



From open weather data to accessible weather information services for smallholder farmers

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CTA Policy Brief

Weather data and services derived from weather data have a high potential to enhance support for smallholder farmers in taking operational decisions on farm management. Plant growth is driven by weather variables and therefore agricultural production is directly dependent on weather conditions. Many agricultural activities (e.g. sowing, harvesting, and fertiliser application) are dependent on weather conditions for planning and effectiveness. Given this, all agricultural stakeholders are interested in some form of meteorological data. This Policy Brief outlines the importance and benefits that can be derived from weather data in agriculture and nutrition, the challenges in the weather data value chain and recommendations to address these challenges.

Having access to accurate, localised weather information is crucial for farmers to make well-informed farm management decisions, like timing irrigation and fertilisation and harvesting. This access also allows for effective risk mitigation.

Access to open data and particularly weather-related data was identified as a key factor in transforming agriculture and nutrition by the G8 in 2013. Open data is simply defined as data that can be used, re-used, shared and built-on by anyone, anywhere, for any purpose. By making meteorological data available as open data it not only becomes easier to share, but also allows the development of specialised information services by infomediaries targeting specific user needs and the prediction of suitable conditions for farm activities.

Scope and severity of problem

About one in nine people on earth suffer from hunger and malnutrition and the world's population by 2050 will reach 9.1 billion. Nearly all of this population increase will occur in developing countries and FAO estimates a 60% increase in food production by 2050.

Weather represents the greatest opportunity – and risk – in the agriculture sector. Climate change presents major risks for long-term food security and developing countries

may suffer the greatest share of damage in the form of declining yields and greater frequency of extreme weather events. For example, studies indicate that the aggregate negative impact of climate change on African agricultural output up to 2080-2100 could be between 15 and 30 percent¹. While 80% of the necessary production increases needs to come from increases in yields and cropping intensity, a continuous linear increase in yields at a global level, following the pattern established over the past five decades will not be sufficient to meet food needs².

The challenge is therefore for technology to assist in addressing this problem. Data has risen high on the food security policy agenda. The last decade has seen an exponential increase in the volume and types of data, and the benefits of open data for agriculture are potentially huge. In many areas of the world, agriculture is already a data-driven business, with precision farming making extensive use of GPS, weather, and satellite data, alongside soil information and crop production statistics.

Providing value-added services for smallholders using open weather data in developing countries is challenging for several reasons, such as a lack of infrastructure within meteorological departments, a lack of technical skills and capacity and a lack of incentives and viable business models to sustain the release of more weather data. It will require collaborative efforts and

¹ How to Feed the World in 2050, Food and Agriculture Organization of the United Nations. Rome, 2009.

² The future of food and agriculture – Trends and challenges. Food and Agriculture Organization of the United Nations. Rome, 2017.

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partnerships to develop localised services from raw weather data. Effective use of the data will require increased engagement with farmer communities; increased use of open data standards to ensure interoperability and the addressing of major capacity gaps in the open weather data value chain.

Why open data?

For data to be considered 'open', it must be accessible online, available in a machine-readable format, and have a license that permits anyone to use it. As such, open data is a vital link to increase efficient and effective decision-making, to increase innovation (because of better insights for solutions), and to increase transparency as people can follow developments.

Open data with the use of analytics have begun and closed to affect every node in the agriculture value chain and, in the process, are redefining operations, competition and strategy within and between the various circles. For example:

- Research institutions developing new drought and stress resistant varieties require access to frequent reliable weather data.
- Agriculture dealers such as input suppliers, breeders and others need access to data on localised weather conditions to optimise their products, prioritise their production, and improve recommendations to farmers.
- Information technology and mobile service providers need to develop solutions that will provide farmers with daily weather data and agronomic alerts through SMS messaging, smart phone apps and videos.
- Extensionists require data and information on current conditions including weather;

pests, diseases, and crop stress, in order to provide accurate advice and early warning. Better information across the value chain empowers the smallholder farmer.

- Insurance providers require access to weather data to determine the risk of rainfall or temperature variability or extreme events and the appropriate cover options of weather index-based insurance.
- Smallholder farmers in developing countries can now receive real-time weather forecasts, alerts, and field recommendations generated through mobile service providers on a basic cell phone.

These are just some ways that localised, field-level weather and agronomic data can have a greater impact. To ensure sustainable agricultural systems, there is need to explore new opportunities on how to deliver more open data to add more value and deeper impact to the agricultural value chain.

One such example is an innovative project funded by CTA³ that has helped farmers in the Gezira irrigation scheme, Sudan, to more than quadruple their wheat yields while conserving water and other key inputs. Using satellite data and mobile phones, farmers participating in the project received field-specific information, irrigated their crops more often, but applied less water than non-participating farmers, and increased their yields.

