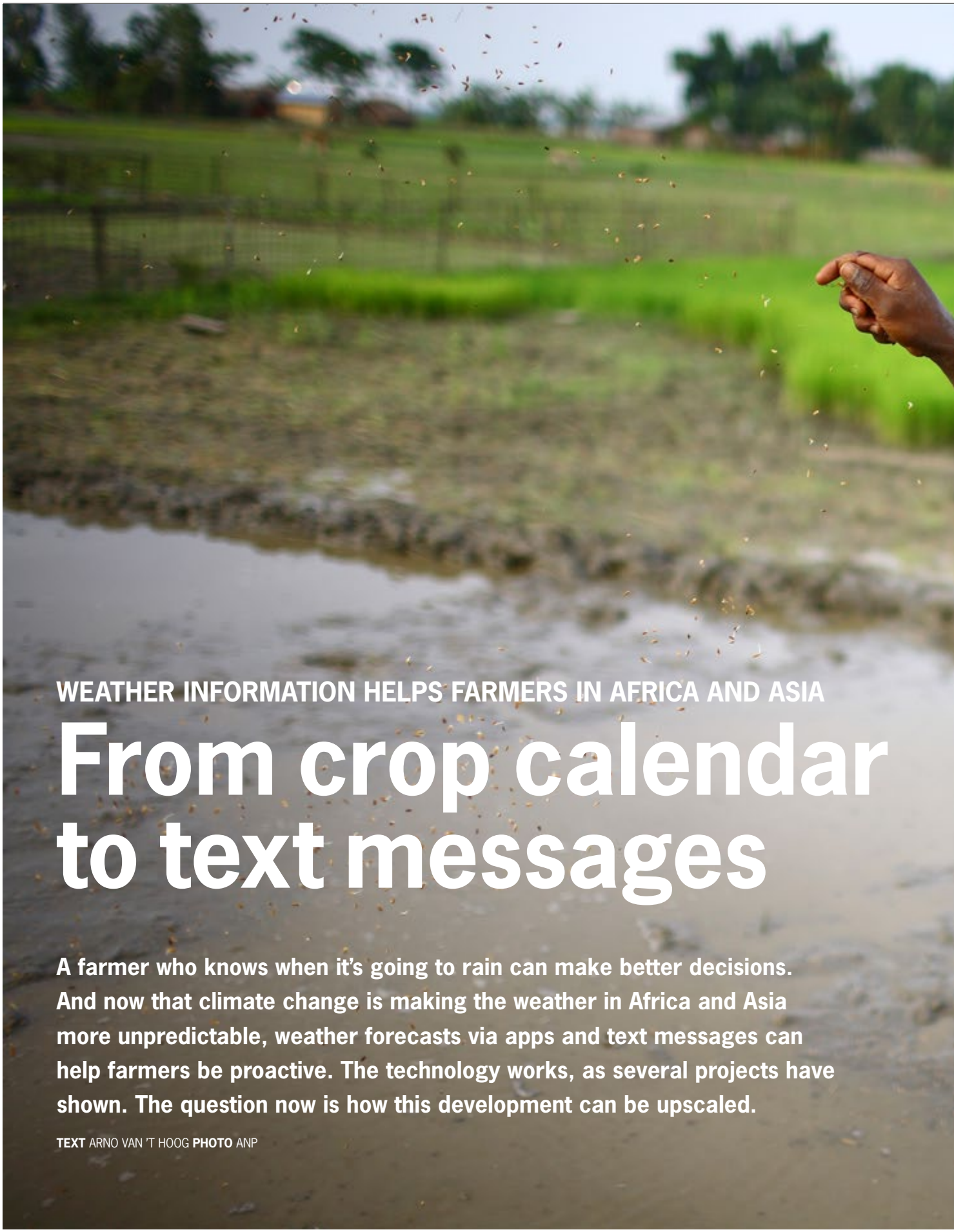

WEATHER INFORMATION HELPS FARMERS IN AFRICA AND ASIA

From crop calendar to text messages

A farmer who knows when it's going to rain can make better decisions. And now that climate change is making the weather in Africa and Asia more unpredictable, weather forecasts via apps and text messages can help farmers be proactive. The technology works, as several projects have shown. The question now is how this development can be upscaled.

