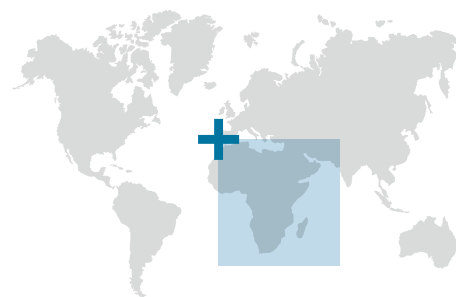


IN FOCUS: ACCESS TO DATA



SUBJECT

Agricultural insurance is a business transaction based on the quantification of risk. The basis for all calculations of risk exposure in agriculture is sound data. Lack of data makes insurance companies shy away from agricultural insurance, either because the uncertainty makes it impossible to calculate risk or because the cost required to generate data makes the business model unviable.

Generating data and making that data available to insurance companies is a key contribution from the public sector to the development of agricultural insurance. Insurers should have a right to access data that has been generated with taxpayers' money, for example, weather data generated by state meteorological administrations.

Providing this data for free to insurance companies is a smart way for governments to provide fiscal support for agricultural insurance. The government avoids market distortions and contributes to the competitive business environment by granting all insurance companies, public and private, equal access to data. The key rationale for providing data free of charge is that insurance companies incur less cost when developing products or monitoring the performance of their products, and, thus, are able to offer lower premium rates to farmers.

On behalf of

giz Deutsche Gesellschaft
für Internationale
Zusammenarbeit (GIZ) GmbH



Federal Ministry
for the Environment, Nature Conservation
and Nuclear Safety

CHALLENGES IN GHANA

The basis for designing insurance products which provide coverage for agricultural production is collecting and analysing data on farming households, agricultural production and agricultural conditions such as soil and weather data. This kind of data is needed for two purposes: a) to understand the risk profile of a particular insured unit (farmer level, village level, district level, province level) which is needed for insurance product pricing and b) for loss and claims assessments during or at the end of the season. Such information is readily available for large-scale commercial farms and plantations that often operate their own weather stations or rain gauges and have a production data track record. But approximately 60% of Ghanaian agriculture is composed of smallholder farming. Most of these small farms have an average landholding size of less than 3 acres and are only partially integrated into formal markets. Collecting data for these subsistence or semi-commercial farms was thus challenging for the project.

For the development of weather index insurance products, the low density of weather stations and a limited availability of high-resolution satellite-based rainfall data were stumbling blocks for the development of the Ghana Agricultural Insurance Program (GAIP). In 2012, the Ghana Meteorological Agency (GMet) had a total of 22 synoptic stations, 115 climatic and agro-meteorological stations, and 600 rain gauges, out of which only 156 were operational. Weather station density in northern Ghana was particularly scarce.

Another key issue was the limited financial and technical resources of the Ghana Meteorological Agency (GMet) to maintain weather stations, collect, store and manage weather data. Most of the rainfall gauges were operated by volunteers that were not provided with the necessary financial resources or technical support to transmit data. Many rain gauges were not operational at the on-set of the project.

SOLUTIONS

Established and maintained weather station infrastructure

Assessing weather station infrastructure. The IIPACC project supported its partners GAIP and GMet in assessing and analyzing the status of the weather station density, quality, data reliability and data availability in the whole of Ghana. The project team travelled through the country and physically assessed weather stations and rain gauges according to pre-specified criteria and guidelines. The assessment looked at the location, availability and condition of equipment, regularity and accuracy of the data collection as well as the availability and skills of staff operating the weather stations. Based on the assessment, the investment priorities and training requirements were defined, both in terms of technical capacity and geographical coverage of the weather station infrastructure.

Specifying the technical outline of infrastructure.

The project team discussed with GMet the purchase of new weather stations. Location of the new stations was selected based on the weather station assessment study and demand for insurance coverage. The project partners developed technical specifications for weather stations and prepared tender documents. A key consideration besides the cost was the robustness and maintenance of weather stations.

Purchasing weather stations. With support from IIPACC the GMet acquired and installed 18 automatic weather stations (AWS) in 2011, purchased a further 18 in 2012 and installed 4 of them, and installed the remaining 14 weather stations in 2013. Through the strategic partnership with the USAID ADVANCE project, a further 5 stations were purchased and handed over to GMet.

Dealing with operational and maintenance issues: Several training courses for installing and maintaining AWS were carried out targeting key personnel from GMet in Accra and the regional offices. Five months after installation in 2011, a number of the AWS were not transmitting data properly. An investigation revealed that the main problem was low battery voltage. The manufacturer of the AWS supplied spare batteries and solar panels to ensure a constant power supply of the stations. To avoid any interruptions in data transmission, GMet had to ensure that sufficient credit was maintained on the weather station SIM Cards at all times.

Setting up a data processing system. IIPACC also helped to set up the required IT infrastructure including a server, database and data analysis software that allows for timely processing and analysis of weather data. A Memorandum of Understanding (MOU) between GMet and GAIP was signed to organize the regular flow of data from GMet to the Technical Management Unit (TMU) of GAIP. This process was supported through IT trainings focused on setting up and maintaining servers, as well as data transmission and analysis.



