ENHANCING SMALLHOLDER COCOA PRODUCTION THROUGH IMPROVED PEST AND DISEASE CONTROL

*Cocoa and Coconut Institute of Papua New Guinea, Locked Bag 1846, Rabaul 611, East New Britain Province, PNG
*The University of Sydney, Sydney 2006, NSW

INTRODUCTION
An estimated 150,000 smallholder families produce over 80% of cocoa in Papua New Guinea (PNG). The annual production of 42,000 tonnes p.a. supplies 2% of the world cocoa market (1). The smallholder industry emerged out of a plantation based industry. Before the crisis, cocoa was also a major plantation in Bougainville, and with the recent cessation of hostilities a smallholder cocoa industry is now emerging.

The current average yield of 300 kg dry beans/ha is less than half of what was produced on plantations. Smallholder farmers typically grow cocoa as a source of supplementary income and invest little time or money on farm management. Yield losses, mainly due to Phytophthora pod rot and canker (Phytophthora palmivora) and vascular-streak dieback (VSD, Oncobasidium theobromae), cause losses estimated at 40%. Improved cocoa management and higher yields are hampered by the lack of information about, and poor adoption of, new technologies.

We have developed a series of management options that recognize the individual aspirations and resource limitations of smallholder farmers. The benefits and costs of "low", "medium", "high" and "very high" Integrated Disease and Pest Management (IDPM) packages are presented at village meetings. On-farm demonstration plots are established in highly visible areas near roads or commons through participatory action research (PAR). Responsibility for initiating, implementing, maintaining and demonstrating these options is shared between lead farmers – trained as "village cocoa protectionists" – and Cocoa and Coconut Institute (CCI) extension staff. We aim to transform the industry from the current 90% low input to 50% medium input farms.

MATERIALS AND METHODS
Disease surveys Farmer surveys were conducted in three cocoa growing regions of PNG (Madang, East New Britain and Bougainville) to establish the socioeconomic context of cocoa production, current levels of farmer knowledge of cocoa management methods and research and extension requirements. CCI staff monitored pod yields and disease incidence monthly in several plots in East New Britain over 12 months.

Integrated Disease and Pest Management (IDPM) Options Low, medium, high and very high input options were developed and presented to farmers through PAR and on-farm demonstrations (Table 1). IDPM training is scheduled with local cropping cycles and farmers are taught via hands on training during establishment of the plots. PAR farmers monitor their plots and collect their own data so they can assess the changes in productivity.

RESULTS AND DISCUSSION
Adoption By mid-2007 over 1500 farmers have been trained and more than 108 PAR trials established. Participating farmers and their neighbours are increasingly choosing high and very high management options and reporting significant yield increases. PNG smallholders are investing in cocoa for the first time.

Table 1. IDPM options for smallholder farmers in PNG.

<table>
<thead>
<tr>
<th>IDM Input</th>
<th>Activities</th>
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<tbody>
<tr>
<td>Low</td>
<td>Current practice (minimal)</td>
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<tr>
<td>Medium</td>
<td>Sanitation, weekly harvest, pruning, weed control</td>
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<tr>
<td>High</td>
<td>Option 2 + fertiliser, manure, manual canker treatment,</td>
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<td>Very high</td>
<td>Option 3 + chemical canker treatment &amp; insect management</td>
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Disease surveys Over 95% of 108 farmers surveyed had no knowledge of cocoa disease and pest management, and had never received any first-hand training in cocoa management. The only technology adopted by PNG cocoa farmers are improved genotypes bred at CCI. Young trees are carefully tended, but only visited for harvests once mature. Farmers enthusiastically embraced the IDPM options presented and the rate of initial adoption approached 100% in regions such as Bougainville. We will continue to monitor adoption rates.

Effect of IDPM options on yield and disease incidence Cocoa yield increases with an increase in inputs. Sanitation, weekly harvests, pruning to optimize humidity and shade and insect control all contribute to an increase in yield, and a reduction in disease incidence due to P. palmivora (Figure 1). The uptake of options amongst farmers using the PAR approach is high, and over 80% of farmers prefer the higher input options.

![Figure 1. Effect of IDPM options after one year on the ripe cocoa pod harvest (columns) and the incidence of disease due to P. palmivora (line), the cause of black pod and canker, on a typical demonstration plot in East New Britain, PNG.](image)

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REFERENCES