 drops”) are interpreted correctly.
- The detailed textual forecast is valued, especially the amount of rainfall in mm.
- Farmers use their own rainfall measurement and weather forecast in mm to verify and critically assess the weather forecast. The manual rainfall measurement is helping the farmers to better interpret the weather forecast.
- The rainfall forecast is generally rated as “accurate” to “very accurate”: 65% to 98%.
- The temperature forecast is almost never used, as degrees Celsius has no meaning to the farmers.
- Farmers use the weather forecast to adapt their planning, e.g. postponed planting, hiring workers, going to the field.
- All farmers expect an increased income(/yield) as a result of the weather information they get, mainly due to limiting errors and problems.
- All interviewed farmers recommend the weather forecast for other Burundian farmers.
- Suggestions for improvement:
  - Splitting the “sun/cloud” weather symbol in: “sun”, “sun/cloud”, “cloud”.
  - Addition of wind forecast
  - Addition of sub-daily forecast, e.g. “at what time of day will it rain?”
  - Extending the forecast to longer time scales (1-2 months)

### 3 Interview transcripts

#### **12-03-2019 – KIGABIRO-GR3**

Name: Bakoma Celeus (male, ca. 40 years old)  
 Role: Group leader, Chef rain, and farmer

Bakoma uses the weather forecast (WF) daily, every morning when he submits the rainfall measurements (RM) into the UMVA system he also checks the WF. At most days he has a working internet connection. If there are connection problems, he contacts the super activator for help. He looks at the WF alone, after which he tells the other farmer about the weather for today and the week’s outlook. WF is then spread through mouth-to-mouth talks to the rest of the G50 group. He understands the functionality of the AgriCoach app and is capable of selecting his own G50 group from a drop-down menu to get the local forecast for his farm/village (in a newer version this should be automatised based on GPS coordinates).



He uses the weather symbols and can explain the weather symbols really well: “this means no rain”, “... little rain”, “... more rain”. He also interprets the forecast for today and other days well: “today is likely dry, while tomorrow it will likely rain a little. The rest of the week is probably dry too”. He also uses the textual weather forecast and knows how to select other language: English, French or Kirundi. He indicates no preference to change the selected time

periods (today, tomorrow, days 2-4, day 5-8). He also (surprisingly) understands the probabilistic rainfall graph really well, he is able to explain which days have low/high chances for lower/higher amounts of rainfall. He uses these likelihoods for his decision-making. Concluding, he understands and uses all 3 components of the WF.

What would he like to change/add to the WF: perhaps add lightning chance for safety and extend the forecasts (up to a month). This would help them to make even better planning

Farmers in the G50 group use the forecast to adapt their planning. They expect that the WF will help them to increase their yield, as they expect less problems. For example: Less problems/losses with planting during a drier period, which will like lead to a loss of seeds. Rainfall forecast is very valuable for them to help with planning. Example: he postponed planting for 2 weeks due to the forecast. 1<sup>st</sup> week: forecast was too dry, 2<sup>nd</sup> week: forecast was too wet, 3<sup>rd</sup> week: he planted and was happy with this outcome. Rainfall is for 85% accurate, he says. He sees no real benefit for the temperature forecast. Would definitely recommend the WF to others: "Every farmer in Burundi needs this!".

On the rainfall measurements: He does it every morning around 7AM. Sometimes he has problems with submitting to UMVA due to connection problems. If so, he contacts the activator (he showed us the whatsapp-group). He needs no encouragements for the submission: he likes to do it! He combines his rainfall measurement with the WF, as he uses them at the same time every morning. He feels the WF and his measurements align, although the time was too short to conclude (only two weeks).

#### **Additional notes from other farmers from the group.**

There is usually access to the internet to collect the WF. Farmers get the WF every day from the group leader who spreads the information to the group. The farmers understand and use both the icons and the written forecast. They also understand the amount of millimetres. The group mentioned some suggestions for improvement: they would like to know better when it will rain (for example in the morning, or in the afternoon). Also, they would like to have a forecast of the wind speed and hail. They use the rainfall forecast to make canals when lots of rain is forecast. Also it helps them to better plan activities and to decide when to hire people to work on the land. The rain forecast is in general accurate, however sometimes it rains when a dry day is forecast. The farmers do not use temperature forecast. They would like to also have long-term forecasts.

#### **12-03-2019 – MYUGARIRO-GR2**

Name: not one specific person, but talked with a group of ca. 20 people

Role: Farmers

Talked to half of the G50 group, who were a new group and did not have a tablet yet and therefore have no experience with interpreting the WF.



They are very interested in receiving the WF. If they get it, they will share it with other people and groups: they claim they can reach >500 other farmers on daily basis. The main reason the use the WF will be to better plans their activities. They are also interested in the temperature forecast, as certain crops grow better in certain temperature ranges. Access to the WF will mean more knowledge, so less errors and therefore more yield.

