Workshop with Kokonas Indastri Koporesen (KIK)

# Rhinoceros beetle damage

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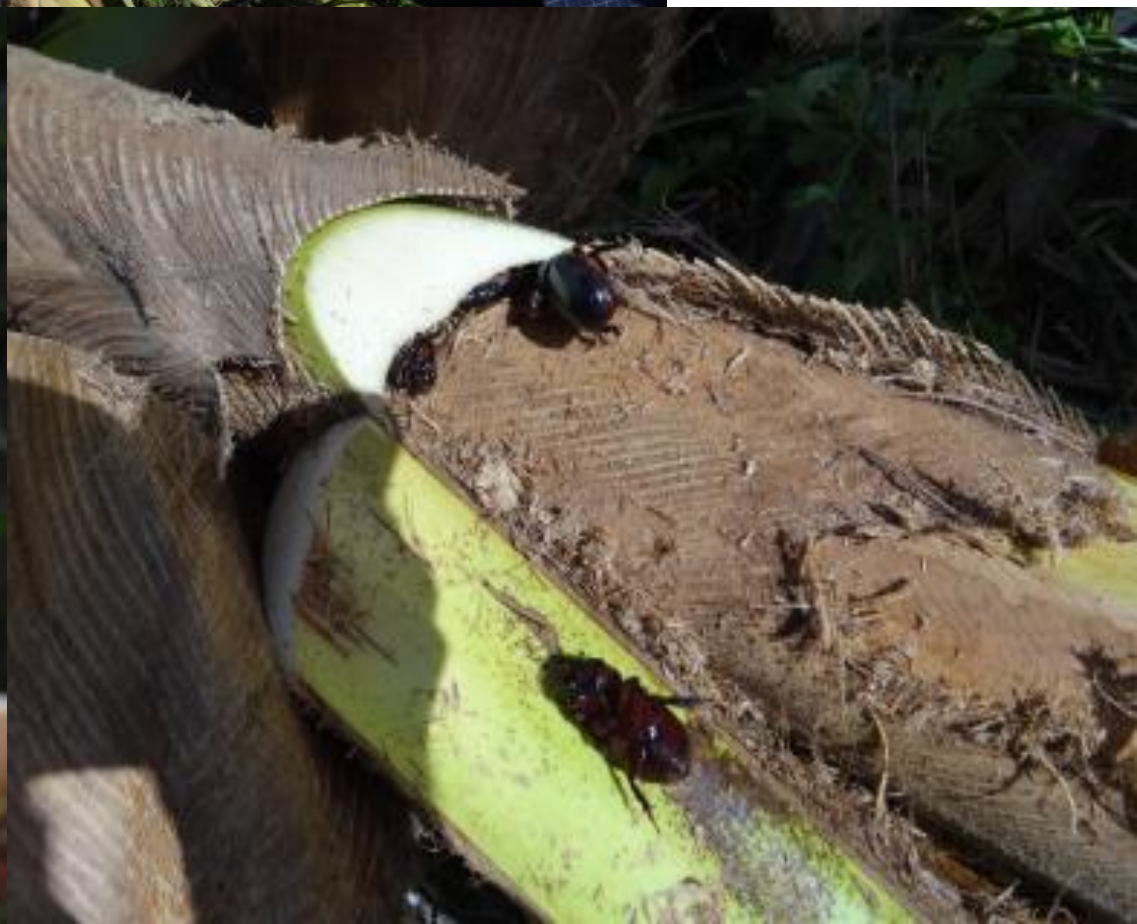
# The problem – rhinoceros beetle and other pests damaging food crops


# Devastating impact of rhinoceros beetle

From Bedford 2013.  Rhinoceros beetle damage at Drauniivi, Fiji, 1973.

agresearch



5 to 30 cm. into the softer cabbage, backing out of turning around in the soft interior.