LESSONS LEARNED

Establishing or improving a weather station network is expensive. A proper analysis of the required geographical density of weather stations and the minimum technical capacities of the system thus helps to keep investment costs low.

Weather stations have to be suitable for the environment and climatic conditions they are exposed to. The decision on hardware, data logger, appropriate sensors and data transmission depending on the intended purpose and users of the data. The hardware has to be easy to install and ready for use. A simple technical design ensures that even low skilled technicians in rural areas are able to properly maintain the weather stations.

The investment efficacy can be increased if the weather stations are used not only for insurance purposes but also to generate information that is useful for the daily operations of farmers, for example, to determine optimal planting or harvesting periods.

Electricity in many rural areas remains a challenge. Power supply solutions for AWS have to thus fit the local context to ensure the

uninterrupted collection and transmission of data. Spare batteries and solar panels are simple but practical solutions for this issue.

The flow of data can be interrupted due to seemingly minor issues, for example insufficient credit on SIM cards to transmit data. Therefore, the weather station network and data management software has to be designed in a way to quickly discover data interruptions, make plausibility checks and provide alerts to staff in charge. The availability of trained technicians is critical to ensure that problems are identified and solved in a timely manner.

Data processing systems are as important as the physical weather station infrastructure. Setting up servers, and installing and running data processing programs require both financial resources and skilled IT experts. Questions such as database size, software requirements, access rights, configuration changes, IT security including a backup concept need to be considered. A timely and reliable processing of data is essential to ensure that insurers accept the data, insurance payouts are calculated on time, and farmers receive compensation fast.

OUTCOME

Between 2011 and 2013, IIPACC assisted with the purchase and installation of 36 AWS. The weather stations were placed in seven out of ten regions of Ghana. As of 2016, GMet has 22 synoptic stations, 132 climate substations (of which 116 are operational), and 300 rainfall stations.

Despite the installation of weather stations to complement GMet's network, many farmers in Ghana are too removed from the nearest station (more than 20 km). GAIP thus also uses satellite-based rainfall estimates (Africa Rainfall Climatology, RFE 2.0) provided for free by the US National Oceanic and Atmospheric Administration (NOAA) to complement weather station data with satellite-generated rainfall data.

The project assisted in setting up a data management and analysis system. GMet provides the rainfall data needed for loss and claims assessment in the insured areas at the end of each month to the TMU of GAIP within 15 days. The data is processed at TMU where the trigger levels of the insurance products are monitored.

During project implementation, IIPACC helped to develop and market two index insurance products in four regions of Ghana. During the project's lifespan, 6,116 farmers were insured. In 2012 and 2013 weather stations installed by IIPACC across the Northern part of Ghana registered long dry spells. The AWS recorded data triggered payouts to farmers in these areas.





Automatic weather stations

An automatic weather station (AWS) is a traditional weather station that has been automated to either enable measurements from remote areas or to save human labour. An AWS typically consists of a weather-proof enclosure containing the data logger at the heart of the AWS, as well as a rechargeable battery, telemetry (data transfer mechanism, e.g. via mobile phone technology) and the meteorological sensors with an attached solar panel and mounted upon a mast. Most automatic weather stations have a thermometer for measuring temperature, an anemometer for measuring wind speed, a hygrometer for measuring humidity, a barometer for measuring pressure and some of them include a rain gauge for measuring rainfall. The specific configuration varies and depends on the intended purpose and users of the data (e.g. Ministry of Water Resources, Ministry of Agriculture, Department of Disaster Prevention, academia, insurers?)

This needs to be considered in the specification of the system and sensors before it is purchased and installed. Other important considerations are: Where will the stations be placed? Are those locations connected to the electricity and communication grid? What about security/ manipulation resistance? What are the climatic conditions the stations will be exposed to? What are the maintenance requirements and who will maintain the station regularly? What about spare parts? What level of data accuracy is needed?

In the case of Ghana, GMet decided to purchase a solar panel-supported weather station system with a back-up rechargeable battery to be independent of the electrical grid's power supply. The AWS sensors included measurements for temperature, relative humidity, rainfall, wind speed, wind direction and solar radiation. Furthermore, the data transmission using the mobile communication system was chosen, which is capable of sending data hourly from the weather station directly to an FTP server located at the GMet headquarters in Accra.

Name of programme:

Innovative Insurance Products for the Adaptation to Climate Change (IIPACC)

Duration:

December 2009 – June 2014

Programme area:

Ghana (countrywide)

Cooperation partner:

National Insurance Commission Ghana

Local partner:

National Insurance Commission Ghana, Ministry of Finance, Ministry of Food and Agriculture, Ghana Insurers Association, Ghana Meteorological Agency

Target group:

Actors in the agricultural value chain, such as smallholder farmers, commercial farmers, input suppliers, extension services, processors, financial institutions, lending to the agricultural sector

Contact person:

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