

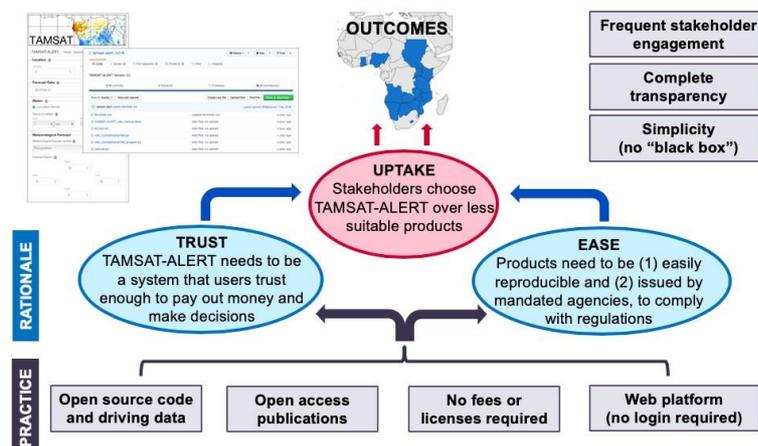
## Using Open Research to mitigate the impact of adverse weather on agriculture in Africa

Professor Emily Black and Dr Ross Maidment discuss the TAMSAT Agricultural Early warning system (TAMSAT-ALERT), an open monitoring and decision support tool which helps stakeholders in the African agricultural and financial sectors assess the potential impact of adverse weather on agriculture. The application of Open Research principles has directly increased the uptake and impact of TAMSAT-ALERT, particularly in the financial sector, where transparency in decision-making is essential.

Early warning of weather-related hazard is crucial for a range of decision makers, from policy-makers to local farmers, to mitigate their exposure to risk. **TAMSAT-ALERT** is a framework that combines multiple sources of information on historical weather, land surface properties and forecasts with a well-established impact model to quantitatively assess and anticipate the risk of meteorological hazards to agriculture across Africa.

Motivated by the needs of stakeholders, we were prompted to adopt a number of open practices as we developed and implemented TAMSAT-ALERT:

- We made the TAMSAT-ALERT source code publicly available via GitHub<sup>1</sup>. This allows users to run TAMSAT-ALERT within their organisations and contribute to the source code. It also demonstrates transparency, which is essential in the financial sector where independent verification by re-insurers and regulators is often required.
- We developed TAMSAT-ALERT to run using publicly available data. This ensures that no fees or licences are required to run the system.
- The science behind TAMSAT-ALERT has been published in three Open Access articles<sup>2 3 4</sup> ensuring the research is accessible by everyone.
- We involved various non-academic stakeholders in the research process, giving them full access to code and data. This was critical so that the outputs of the system accurately targeted the requirements of the users.
- We built an open web-based interface to serve TAMSAT-ALERT, providing freely accessible outputs with no login required<sup>5</sup>. In this way, there are no barriers to accessing TAMSAT-ALERT outputs.





TAMSAT meeting, Kouthiakoto  
Ndene village, Senegal  
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The development of TAMSAT-ALERT as an open resource has not been without its challenges. Underpinning the system is a drought model which had to be developed in-house because existing models were only available for research and not publicly available, which meant they were unsuitable for the targeted users of TAMSAT-ALERT. We also had to develop downscaling technologies to use openly-available lower-resolution driving data, because the preferred higher-resolution products were only available under licence.

TAMSAT-ALERT has produced recognised benefits across Africa. It has been used to support insurance products and forecasts for 2.6 Million farmers in Zambia over 2 years. Key to this success was the ability to replicate outcomes by the re-insurers and regulators. Elsewhere, TAMSAT-ALERT has improved evidence-based decision support for planting date and rainy season onset for over 500,000 farmers in Mozambique and Malawi.

We have learnt a great deal during the development of TAMSAT-ALERT. Developing systems to support low-income countries requires tools that are open, especially as there has to be a high level of trust between the developer and user. Using proprietary licensing models limits the applicability of methods and hence take-up, because licence restrictions may prevent potential users from developing value-added products. Transparency in the development process is also critical for trust, even if this means exposing mistakes and coding errors.

Open Research has made the success of TAMSAT-ALERT possible and will be critical to its ongoing development. We are planning new applications and development of this system, for example through take-up by other meteorological agencies and regional centres.

### Open at a glance

- Online tool delivering benefits to thousands in Africa built on open data and code, with Open Access papers on underlying science
- Transparency about methods and materials builds trust with stakeholders and increases collaboration
- Open licensing encourages re-use and development of value-added products
- Development challenges where other parties did not release models and data under open licences

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### References and further information

1. TAMSAT-ALERT Version 1.0. Source code. <https://github.com/tamsat-alert/v1-0>
2. Asfaw, D. et al. (2018). TAMSAT-ALERT v1: a new framework for agricultural decision support. *Geoscientific Model Development* 11: 2353-2371. <https://doi.org/10.5194/gmd-11-2353-2018>
3. Brown, M. et al. (2017). Monitoring drought in Ghana using TAMSAT-ALERT: a new decision support system. *Weather* 72: 201-205. <https://doi.org/10.1002/wea.3033>
4. Black, E. et al. (2016). The use of remotely sensed rainfall for managing drought risk: a case study of weather index insurance in Zambia. *Remote Sensing* 8(4): 342. <https://doi.org/10.3390/rs8040342>
5. TAMSAT-ALERT. Website. <http://52.171.139.33/tamsat-alert>