



Adapting integrated crop management technologies to commercial citrus enterprises in Bhutan and Australia

Overview

Citrus is one of the most important agricultural commodities to the economy of Bhutan providing valuable export income for the country and also income and employment for at least 60% of the rural population. However the average fruit yield of only 4 tonnes to the acre is well below other Asian counties such as Thailand and Taiwan. Traditional cultural practices and the lack of adoption of new management practices is a major impediment to achieving the Bhutan government target of 100,000 tonnes of citrus fruit exports to Bangladesh and India.

This project builds and expands on the key issues identified as being critical to maintaining and improving citrus production in Bhutan. It follows on from a previous project which aimed to introduce the use of citrus rootstocks, the concept of demonstration farms and irrigation, pest and disease management strategies, development of high health status propagation material and the training of a dedicated citrus team.

ACIAR project number	HORT/2010/089
Start date and duration (years)	1 April 2012 5 years
Location	Bhutan
Budget	\$1,236,483

Project leader(s) and Commissioned Organisation

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Distribution of protein baits to farmers in the Tsirang



Research

The key objectives of the project are:

- » to improve nursery production practices, establish high health status mother trees, collect and secure local citrus germplasm in an insect proof screen-house and introduce a selection of commercial citrus varieties from Australia for local evaluation
- » to improve knowledge and management of key citrus pests and diseases
- » to improve citrus management practices, tree nutrition and evaluation of water supply options for the orchard
- » to build the capacity of Bhutanese scientists, extension agents and leading farmers through in-country training and 4 week training visits to Australia for key personnel

Achievements

Additional funding supplied by ACIAR to upgrade/repair insect proof structures at the National Citrus Repository, Mithun.

115 citrus accessions have been collected and propagated at the National Citrus Repository, Mithun along with the establishment of commercial citrus varieties introduced to Bhutan for evaluation.

Improved potting mix trials confirming the use of a more 'free draining' potting mix had a positive and significant effect on citrus seedling growth.

Pathology specific visits to Bhutan in October 2015 and April 2016 finalised the data collection for a linked PhD project on Huanglongbing (HLB) citrus disease incidence, transmission and insect vector activity.

A training workshop on 'Area Wide Management of Citrus Fruit Fly' was conducted in March 2016 by the National Plant Protection Centre at Tsirang in southern Bhutan for extension agents and agricultural officers to update results and maintain awareness of the ACIAR supported program.

Seven demonstration orchards are now established across 6 citrus producing districts.

'Nursery Irrigation Management' and 'Soil and Water Management' courses were delivered by Australian project staff and the training manager from 'Irrigation Australia' in April 2015 to improve the skills and knowledge of Bhutan Ministry of Agriculture and Forests staff (MoAF).

Training visits to Australia included a group tour in June by five senior MoAF officers to familiarise with the Australian citrus industry, a 4 week 'Citrus Variety Evaluation' program for a senior scientist in July and a 'Biometric course' and trial design program for 2 research officers in October 2015.

Impact story

Chinese citrus fruit fly (CCFF) infests citrus fruit causing premature ripening and subsequent fruit drop. Yield losses can be as high as 80% in severely affected orchards in Bhutan. In 2013 an area wide management program involving 230 farmers in the Tsirang district was initiated. Farmers received training on fruit fly biology and management approaches with refresher training in 2015. The aim of the program was to mobilise the community for a collective approach to fruit fly management. A key activity being the collection and destruction of fallen fruit to reduce the infective population of flies. A complimentary measure is the use of protein bait lures to attract and kill the fruit fly.

The area wide approach was also tested in the adjacent district of Dagana, Drujegang sub-district where 11 farmers were selected to assess their total fruit yield and income before and after the program. Production and monetary returns generally improved as a result of the fruit fly mitigation program with 9 farmers having increased yield and 10 reporting an increase in cash income.

The area wide approach to fruit fly management is an on-going initiative with the main Bhutanese fruit fly entomologist beginning PhD studies on fruit fly control at an Australian university in 2015. The new skills, knowledge and contacts developed in Australia will return with him to Bhutan at completion of his studies.



Soil pit and citrus root distribution training at Wengkhhar