



PHOTO: BRAD COLLIS

New rules for irrigation

By evaluating farmers' water scarcity in the context of the whole landscape, an ACIAR team is helping to develop new approaches to problems of sandy soils and low water availability in Vietnam's coastal farming regions

BY DR PETER SLAVICH*

Cashew farming offers promise to expand agricultural production and reduce poverty in one of Vietnam's poorest regions. Utilising wet season run-off for irrigation use in the dry season is vital to expanding this production, but requires some changes to how farmers approach water management.

Like most crops, cashews have stages of development that are sensitive to water stress, in particular those from flowering through to nut fill. On the southern central coast of Vietnam these stages coincide with the dry season, a coincidence that necessitates irrigation.

The region has up to eight months of dry season, which is also hot and humid. The coastal river flood plains are prone to flooding

in the wet season and are mainly used for rice. The coastal zone and lower foothills of the river valleys are used for mixed farming, with both ground and surface-water resources for irrigation. Upland soils are subject to erosion in the wet season and many also have acidic subsoils. Farm incomes in the region are low and constrained by low soil fertility.

Farmers in the region currently use a rule-

of-thumb approach to irrigation and there is a need for cost-effective tools to help them decide when and how much irrigation water to apply. This can vary widely with soil, crop and climatic conditions.

An ACIAR-funded project is currently evaluating mini-evaporation pans as an irrigation-management tool for tree crops in the southern central coast of Vietnam.

Taking part are Southern Cross University in Australia and the Vietnam Academy of Agricultural Science, together with the Vietnamese National Institute for Soils and Fertilizers and Department of Agricultural and Rural Development.

The mini-evaporation pan is installed in the farmer's field and observed daily. When evaporation causes the water in the pan to fall to a critical predetermined level, then it is time to irrigate. This level varies depending on the water storage capacity of the soil, the depth of the main root zone and the size of



infrastructure if they are to use irrigation more effectively. This may be as simple as installing irrigation mains with several outlets or submains to transport water across their orchard. Alternately, investment in suitable pressurised drip or micro-sprinkler systems could be introduced if cost-benefit analysis indicates the expenditure is justified. ■

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the tree canopy. The amount of irrigation water applied is also guided by these factors. The mini-evaporation pan is refilled at the start of each irrigation event and the process starts over.

Results from field trials for the 2008–09 season indicate that cashew farmers who used the mini-evaporation pan irrigated every 4–5 days and applied about 500 litres of water per tree. This compares with 2,000 L per tree every 15 days under the rule-of-thumb approach.

Overall, irrigation based on the mini-evaporation pan resulted in reduced water use and higher yields. Evaluations of the mini-evaporation pan are continuing into the 2009–10 season, with an additional adjustment based on using the watertable depth as a trigger for commencing the irrigation season, as opposed to existing practice where many farmers currently use the end of the Tet holiday as a trigger to commence the irrigation season.

Work undertaken so far indicates that farmers will need to change their irrigation



GEOGRAPHY / CLIMATE

- Driest area of Vietnam
- Wet season 3–4 months duration
- Coastal, plains and mountainous regions
- Salinity present in coastal aquifers and soils

FARM

- 73% smaller than 2.45 ha
- Mixed enterprise – rice main crop
- Soils are sandy with acidic subsoils – lowering ability to hold moisture and nutrients
- Groundwater salinity common
- Water shortages in dry season common
- Labour in short supply

PRACTICES – PRESENT

- 95% of farmers extract water from wells for irrigation
- Use of hand-held hoses or irrigated flooding at flowering
- Use of manure for soil improvements
- Use of inorganic/mineral fertilisers applied on experimental rules basis

CHANGES TO PRACTICES

- Time water applications using simple on-farm indicators
- Mini-evaporation pans used to indicate frequency of irrigation
- Use of bio-char from rice husks
- Apply fertiliser to bio-char
- Uses of standardised bunds

A farming snapshot – understanding the problem

ACIAR-funded project teams often work closely with farmers to establish new practices to boost agricultural productivity. A key component of this work is understanding the influences on farmers, from the climate and land they work with, through to constraints such as labour availability.

The project to improve water and soil resources for tree crop production surveyed 150 farms in Ninh Thuan and Binh Dinh provinces in 2007 to gain insight into farming practices used in the region, particularly for water and nutrient management. A follow-up with 15 farm case studies examined management practices, revealing a range of yield differences for cashew crops, from 0.4–2.5 t/ha, depending on variety, irrigation and nutrient inputs. Key findings are summarised in the diagram on this page.



Water and soil resources for tree crop production

Sandy soils (arenosols) occupy 900 million hectares, or 7% of the Earth's land area, and pose many constraints to agriculture, particularly when they occur where there are seasonal hot dry tropical climates.

Arenosols in the tropics usually have low water and nutrient-holding capacity due to their low organic matter content and clay contents. Carbon storage capacity—typically less than 0.5%—is limited by the low surface area available to bind with carbon compounds and low volume of small pores, which protect carbon from microbial activity.

This means farmers who are reliant on sandy soils need carefully designed and well-integrated water and nutrient-management systems to increase their productivity and reduce adverse effects on groundwater and soil acidity.

In the southern central coast region of Vietnam there are more than 500,000 ha of sandy soils that are derived from weathered granite, alluvial deposition and aeolian coastal sands.