Policy Brief

SUSSEX SUSTAINABILITY RESEARCH PROGRAMME | APRIL 2021

Forecasting for food producers

EXECUTIVE SUMMARY

This policy brief shares lessons from Sussex research in climate and environmental sciences that contributes to Sustainable Development Goals (SDGs) relevant for food producers such as farmers, fishers and pastoralists. It oulines four research initiatives that involve climate modelling, weather forecasting and early warning systems (EWS) to help people better understand and prepare for weather extremes – especially storms, floods and droughts. We worked with planners, forecasters and communities across Sub-Saharan Africa and South Asia to co-produce weather knowledge. These initiatives share the mission of the Sussex Sustainability Research Programme (SSRP) – providing science for the SDGs. They are in line with SDG13 (Climate Action) targets 1–3 – to enhance local resilience and adaptive capacities to deal with weather-related hazards and disasters, integrate climate change measures into national policies, and improve people's awareness and capacity for climate change adaptation, impact reduction and early warning systems. This work with food producers takes us closer to SDG2 targets 1–4 of ending hunger and malnutrition, doubling farm productivity through knowledge and other inputs, and sustainable food production through resilience and adaption to climate change.

PHOTO: FISHERS OF SOUTH INDIA BY MAX MARTIN / ROYAL GEOGRAPHICAL SOCIETY

RECOMMENDATIONS

Link forecasters with forecast users and create a feedback loop to improve forecast accuracy, access, usability.

Forecast across different spans of time and space in line with early warning systems (EWS) and disaster risk reduction (DRR) interventions.

Improve forecasts, backed with robust observations, modelling and analyses.

Provide forecasting with better weather information at different lead times – days, months and sub-seasons.

Streamline forecasts with metrics of flood and drought EWS and DRR. Give forecast users different response options, including financing for better preparedness and preventive action.

Co-produce weather information products with forecast users, taking into account their local needs, traditional knowledge and cultural factors that determine forecast uptake and usage.

Promote seamless forecasts, streamlined with safety and sustainability initiatives in synergy with user groups.

CITATION

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UNIVERSITY OF SUSSEX | institute of development studies | Royal Geographical Society with IBG — Advancing geography and geographical learning

HIGHWAY

The high impact weather lake system (HIGHWAY) project aims to deliver regular weather forecasts and severe weather warnings for fishing boats and small transport vessels on Lake Victoria. It is part of the Weather and Climate Information Services for Africa (WISER) initiative funded by UK Aid.

Approximately 5,000 fishers die each year on Lake Victoria and livelihoods of 40,000 people are affected. In this context, indigenous, locally produced, traditional knowledge-based weather forecasts play a considerable role in the decisions of fishers in Lake Victoria.

The project is being delivered by the World Meteorological Organization (WMO) in collaboration with the UK Met Office, the US National Center for Atmospheric Research (NCAR), the Lake Victoria Basin Commission and the National Meteorological and Hydrological Services (NMHSs) of Kenya, Rwanda, Tanzania and Uganda, and the East African Community (EAC).

Early studies by the WISER programme indicate that only 20% of fishers use meteorological forecasts from local met offices. Sussex researchers were invited to develop a regional research network and facilitate enhanced uptake of weather warnings by making them more relevant and usable, with local knowledge and terminology. Sussex has helped develop a methodology that blends local, indigenous and traditional knowledge-based forecasts with those from the meteorological offices. This methodology is now being trialled in the riparian states to explore its applicability across different scales and contexts.

PHOTO: FISHERS AT LAKE VICTORIA, UGANDA BY SARAHEMCC (CREATIVE COMMONS)

Recommendations:

1. Promote traditional and indigenous forecasts that share characteristics similar to meteorological forecasts in terms of uncertainty over time and space.
2. Clearly communicate risks to fishers' safety.
3. Acknowledge that different ontologies, epistemologies and commonalities of different weather knowledge systems provide the basis for a dialouge to integrate different forecasts.

ASTROCAST

The STFC-GCRF funded research project Applying Astronomy Data Analysis to Enhance Disaster Forecasting (AstroCast) used advanced data analysis techniques on earth observation data to forecast vegetation condition, a key indicator in many drought early warning systems.

In drought-prone Sub-Saharan Africa, early action based on early warning can save lives and resources. However, existing early warning systems focus on monitoring, rather than forecasting the environmental and socioeconomic indicators of drought. AstroCast used satellite-based indicators of vegetation condition, specifically Normalised Difference Vegetation Index (NDVI) and the Vegetation Condition Index (VCI), over pastoral livelihood zones in Kenya as indicators of drought.

Using data from MODIS and Landsat satellites, scientists applied linear autoregression and Gaussian modelling methods (often used in astrophysics) to provide forecasting ahead of drought events. This method helped the Kenyan National Drought Management Authority (NDMA) predict drought events four weeks ahead.

Recommendations:

The methods developed by AstroCast can help policymakers, disaster risk managers and other key stakeholders to understand the state of vegetation in pastoral areas in advance of drought events. This will allow people to access resources and develop procedures to adapt to drought impacts.