TEXT ARNO VAN 'T HOOG **PHOTO** ANP

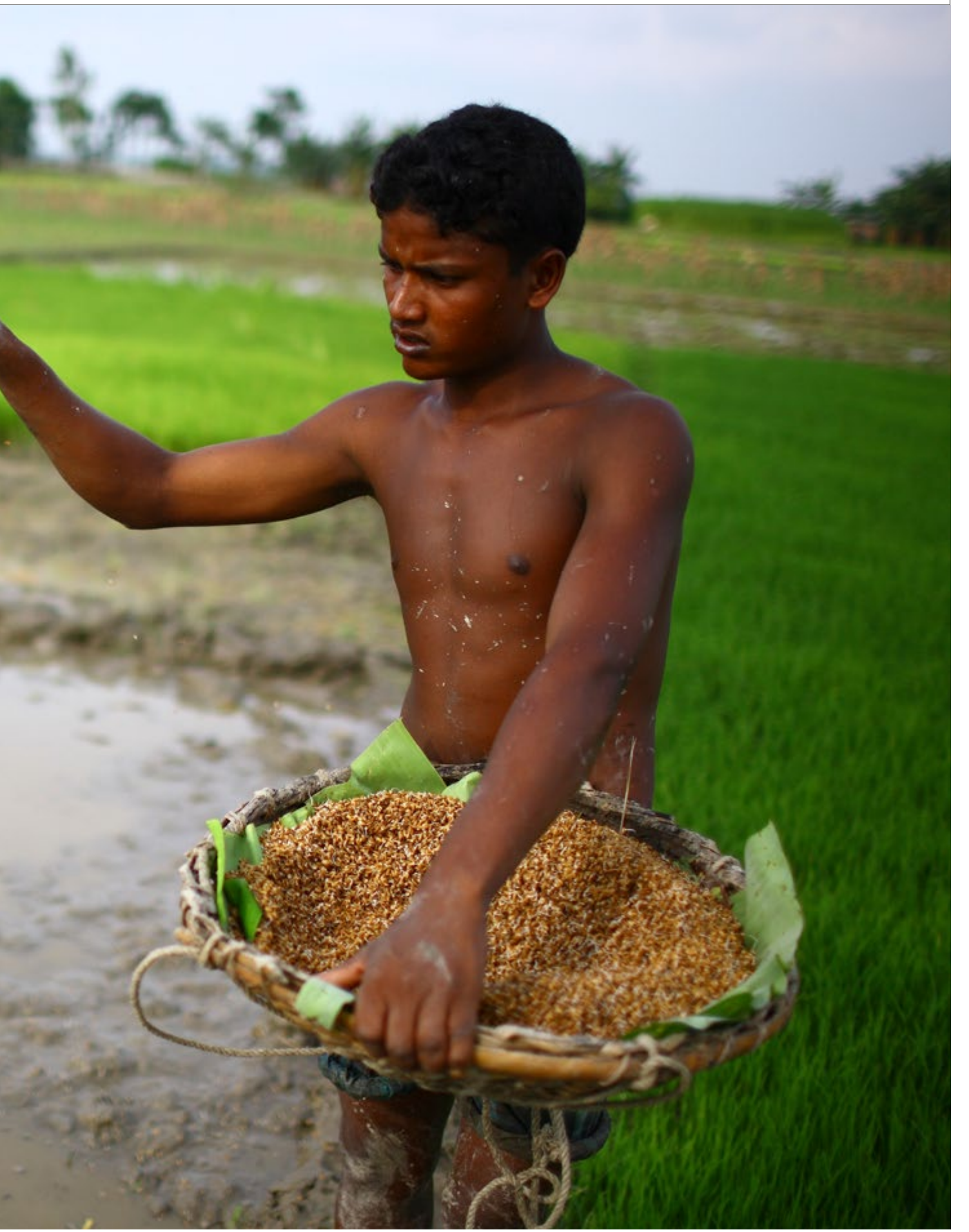

PHOTO BARON LATTIMORE, XACKLEY! STUDIO

WEATHER FORECAST BY SMS IN ETHIOPIA

Few sesame farmers in Ethiopia have a smartphone but most do have a mobile phone. In the G4AW project, weather information from satellites and other sources is transformed into a compact text message in the local language.