The group was shown screenshot of the WF in AgriCoach for the first time, but they are able to interpret it pretty well. Sun/Cloud is interpreted as “sunny”, while the clouds with drops are interpreted as different types of rain (low/high intensity). Someone read the WF text out loud and most farmers nodded as they understood the message of the forecasted weather. The amount of mm is appreciated, as certain seed packages contains mm rainfall, so having these amounts would help them. One man notices that he would need to have a rain meter to even better understand (AUXFIN-B will likely provide this group with a rain meter). We did not discuss the rainfall graph, as I think it would be too difficult for now. The group has one suggestion to add: divide the dry weather symbol into “Sun”, “Sun/Cloud”, and “Cloud”.

A woman is also asked for her opinion about the textual forecast, but admits she cannot read and therefore does not understand. When shown only the symbols (without the text), she smiles and explains that she now does understand. She interprets the given WF (only rain tomorrow) correctly.

#### **Additional notes from other farmers from the group.**

The group right now use the radio weather forecast as they do not yet have AgriCoach. This forecast is only for today and tomorrow on a province level. The farmers are able to interpret the weather symbols (the textual weather forecast was not discussed). They use the forecast for planning their activities. They would like to also have monthly, long-term forecasts.

#### **13-03-2019 – RUGAZI-GR2**

Name: Nabomenyereye Telesphore (male)

Role: Farmer/Group leader/Chef rain

Nabomenyereye uses the WF daily since two weeks, when AUXFIN-B told him about the AgriCoach and the WF. He does not always have internet service, due to bad connections from Lumitel. He will arrange a new SIM card from provider Leo, who has better reception. He looks daily at the WF in the morning, mostly around 7AM, when he also submits the rainfall measurement in UMVA. He looks at the WF alone and tells the group through mouth-2-mouth communication about the forecast. This is confirmed by other farmers. He also mentions that farmers come to him directly to ask about the WF and sometimes want to look at the WF on the tablet themselves.



He uses the weather symbols and can interpret them well. Sun/Cloud is “sunny, no rain”, 1 drop is “little rain”, and 3 drops is “a lot of rain”. The forecast shown to him is interpreted well by him, he concludes that the forecast contains sufficient days of sufficient amounts of rain. He says he therefore would decide to plant today based on the weather forecast. He also uses the textual forecast as it adds insight to the symbols. He particularly likes the range in mm that is given as he can compare this to the measured mm in the rain meter. He likes reading the text forecast in French, as it helps to improve his French. He reads all 4 textual forecasts and uses them all in his planning and decision making. The rainfall graph is not used, as he finds this too difficult to interpret. However, he is looking forward to learn about this from the key activator (KA/SA), as he wants to use it in the future.

A suggestion is to inform the farmers by UMVA message or SMS text if the forecast is wrong/offline, so they won't use it. He names as an example the past Saturday when the WF did not align with the rainfall measurement (WF: lots of rain, reality: no rain, which was actually a bug in the AgriCoach app which has been fixed). He told all farmers that it would rain, so people came to his house in the evening to ask what was wrong, as it did not rain. He would also like longer forecast (monthly), so he can better plan ahead. Humidity might also be interesting (some plants need certain humidity regimes), however, he admits that he will not be able to interpret the numbers (%'s) without any training. He would also like a heavy thunderstorm warning, as lightning and high winds can damage crops. If they know before, they can take precautionary measures.

Rainfall WF is used for planting and planning of all other farming activities. The rainfall WF is “98% correct”, as only the past Saturday was wrong according to him. He stresses that he is very happy with the rainfall forecast. The temperature forecast is not used, as they see no use for it. The WF will likely increase their yields as the WF helps to reduce errors (e.g. planting too early) and less errors means more yield.

He recommends the WF to every Burundian farmer. Every farmer needs it and if they get this WF “it will change their lives”.

On the rainfall measurements: He measures and records daily at 7AM, he is very punctual. Last week, he even waited 1,5 hours at home before he went to the field as he needed to be home at 7AM. (We told him that measuring at 6AM or 8AM is also fine). The internet connection is a big problem to submit the measurement, but he can SMS or Whatsapp (other phone) the measurement to the MA. No need to be encouraged, he likes to do the measurement. The measurements help him to better understand the WF; he directly compares the measured rainfall to the forecast and uses it for the trustworthiness of the WF. Most of time, the rainfall measurements and the WF align quite well.

#### **Additional notes from other farmers from the group.**

The farmers look at the weather forecasts every morning. There are two tablets in the group. On Friday, the farmers come together and look at the WF, the other days the information is transmitted from person to person. They understand the weather icons and they mention that they are alerted when the heavy rainfall icon comes up. The text forecast is a good addition. The time periods are understood well.

