



PHOTO: YAHYA ABAWI

MODELS OF PREDICTION

Australian climate experts have developed models to predict seasonal water availability in Indonesia, helping farmers make more productive crop choices

BY CATHERINE NORWOOD

With little capacity to collect water for irrigation in either regional or on-farm storages, the many smallholder farmers on the Indonesian island of Lombok rely on rainfall to make their rivers run and provide water for their crops.

Australian scientists from the Queensland Centre for Climate Change Excellence (QCCCE) have been working with ACIAR and Indonesian Government agencies to develop climate and water-availability models for Lombok. The aim is to improve decision-making about irrigated cropping and increase profits for farmers, through a better understanding of long-term rainfall trends.

Project leader Dr Yahya Abawi, formerly with QCCCE and now with the Australian Bureau of Meteorology, says an analysis of past climate data shows that during La Niña weather patterns there is enough water to irrigate three crops in a year across most of the island—usually two rice crops followed by a break crop. Typically in a La Niña event, farmers can plant 100% of their land with the first rice crop, 80% with a second rice crop, and 50% of their land with a third crop.

“However, in an El Niño event, like the current one, there is likely to be water for only 95% of the first crop,” Dr Abawi says. “And water availability will decline dramatically for further crops, particularly in the east, which is generally drier and more strongly affected by El Niño.”

With a limited capacity to store water or regulate river flows, more accurate climate data are essential to helping the community plan for climate variability by providing more accurate seasonal outlooks.

The Australian team, through the ACIAR project, has developed the Flowcast model to analyse historical data and current weather

conditions and provide forecasts of likely rainfall and stream flow to Indonesian agencies. The project has also trained staff at Indonesia’s meteorological agency (Badan Meteorologi Klimatologi dan Geofisika) to use the model. The outputs from Flowcast are then used in an integrated quantity and quality model (IQQM) tailored to the Lombok irrigation system.

Staff at Indonesia’s University of Mataram use information from the Flowcast and IQQM models for the CropOptimiser software, also developed as part of the ACIAR project. CropOptimiser analyses the complex climate, water and market factors to identify the most profitable alternative crops, given the likely water availability.

Farmers generally focus on rice crops for food security, which typically use 12–15 megalitres per hectare, although government regulations prevent them from growing three consecutive rice crops in order to provide a break for pest and disease control.

Dr Abawi says the aim is to identify those seasons when water availability is limited—and how limited it will be—to help farmers make choices about alternative crops that will use less water and will reach harvest. Soy and corn, using 4–5 ML/ha, are popular choices.

While some parts of the island have access to supplementary water for irrigation from community-owned embungs (small dams) or from groundwater, these sources are generally reserved for high-value cash crops such as tobacco, which are hand-watered.

Farms in Lombok average only 1,000 square metres, so the crop decisions of any individual farmer have a limited impact on water available to others, or on the oversupply of produce. However, recommendations about crop selection are often made at a subregional level by farmer cooperative committees. Recommendations at

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this level can significantly affect market supply.

These committees include representatives from government agencies, community elders, religious leaders and farmers. About 75% of farmers on Lombok have had no schooling and rely on the cooperatives for direction. Dr Abawi says the committees provide an important link between the science community, government agencies and farmers, and offer the best avenue of providing relevant information to growers.

While the three models—Flowcast, IQQM and CropOptimiser—each stand alone, together they provide a comprehensive planning toolkit in climate, water and agricultural management that can improve decision-making in Lombok. For the moment local expertise behind the use of the models is limited, but Dr Abawi hopes it will continue to grow with further training opportunities and as users become more familiar with the scientific approach.

He says one of the challenges has been to improve the links between different agencies, as well as to provide information for growers in a way that will be accepted in communities where traditional knowledge and beliefs are still the foundation for many farm decisions. Partnerships such as this between Australian and Indonesian scientists can positively influence traditional beliefs by presenting modern ideas in a practical context that farmers can apply and benefit from. ■