Policy recommendations

1. Capacity building tailor-made for all stakeholders in the value chain

Capacity gaps occur at all levels in the open weather data value chain. At the data provider level, it is about building the data infrastructure including technical support

Weather data for agriculture



Forecasting

(Model based on weather stations)
www.openweatherdata.org



Agriculture monitoring tools

e.g. Famine early warning



Index-based insurance

Open data archives



Specific alerts E.g. Irrigation

- Satellite image with models
- SMS delivery

³<http://bit.ly/1TJF3oV>

and understanding the end users' needs through feedback mechanisms.

At the intermediary's level, capacity is needed on how to interpret and translate raw data into actionable information. A better understanding of sound business models and good entrepreneurship skills is also needed. Improved communication skills and understanding the farmers is important for intermediaries to apply human centred design skills for their services. They also need to understand what is essential when providing climate information services to increase productivity, resilience, and mitigation/adaptation.

Awareness about the importance of (open) data needs to be raised at the level of end users, the consumers of the weather information services. They need more knowledge about data rights and the quality of data used in services. Furthermore, they need a better understanding on how to interpret data for planning and changes in their farming practices.

Skills cascading models are necessary and the creation of train-the-trainer networks will reduce duplication of efforts through better cooperation and communication. Investors should also not be overlooked as many are not aware or do not fully understand the opportunities in the open weather data value chain.

2. Increased technical support for data collection and exchange

Sustainable publishing of high quality data in standard forms is an important element of a strong data infrastructure. To ensure that weather data can be easily accessed, used and shared requires the use of data standards. Data standards are documented, useable agreements that help organisations to publish and exchange data in consistent ways. Presently with observational data, one of the challenges is that different stations work with different standards and produce data that is not easily interoperable. It would be a step in the right direction if some collaborative work were done to improve this. An example of this can be found in the recently launched map of agri-food data

standards⁴ and the open data standards directory⁵, which has a wider scope.

Some key recommendations for better use and usability of weather data standards:

- Address discovery issues relating to weather data (improving use of discovery metadata to help catalogue and describe data)
- Improve the documentation and self-description of existing data standards (creating developer documentation; publishing existing vocabularies in new ways); offer community support; Q&A services
- Identify 2-3 key code lists that should be published in more linkable, versatile formats; link key code lists and publish existing alignments; provide web services for cross-walks.

3. Developing viable business models

The key issue for sustainability is developing solid business models, beyond project funding and subsidies. Business models that provide incentives for various entities to collect and share weather data. If these models provide business value directly to the data providers, the quality of the collected data will also be higher. One telecoms company in Southern Africa, for example, is providing agro-input advisory services including weather information via SMS to smallholders. They have managed to sell the service (EcoFarmer) and sustain it by providing it as a bundle, which includes other services that smallholders require, e.g. funeral insurance.

4. Partnerships and collaboration

Co-creation in the open weather data value chain, bundling services, and packaging different data sources requires collaboration with many stakeholders. Such broader focus and engagement can only be achieved in Public Private Partnerships (PPPs) or multi-stakeholder constructions to offer ways to combine all the skills, perspectives, and options that could optimise market opportunities and find solutions for challenges, including monetising on investments.

In partnerships, all stakeholders have their own roles and responsibilities to add

⁴ <http://vest.agrisemantics.org/>

⁵ <http://datastandards.directory/>

value and reduce costs. They therefore can create trade-offs between initiatives and stakeholders on which competition can be channelled. Governments have a role to drive this process creating an environment in which PPPs or multi-stakeholder partnerships can thrive.

5. Measuring impact

Impact measurement is often forgotten, but it is critical to ensure weather data services are made sustainable in the long term.

Context, however, is crucial to assess the potential impact of open data initiatives.

Key considerations include:

Favorable policy environment

- Political will and commitment in supporting transparency and open data
- Legal framework: clear rules and legislation

Technical environment

- Access to ICT for data providers, intermediaries, end users

Economic environment

- General business climate
- Co-development opportunities (e.g. PPPs)
- Innovation capacity

Skilled stakeholders

- Technical skills
- Communicational skills
- Economic skills, e.g. knowledge of organisation development business models
- “E-readiness”

Accessibility

- Availability of reusable data (FAIR – Findable, Accessible, Interoperable, Reusable).

Conclusion

Weather data is used by providers of ICT services, extensionists, and farm advisors to generate added value through combining this data with soil data, crop data, agronomic knowledge and bringing this knowledge to farmers through a variety of services. Providing weather data-based support to farmers goes beyond being familiar and being able to work with weather data. It requires a broader view on standards, capacity development, entrepreneurship, partnerships and impact measurement.



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About the series

CTA Policy Briefs provide a concise summary of a particular issue of relevance to the Centre’s activities, the policy options to deal with it, and some recommendations on the best option. They are aimed at policy-makers and their technical advisors, academics and educators working in the policy field and others who are interested in formulating or influencing policy.

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