As a suggestion to improve the forecast, they would like to have more on the long-term. Also, they would like to have more tablets. They would like to have information on wind.

As an example, when there is a lot of wind they could cut some leaves of the banana trees to make them less heavy, so the trees won't break.

The weather forecast is used for planning their activities. As an example, last year when they did not have the WF yet, they planted maize but the crops were lost due to a postponed rain season onset. They could have prevented this if they had the WF.

The rainfall forecast is mostly correct: they verify the WF themselves with the rainfall measurements. The group also uses the temperature forecasts, as this is important for certain crops.

They say the WF improves the crop yield a lot and they want others outside of the group to come see the results, as they recommend the WF.

### **15-03-2019 – KIVOGA-GR2**

Name group leader: NSENGIYUMVA Claude

Name chef du rain: MARIATUNGA Fabien

Name farmer: HITIMANA Thailisse

Here, I interviewed three people simultaneously who all view the WF daily. They do not always have an internet connection in the afternoon, but almost always in the morning they do. The WF is checked in the morning, simultaneously with the rain measurement at



7 AM. Most the time, the group leader and Chef du Rain look at the WF together and then tell the rest of the group about the expected weather. The WF is communicated through mouth-2-mouth conversations.

They use the WF symbols and find them useful. The sun/cloud symbol is interpreted as “no rain”, although they say that “no rain” not necessarily means no drops, a little shower is ok. Two drops are “significant rain”, while three drops are “too much rain”. They rather like a “no rain” forecast that turns out to be wrong (reality: it rains) than vice versa (“rain” forecast that does not occur). They also use the textual WF and are happy with the details given (e.g. amount of mm), which they use to compare with the rain measurements. They do not use the temperature forecast, as they have no feeling for degrees C. They would also rather have a textual forecast per day, instead of day2-4 and day5-8 combined. The group leader also uses the rainfall graph and can explain it in detail: the likelihood represents the chance on a certain amount of rain. For example, in the given forecast there is “36% chance on a large amount of rain”, while the next week there is less chance and the amounts are also less. This interpretation was spot on.

They have not many problems with the WF. Sub-daily WF would be appreciated (“when will it rain on the day”). Also they would like to be able to interpret the temperature forecast, they suggest to provide them with a thermometer so they can also compare the temperature. Information on high winds is also needed. One farmer also mentions “black rain” (?), which he would like to know about as it damages crops.

The rainfall forecast is used to change the planning of their activities: when rain is forecasted, they do not do farming activities. He gives two examples. Once, he planned to hire 10 people

to work on his land (20k BIF) but there was rain forecasted. The forecast was true and he therefore saved money by not hiring the people. Another time, they wanted to plant beans that do not grow well with a lot of rain, so they waited for a forecast without rain for a couple of days. This also worked, as the drier forecast was right. They say the rainfall forecast is 65% accurate. The temperature forecast is not used, as they cannot interpret it.

It is too short to say if the WF will help them to increase their yields, as they only use it for 3 weeks. However, with the two examples above they think it will definitely help them to save costs and increase yield. They would recommend the WF to all households in Burundi, everybody should use it. It helps to better plan activities and increase crop yield.

They are happy with the rainfall measurement set-up. Sometimes they have connection problems that are solved by sending a SMS to the key activator. Rainfall measurements are used directly to compare and verify the WF. For the past three weeks, the WF and RM align many times.

### **15-03-2019 – RUHANDE-GR1 & RUHANDE-GR2**

Name group leader GR1:  
SUGWIGANO Gerard

Name group leader GR2: (not known by us)



We met the two group leaders of these 2 groups combined, as the groups are very close together and also work closely together. They often discuss the WF and compare the rain measurements, they noted that sometimes the rain measurements do not align (“3mm here and 5mm there”) indicating the local character of some rainfall events. The WF is checked every morning at 6AM, in combination with the submission of the rain measurement. They have many connection problem with their tablet, but contact the KA about the RM and WF: e.g. look at the WF on the KA’s tablet. They look at the WF with a few people (2-4 people) and communicate it the other farmers.

They use the symbols of the WF and know where to find the explanations of the symbols. They take it very literal and use the forecasted mm directly. The sun/cloud symbol is interpreted as “no rain”, while the 3 drop symbol is interpreted as “more rain, a large amount”. A “no rain” forecast, while in reality it rains is bad for them as they plan accordingly. On the other hand, the vice versa example is also bad for them. They have no preference for the one or the other. They use the textual forecast and particularly use the amount of mm. They would like to use the temperature forecast (as for some crops a temperature range is given), but they do not understand the forecast and units degrees C. A thermometer would help them to interpret it. The rainfall graph is difficult to interpret for them and they hardly look at it.