Future research needs to improve forecast skill for drought impact indicators with clearly-defined triggers and thresholds. Further, people need access to financial systems across various timescales before the disaster occurs.

FORPAC

Forecast-based Preparedness Action (ForPAC) aimed to improve forecasts of extreme rainfall, flooding and drought, over 'seamless' lead times from days to months; and enhancing forecast uptake by integrating forecasts into operational flood/ drought EWS using a systematic anticipatory approach called Forecast-based Action (FbA). The project involved two case studies in Kenya: the national Drought Early Warning System (DEWS) with a pilot in Kitui County; and flood management in Nairobi and the Nzoia river. The study found that Kenya and the wider East Africa region make a 'sweet spot' for weather/climate predictability at seasonal and subseasonal lead-times; offering a strong potential to use forecasts.

This means that using the best performing global forecast models could improve forecasting skill. It became clear that FbA could enhance credibility and salience of forecasts. However there are technical, financial and institutional barriers.

Recommendations:

1. Promote better interface between forecast producers and users. Allocate dedicated resources for anticipatory action.
2. Take a long-term perspective on risk management, using probabilistic, skill assessed forecast information and early action. Monitor and reward forecast dissemination and use across systems.
3. Institutionalise FbA into the national early warning system and sustain it. Integrate and streamline institutional mandates, using strong national risk management policies.
4. Make forecasting seamless with new forecasts at sub-seasonal lead times.
5. Issue forecasts in line with metrics used in the EWS at critical phases to aid decisionmaking. Synergise EWS across agencies and actors.
6. Promote national ownership of information flows.
7. Build technical capacity of risk managers to interpret new forecasts and define triggers for action.
8. Be transparent about forecast skill to enhance trust and forecast uptake.

PHOTO: VILLAGERS NEAR MOUNT KENYA BY ALAMY (CREATIVE COMMONS)

FORFISH

Forecasting with Fishers (ForFish) was funded by the Sussex Sustainability Research Programme (SSRP), Royal Geographical Society and UKRI-GCRF. ForFish investigated co-producing weather forecasts for safe and sustainable artisanal fishing in South India. In the context of frequent accidents at sea involving fishers, forecasts were tailormade in line with the local practices and risk cultures.

Forecast accuracy was tested through in situ and satellite observations and consultations with fishers. We find that co-production makes weather forecasts more accessible and useable at the last minute. It also contributes to filling the gap between what marine weather forecasters disseminate and what artisanal fishers recognise as useful inputs for decision-making. The study shows that even when the forecasts are accurate, fishing decisions are not entirely based on weather-related risk factors, but they take into consideration the availability of abundant fish, and hence the prospect of large catches and a good income.

Recommendations:

1. Make forecasts more precise in time and space, and more relevant to specific groups of fishers. This requires better

observations, forecast skills, toolkits and a feedback loops.

2. Disseminate weather information through multimedia, i.e. mobile phones, social media, streaming, FM radio and two-way wireless sets.
3. Bring forecasters and fishers together. Share knowledge and concerns, and build trust.

CONCLUSION

All four of these research initiatives favour user-led, seamless forecasting with a clear action components. Three of them show that a close interface between forecasters and forecast users can create feedback loops and contribute to better forecast accuracy, access and usability. Concurrently, there is a clear case for forecasting across different spans of time and space in line with early warning systems (EWS) and disaster risk reduction (DRR) decisions. Such user-led forecasting falls broadly within the scope of effective climate action (SDG13). Effective forecasting also reduces hunger (SDG2) and poverty (SDG1) and enhances the resilience of local communities to climate change in line with multiple other Sustainable Development Goals (SDGs).

Regarding policy recommendations, firstly there is a clear need for better forecasting skills, backed up with robust observations, modelling and analyses. This should lead to seamless forecasting with new and improved weather information with different lead times, i.e. days, weeks, months and subseasons, for specific geographical areas and user groups.

Second, forecasts need to be streamlined with metrics used in early warning systems (EWS) at critical phases of disaster risk management. Integrating forecasts into operational flood and drought early warning could considerably enhance their relevance, effectiveness and uptake. Forecast users should have access to different response options, including financing.

Third, there is a need to foster a synergy between communities, local officials, forecasters and scientists to co-produce useful weather information products. Local and practical knowledge can inform such co-production. Such a close interface will give the forecasters a better understanding of local needs and cultural factors that determine forecast uptake.

In short, the mantra of forecasting effectively for food producers is: streamlined forecasts for safe and sustainable food production in synergy with user groups.

FURTHER INFORMATION

This policy brief is an outcome of the mini-symposium titled 'Forecasting for food producers' that featured Sussex research in climate and environment for safer and more sustainable food production. The mini-symposium was sponsored by the Sussex Sustainability Research Programme (SSRP), and was part of the dissemination activities of the 'Forecasting with Fishers' research project supported by SSRP and the Royal Geographical Society (RGS).

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