'For the sesame farmers in Ethiopia, the start of the rainy season used to be a reliable fixture. If you sowed when the rains came, things usually worked out well,' says Wageningen-trained meteorologist Gerrit Hiemstra. But now the sesame farmers face change and uncertainty. 'Nowadays the start of the rainy season is much more variable, and sometimes there is a false start: the rains seem to come, but then it is dry for a while again. Farmers have then wasted all their seed and they don't always have the money to sow again. Then there is no harvest that season. The farmers lack access to usable and detailed weather information, which could help them avoid harvest failures.'

In the past five years, Hiemstra and his meteorology and climate change consultancy company Weather Impact have worked on weather information services within the Dutch project G4AW: Geodata for Agriculture and Water. The aim of G4AW was to supply farmers and fishers in Ethiopia, Burundi, Indonesia and Myanmar with usable weather and agricultural information, partly based on geodata from Dutch satellites. Wageningen Environmental Research coordinated the project G4INDO for rice farmers on Java and, together with Weather Impact, was involved in the G4AW project CommonSense in Ethiopia.

'Two text messages a week can make a world of difference'

It's the 'last mile' that's important in these projects, says Hiemstra. How do you get weather information to the farmer? 'For the Ethiopian sesame farmers, we opted for sending text messages. Two text messages a week can make a world of difference, if you previously had to go by the calendar, the wind and bird migrations.' Most sesame farmers don't have a smartphone but do have a mobile phone. 'So we put the data from satellites and other sources into a compact message. In the local language too. About 40 languages are spoken in Ethiopia, many of them with their own script. A weather text message in Amharic looks really special. It sounds simple: sending an individual text message to 10,000 sesame farmers twice a week, specific to their location. But you need to know exactly where a sesame farmer lives. Collecting that data is a challenge in such a big country, where not everyone knows what a map is and how the place they live is shown on the map.'

The project was a collaboration between a sesame farmers' organization, the ministry of agriculture, a telecom provider, and researchers. Hiemstra: 'It takes several parties to get a project like that off the ground. You need the cooperation of various government services, and they are not always used to that. It just does take time and effort to build up those kinds of relations.' Such institutionalization is indispensable, though, for sustaining and improving a weather service in the long term. For good reason, that is one of the main conclusions in Weather Impact's report on the Ethiopian project, on which geo-information specialist Tomaso Ceccarelli of Wageningen Environmental Research worked on as well.

LACK OF WEATHER STATIONS

The Dutch meteorological organization KNMI has dozens of weather stations, a rain radar and wind meters, and farmers, businesses and amateur meteorologists collect precipitation and temperature data too. That knowledge is used to improve weather

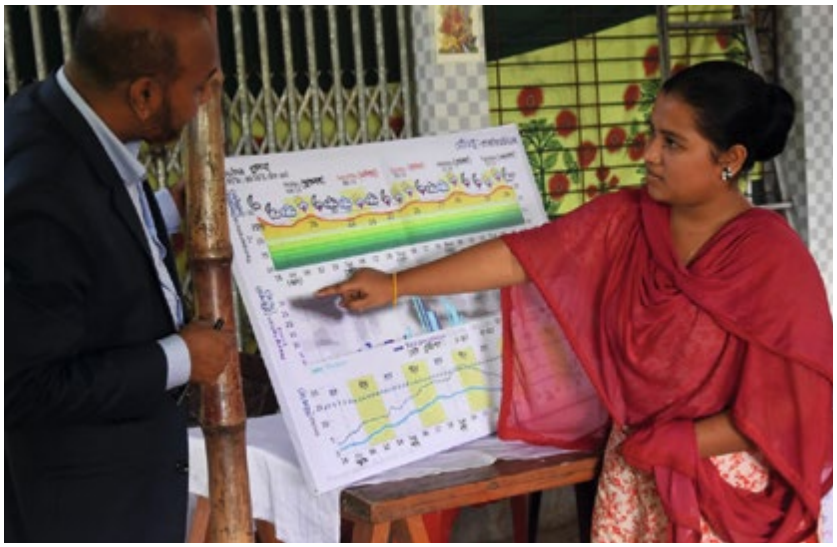

PHOTO METEOBLUE

DESIGNING TOGETHER IN BANGLADESH

In the Waterapps project in Bangladesh, agricultural weather information was designed in consultation with the users. The information is delivered via text message and an app, and is discussed in field schools and app groups.

