

# Cocoa Pod Borer

## Measuring Loss

Rob Lockwood

# Engineer's Advice

If you can't measure it, you can't control it



# CPB infestation causes crop loss in seven distinct ways:

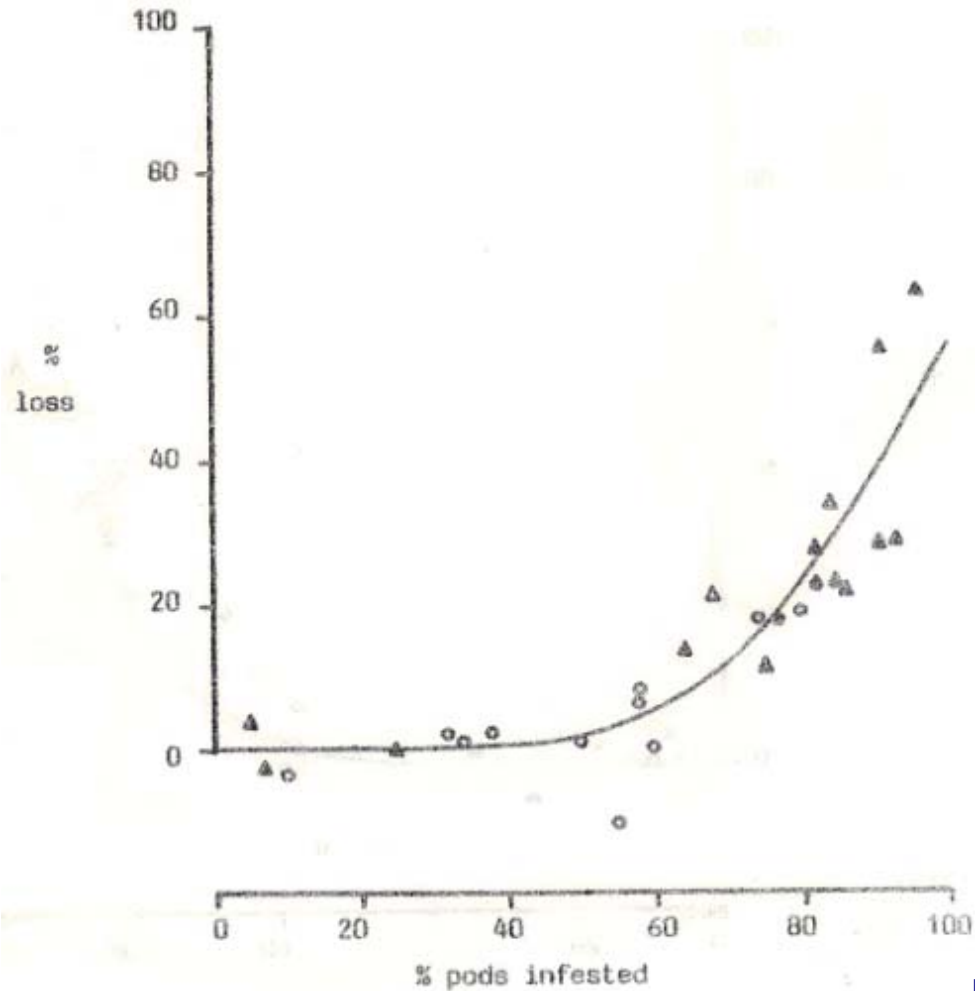
- outright loss of crop because pod development is aborted
- smaller beans in pods that do ripen
- beans that can not be extracted from the pods
- premature ripening of pods
- premature harvesting that reduces bean weight
- reduced cocoa butter content due to both interrupted development and harvesting pods under-ripe in an effort to minimise loss
- resources put into CPB control could be used to improve the crop in other ways

# According to Roger Day

“Once inside the pod, the tunneling becomes less directional. In general, the larvae stay within the pith on the inside of the pod wall and surrounding the beans, or in the funicle, but particularly the young larvae not uncommonly penetrate the testa of the developing beans, and, contrary to some reports (e.g. Entwistle, 1972, Wood, 1980), sometimes the cotyledons may be attacked. Bean feeding appears to be commoner in younger pods, possibly before the alkaloid content of the beans has built up.”



## Relationship between loss of bean dry weight and pods infested



Key:

- Amelonado, peak crop
- Amelonado, trough crop
- △ Hybrid, peak crop
- ▲ Hybrid, trough crop

R. Day (1985). PhD thesis,  
Imperial College London

# Chong-Lay Teh, Joe Thau-Yin Pang and Cheng-Tuck Ho

Effect of cocoa pod borer infestation on the  
weight of wet cocoa per pod.

Source – Crop Protection (in the press)

Clone	Weight of Wet Cocoa per Pod (g)		% Reduction in Weight (Over all pods harvested)
	Apparently healthy	Infested	
AMAZ15-15	120.6	101.4	14.3
BAL244	147.1	128.0	24.9
BR25	116.6	105.6	13.5
IMC23	155.8	139.8	18.9
KKM22	147.5	124.9	12.7
PA13	114.3	108.1	15.6
PBC123	121.5	92.9	18.1
TAP1-2	115.0	97.7	4.8
Mean	129.8	112.3	13.2
SED (range)	9.472-10.71	9.472-10.46	



# PRIMA Insecticide Trial

	Uninfested	Infested	SED
All treatments			
Conv ratio %	34.8	32.5	0.45
PV/kg	29.3	33.6	0.80
Bean wt g	0.91	0.84	0.014
Sleeved			
Conv ratio %	33.7	29.4	1.26
PV/kg	30.8	36.0	2.01
Bean wt g	0.88	0.83	0.064

# PRIMA Trial

## Estimated % loss

(compared to apparently uninfested)

	Conv Ratio	Pod Value	Bean Weight
All treatments	6.6	12.8	7.7
Sleeved pods	12.8	14.4	5.7

# Complex Effects of CPB Control Measures

Many of the measures recommended for control of CPB are good husbandry practices. Although their adoption may increase yield in the presence of CPB, how much better would they do in its absence?

# Assumed Yield Components

It has been argued that there is a “standard” conversion ratio, pod value or bean weight in a particular situation and that any shortfall is a measure of CPB damage. Long term yield component analyses in the absence of CPB show that such approaches can be an approximation at best

# Precision and Accuracy

- *We may* be able to measure traits like pod value or conversion ratio reasonably repeatably. Perhaps we can argue that they are related to loss, though we may be unable to quantify that relationship
- What accuracy of loss estimation do we need? If our argument for controlling CPB is that it causes economic loss, we certainly need more accurate estimates than we have at present

# Conclusion

If we can't measure it we can't control it

.....seems to be truer than we  
thought for CPB losses!