



Australian Government

Australian Centre for  
International Agricultural Research

Crops

# Developing a foundation for the long-term management of basal stem rot of oil palm in Papua New Guinea and Solomon Islands

## Overview

Oil palm is economically the most important crop in both Papua New Guinea (PNG) and the Solomon Islands (SI). In some places it is the only source of income other than garden produce. In South-East Asia, especially Malaysia and Indonesia, vast areas are under oil palm cultivation.

Basal stem rot (BSR), caused by the fungus *Ganoderma boninense*, is a slowly progressing infection, posing a major threat to the oil palm industry. Stands of palms with BSR levels of up to 20% are still economically viable, but levels above that lead to loss of income. Incidence of BSR has been steadily rising with each new re-planting and has reached 43% in some parts of SI.

The only viable long-term control of BSR is using more resistant planting material. Identifying susceptible germplasm requires twice yearly sampling for at least six to seven years after planting. Association of markers with resistance or susceptibility to BSR would allow for early culling of susceptible progenies and removal of susceptible parents from breeding programmes. The project has established and is monitoring an orchard of trees from 81 families in a block infected with BSR, so that trees with different phenotypes (susceptible, tolerant or resistant) can be identified and their genetics analysed.

As of January 2018, the disease has spread throughout the trial of 81 families. The project was extended to 30 June 2021 to allow the completion of the phenotyping and the genotyping to increase the chances of detecting variability in disease traits.



## KEY FACTS

**ACIAR Project No.** CIM/2012/086

**Duration:** July 2014 to June 2021 (7 years)

**Target areas:** Papua New Guinea and Solomon Islands

**Budget:** A\$1,317,209

### Project Leader

Ian Godwin, University of Queensland

### Key partners

- PNG Oil Palm Research Association (PNG OPRA)
- New Britain Palm Oil Ltd (Guadalcanal Plains Palm Oil)
- Solomon Islands Ministry of Agriculture and Livestock

### ACIAR Research Program Manager

Dr Eric Huttner

## Objective

**The project's overall aim is to improve the livelihoods of smallholders and communities dependent on oil palm through greater productivity and sustainability of production.**

### The project's three main objectives are to:

- Better understand disease development and pathogen-host interactions.
- Develop and deploy tools to support selection for tolerance or resistance.
- Assist smallholders and the SI Ministry of Agriculture and Livestock to understand the epidemiology of *Ganoderma* infection in oil palm plantations, and how to monitor and manage BSR outbreaks to minimise losses.

## Expected scientific results

- Better understanding of the pathogen-host interaction and BSR development.
- Collection of data from the field trials (both yield and susceptibility traits) enabling the development of more robust molecular markers linked to desirable and undesirable traits.
- Assessment of pathogenic aggressiveness within the population of *Ganoderma* isolates from the field trials, not been done before in SI.
- Transcriptomics of oil palm infection by *Ganoderma* providing data on the types of genes expressed in both host and pathogen and insight into possible modes of infection.
- Microscopic analyses of early stages of infection for more data on BSR establishment.
- Allelic analyses of key genes involved in lignin biosynthesis in the host and in key genes involved in lignin degradation in the pathogen.
- Better tools for selection of suitable germplasm and breeding.
- Improved linkage map of oil palm by incorporating DArTseq RAD markers.
- Improved nursery pathogenicity test for faster screening of susceptible material.

## Project outcomes:

- Detection of variability for disease traits in the 81 families trialled.
- Identification of the genetic basis for the variability detected in the trials.

## Expected outcomes beyond the project, if successful:

- Elimination of the most BSR susceptible germplasm from breeding programmes and cultivation.
- Development and introduction of new germplasm, helping to reduce the loss of income and allow farmers to continue to plant oil palm in high disease-risk areas.
- Inclusion of palms more resistant/tolerant to BSR in breeding efforts in the long term, helping to prevent high yield loss and reduce effects on export revenues for SI and PNG.