models and to check whether forecasts are accurate. That knowledge is only available in Ethiopia to a limited extent because of an acute shortage of weather stations. There have been attempts to evaluate the forecasts using precipitation measurements, says Hiemstra. 'But then you are dependent on a handful of weather stations in a country twice the size of France. That lack of measuring data on the ground is a hindrance. It makes much of Africa a kind of blank space for atmospheric modelling. People are working on that, but it is a structural problem that is not easy to solve. The scale of the continent is deceptive too. The whole of Europe, the United States, China and India would fit into Africa. That makes it hard to come anywhere near the density of rain meters that there is in Europe.'

According to Hiemstra, the development of meteorology is lagging behind in many countries due to poor organization and a lack of financing. The same goes for the weather services for the sesame farmers. The evaluation shows that the farmers are satisfied. In the report on the project, Yelale Amebachew explains that television used to be the only source of weather information. He used the text messages to postpone sowing in the spring until the rains came, and to protect the harvested sesame and millet in the field with plastic against wind and rain. Hiemstra: 'If you can keep this up, it can really make a difference to sesame farmers. But keeping it up is precisely the problem. At some point, the research project will be over, and the money will be finished. The service stops then. Who is going to carry on providing this service? For hundreds of thousands of participants, the basic costs of the weather service are less than one euro per year per farmer. But the total costs mount up, of course.'

RESERVE A TRACTOR

Access to useful weather information could help improve food security in many countries in Africa and Asia, agrees professor Fulco Ludwig of Wageningen's Water Systems and Global Change chair group. He supervises PhD students in countries including Ghana and Bangladesh who do research on developing weather services geared to local farming communities and their needs and daily decisions. 'In Ghana, for instance, reserving a tractor is a critical moment for preparing the fields, because there is a shortage of machinery. That makes it important to know in advance when the rainy season will start and when you need to plough and plant.'

In recent years, Ludwig and his colleagues were involved in coordinating the Waterapps programme financed by the Dutch Research Council, NWO. Waterapps aimed at developing tailormade water information services for the urbanizing deltas of Accra in Ghana and Khulna in Bangladesh, to improve water and food security there. In delta regions, both periodic drought and heavy rainfall and flooding pose risks. Timely and precise forecasts help local communities to plan better, even in emergencies.

Various organizations collaborated in the Waterapps projects, including Wageningen researchers and PhD students, Wageningen Academy, local universities, governments and agricultural and meteorological services. The aim was to develop mobile information technology for sharing knowledge and weather forecasts. 'In Bangladesh, that led to a system of forecasts that were sent out by text message and discussed in weekly field schools. In Ghana, app groups were set up in which farmers discussed what they did with the forecasts.'

SILTED-UP RIVERS

By participating in projects aiming at more personalized weather forecasts, users learned to make better plans and decisions and to deal with climate change. Local knowledge about weather systems has become less reliable and people have >

PHOTO GETTY

PREDICTING SHOWERS WITH GSM MASTS

Telephone companies regularly check the signal quality, inadvertently also measuring whether it is raining, as rain diminishes the signal transmission between masts. 'For about 15 years, researchers have been trying to estimate precipitation by the way that telephone signal gets dampened,' says Ruben Imhoff, a PhD researcher at Deltares and WUR. 'Just like the rain radar, we are aiming to use these data for a short-range forecast of how showers develop. That is called nowcasting. You forecast the direction of movement and the development of the showers over the next few hours. We are already used to that on the KNMI's rain radar service, but we want to see if it can be done using this method too. The degree of precision depends on the location. There are a lot of masts in urban areas, but not in the IJsselmeer or the Wadden Sea, for example.

The water boards are particularly interested in more precise forecasting of extreme rainfall in the summer, so they can start draining polders in time. 'The weather models the water boards currently use are sometimes out by dozens of kilometres. It just is difficult to predict rainfall accurately.'