As improvements/suggestions, they focus on the connection problems, which need to be solved by Auxfin-B. Weather wise, they would be interested in more detailed timing of the rain events (i.e. sub-daily forecast) and wind warnings for high winds. High winds are dangerous for crops, such as potato, beans, and banana, it is also dangerous for cattle.

They use the rainfall forecast to change their farming plans, he gave two examples. If there is a rainy forecast, they decide to not go to field today. Also, when there is a no rain forecast they decide to hire people to work on the field. If they hire people while it rains the entire day, a lot of money is lost. The rainfall forecast is 80% accurate, according to them. The temperature forecast is not used, as they do not understand.

They expect that WF will help them to increase their crop yield. With more information they can make better decisions: when to plant, when to work in the field. They are very happy to be better informed. Therefore, they also strongly recommend the WF for other people: "it is a very good development and people will be able to work with much more precision, leading to more production".

The rainfall measurement are performed every day at 6/7AM. The internet connection is a serious problem, so they send the measurement by SMS/WhatsApp to the key activator. They tested the rainfall transaction once in UMVA and find that it works well. They use the RM directly to compare with the WF and find it very useful as they can better interpret the WF. They are very happy about the RM and find that they all (!) align with the forecast.

**Additional notes from other farmers from the group.**

The group uses the WF and always have internet to look at it. Usually, they look at it around 8 AM in the morning. They get the weather forecast from the group leader. They use and interpret the weather symbols well, but like the textual version better. They would like to have the wind forecast. They use the rainfall forecast to plan the hiring of people. They also use the temperature forecast.

## 4 Interview form

# Weather Impact



### Questionnaire weather forecast in AgriCoach app

Date		Gender				
Name of interviewee		Age				
UMVA group ID		Profession				
Do you use the weather forecasts provided through the AgriCoach app?	<input type="checkbox"/> Yes / <input type="checkbox"/> No					
Do you always have internet service to look at the latest weather forecast?	<input type="checkbox"/> Yes / <input type="checkbox"/> No					
How often per week do you look at the weather forecast?						
At what time of the day do you mostly look at the weather forecast?						
How do you do look at the weather forecast: alone, with neighbour, with group leader, during village meeting?						
<b>Weather symbols</b>	Kuw 5	Kuw 6	Kuw 7	Kuw 1	Kuw 2	Kuw 3
Do you use the weather symbols?						
What weather type do these symbols represent, according to you?						
How would you interpret the above forecast?						
<b>Text weather forecast</b>	<p>Ejo, hari amahirwe menshi ko imvura igwa (6-18 mm). Ibipimo vy'ubushuhe bizoba biri hagati ya degre cersiyusi 14 na 25.</p> <p><small>Tomorrow, there is high chance of rain (6-18 mm). Temperatures will range from 14-25 C.</small></p>					
Do you use the texts?						
How would you interpret the above textual forecast?						
There are texts for today, tomorrow, day 2-4 and day 5-8. Which ones do you use, and why?						
<b>Rainfall graph</b>						
Do you use the rainfall graph?						
Can you explain what the graph shows?						
How would you interpret the forecast in this graph?						

Do you have any suggestions to improve the forecast? Weather symbols:  Textual forecast:  Rainfall likelihood graphic:	
What other information would you like to have: more weather variables, advices, etc.?	
Did you use the rainfall forecast to change your farming practices?	<input type="checkbox"/> Yes → How? <input type="checkbox"/> No → Why not?
According to your experience, how accurate was the rainfall forecast? (1 = not at all accurate to 4 = very accurate)	1 / 2 / 3 / 4
Did you use the temperature forecast to change your farming practices?	<input type="checkbox"/> Yes → How? <input type="checkbox"/> No → Why not?
According to your experience, how accurate was the temperature forecast? (1 = not at all accurate to 4 = very accurate)	1 / 2 / 3 / 4
Do you think the weather forecasts will help to increase your crop yield?	<input type="checkbox"/> Yes → How? <input type="checkbox"/> No → What would you need?
Would you recommend this weather service to others?	<input type="checkbox"/> Yes / <input type="checkbox"/> No

Questions about the rain gauge measurements, if applicable.

At what time do you usually measure the rainfall?	
What is your experience with submitting the rainfall measurement in the UMVA system?	
How can we encourage farmers to submit their rainfall measurements on a daily basis?	
Does measuring the daily rainfall help you to better understand the weather forecast?	<input type="checkbox"/> Yes → How? <input type="checkbox"/> No
Do the weather forecast and your measurements align?	<input type="checkbox"/> Yes / <input type="checkbox"/> No

Notes/suggestions: (e.g. on: rainy season, 'no rain', flooding, current season, water availability, farming advice)