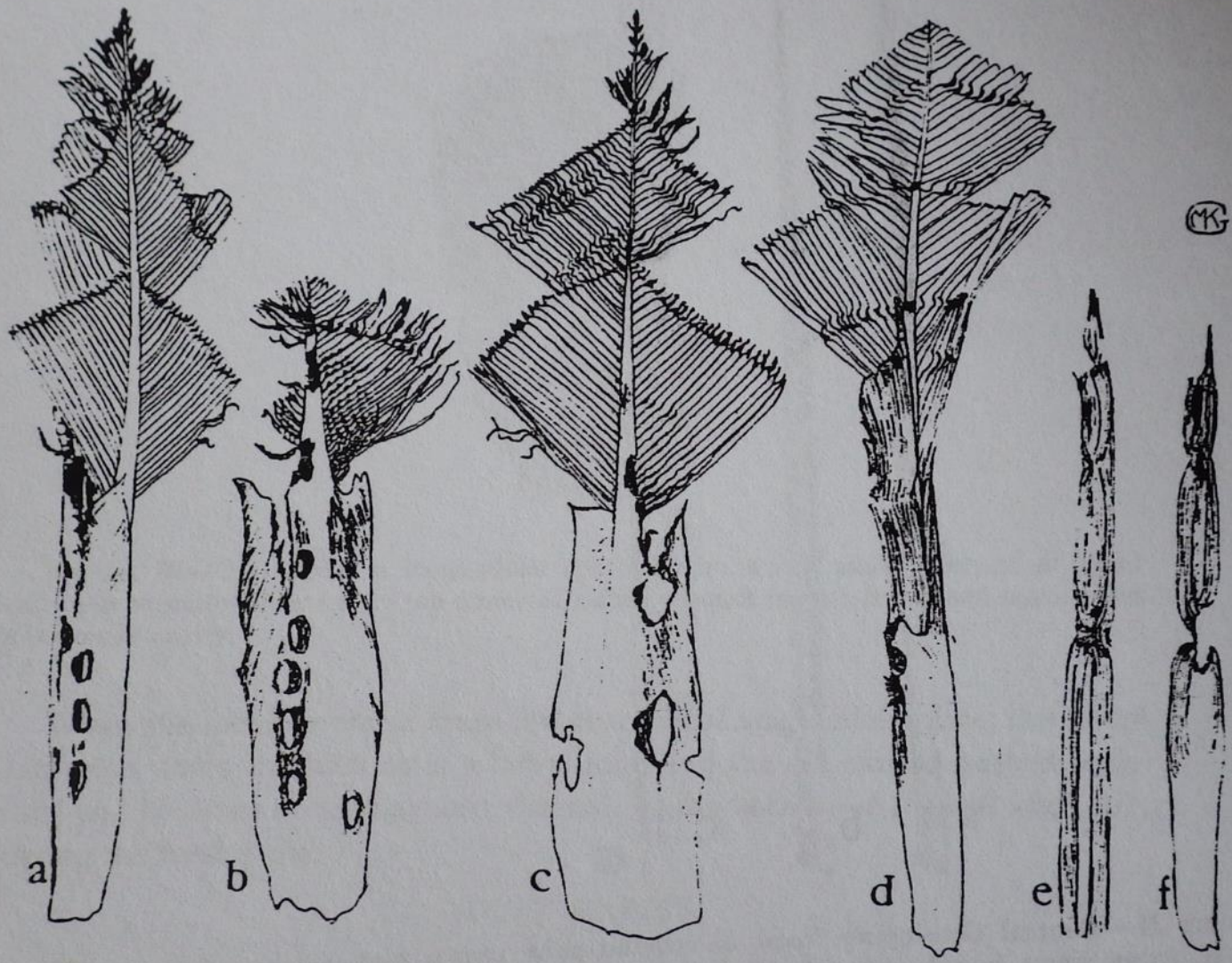


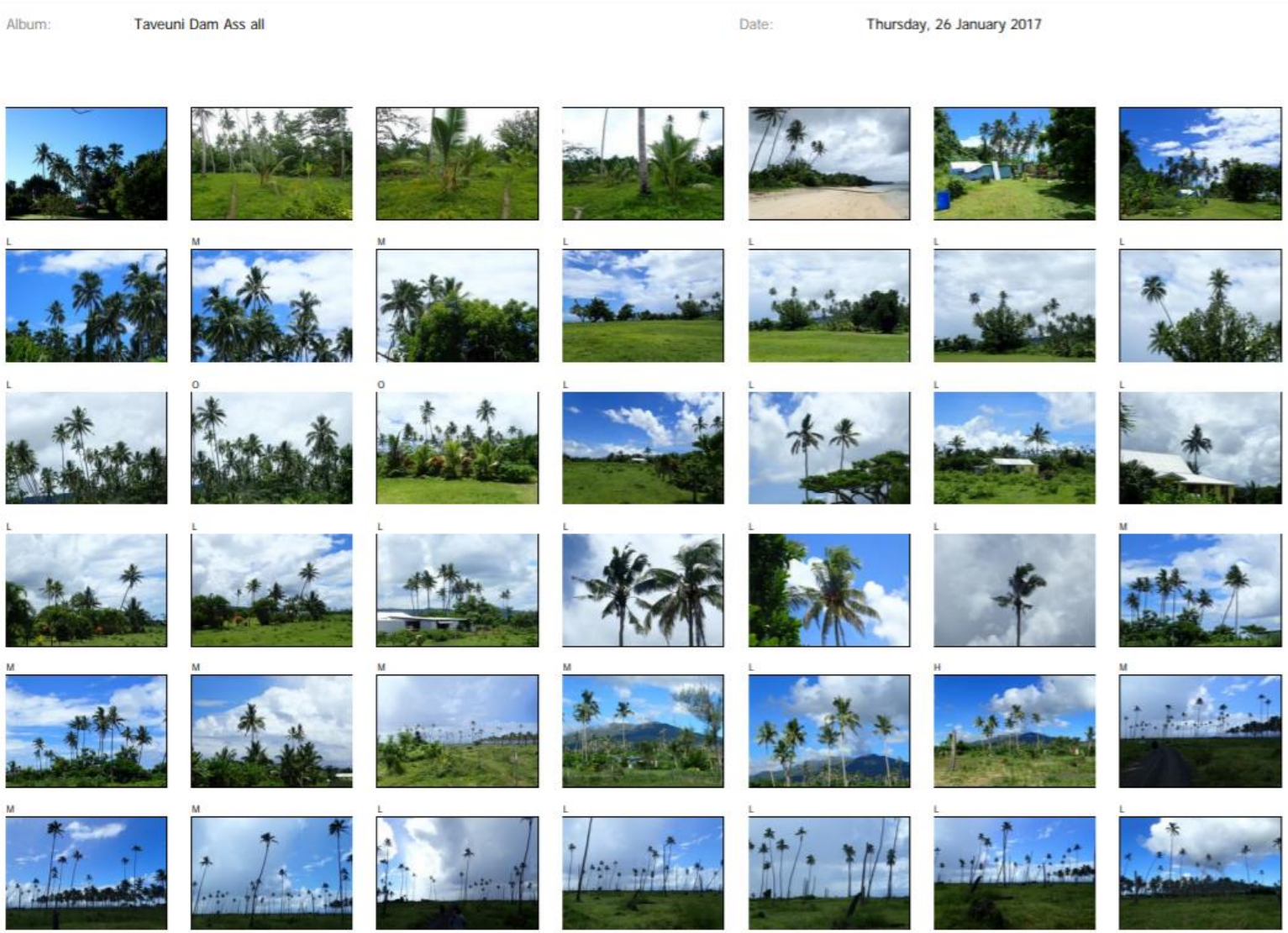

FIGURE 24.—Dissection of crown of recently killed mature coconut palm, showing partial evidence of work of at least nine adults over a period of time: a, central portion of crown, undissected; b, outermost frond of a; c, next frond; d, third and inner fronds together; e, fifth and sixth fronds, growth stopped; f, fourth frond, severed