The new rain-measuring technology could also be of interest for countries where no precipitation radar is available, but mobile phones are. 'We know the measuring technique works in the Netherlands, but my colleagues are now testing it in Nigeria and Sri Lanka, where there are different weather systems. Showers can brew up in half an hour, and it rains much more heavily in tropical regions, so you need to find out whether the method estimates and forecasts precipitation reliably under those conditions too.'

a greater need for something to hold on to, says Ludwig. For example, in certain low-lying rice-growing areas of Bangladesh where irrigation channels and rivers are silting up due to drought. 'Every season, farmers face the choice: am I going to irrigate with saltwater this week, or shall I wait for the rain? If you know when it will rain, you can make that decision. As soon as rice plants germinate, they become sensitive to salt. But if you know it's not going to rain for a while, and everything is drying out, you would be better off irrigating a little bit. A lower yield is better than a failed harvest.' This influences choices like which crop to grow, which depends on how much rain is expected. Maize with a short or a long growing season, for example, says Ludwig. 'If there is not much rain coming, a variety with a short growing cycle is better. The weather forecast is important for the timing and dosage of fertilizer and insecticides, too. Spraying crops with pesticides just before a rainy day is not a good idea. Farmers in Bangladesh say they save money because of the better forecasts, by using smaller amounts of pesticide for instance.'

INTERPRETING DATA

App groups and field schools play a key role in the establishment of weather forecasting services, says Ludwig. You can't just introduce agricultural weather services from an app store in Europe. 'Designing and training – capacity building – in consultation is crucial,' he says. 'In the course of this project, we realized that taking part in the process of designing a weather service was an important learning experience for the participants. That is essential to fully understanding the weather information you receive. You need to interpret data, such as a 20 or 90 per cent chance of rain, which doesn't tell you exactly when the rain will fall. Or to realize that long-range forecasts are always less reliable. Through these kinds of app group, local of-

> ‘Am I going to irrigate with saltwater, or do I wait for the rain?’

ficials from the meteorological service also learn what kinds of weather information farmers need. In many countries, meteorological services still work closely with the agricultural sector.’

It is often somewhat younger and better educated farmers’ sons who pioneer these kinds of development, explains Ludwig. ‘Of course, you do need to be able to read and write. And more technology in agriculture also makes it a more attractive sector to work in.’

PhD student Talardia Gbangou published an article together with Ludwig on success factors in the project, after asking 22 farmers in Ghana about their experiences. The study revealed that as well as better day-to-day decisions, the stepwise structure of the project, gaining an understanding of the margin of error in weather forecasts, and the contact with colleagues all had positive impacts. Personal contact also increases trust, says Ludwig. At one point, a cyclone was on its way. The standard forecasts in Bangladesh sound the alarm three days ahead. ‘That is actually too short notice to respond. Thanks to a better model, we saw the storm coming seven days ahead. The communities we were working with were warned and went into action straightaway, removing trees and branches, and bringing cattle and feed inside before the area was flooded. They listened to our forecast because they knew us. If we had only offered a texting service or an app, we wouldn’t have achieved that.’

ECONOMIC INCENTIVE

So the system using apps and text messaging works, says Ludwig, although there is certainly room for improvement to the available data and forecasts. ‘In many countries there are hardly any observations such as rain measurements, and that makes it difficult to improve meteorological models or to test whether forecasts are correct.’ What is more, what farmers need most is usable weather information about two weeks in advance. In many emerging countries, meteorology mainly focuses on producing accurate daily forecasts for the aviation sector, says Ludwig. There is a more obvious economic incentive in air travel than in agricultural activities.

In Ethiopia, the G4AW projects wanted to develop a sustainable business model, says Hiemstra. ‘That was successful in nearly all cases. The technology works, and all that’s needed is a new financier or a market player who wants to invest. Long-term financing and continuity are the real bottlenecks in these kinds of development. The farmers can’t afford it, or barely, so it’s of little interest to a company. The Ethiopian government isn’t getting involved either, because it suffers a chronic shortage of funding. The same goes for the regular meteorological service in many countries. Meteorology is seen as an expense that doesn’t pay off directly.’

‘The biggest challenge is that of continuity,’ confirms Ludwig. ‘We have tried it now in a number of farming communities in Ghana and Bangladesh. Who is going to pay for the follow-up? The government or the market? The question is how you can go on upscaling and improving this development. How do you create weather products and users’ groups that can work with apps and training modules more independently? That is what I am pondering now.’ ■

www.waterapps.net
www.wur.eu/g4aw-commonsense

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PHOTO GUY ACKERMANS

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