# Simple damage assessment - % damaged

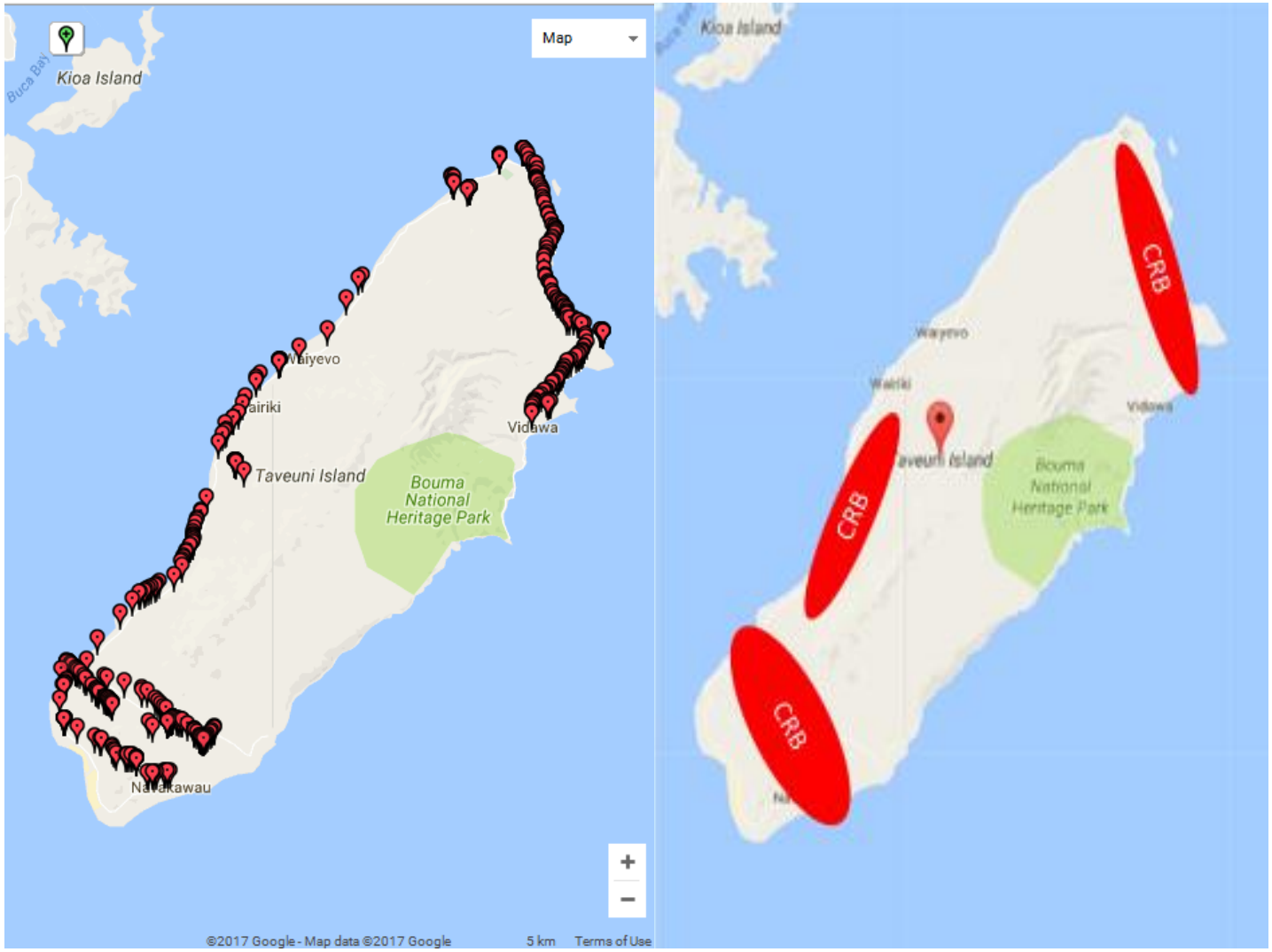
26 palms – all damaged
100%

14 palms – 2 damaged
14%

# Rapid damage assessment – series of images, Graded L, M, H



# Mapped and action areas prioritised



# Damage grading – 5 point scale

| Grading | Scale | Description |
|---|---|---|
| 1 | 0 | No CRB damage symptoms evident |
| 2 | Light | Light damage. Notching or tip damage. <20% foliar loss |
| 3 | Medium | Multiple fronds affected. Notching and breakage. 20-50% frond loss |
| 4 | High | Multiple fronds affected. Notching and breakage. >50% frond loss |
| 5 | Non-recoverable | Palm dead or with the growing point destroyed |

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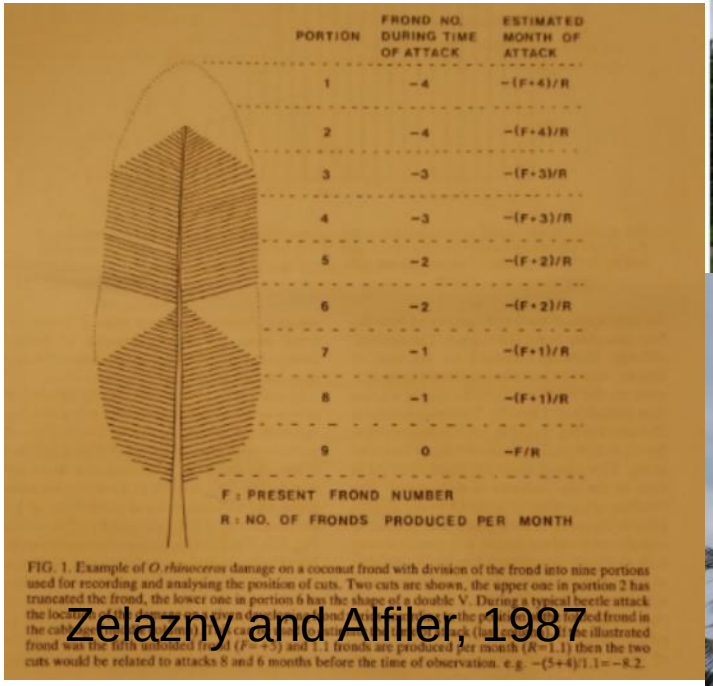
# Estimating yield loss (Under development)

| Grade | Number | Av LA loss | Total LA Loss |
|---|---|---|---|
| 1 | 0 | 0 | 0 |
| 2 | 5 | 10 | 50 |
| 3 | 7 | 35 | 245 |
| 4 | 7 | 75 | 525 |
| 5 | 11 | 100 | 1100 |

Total potential LA - 3000
Loss of LA – 1920
Loss of LA - 65%

# Timing of damage



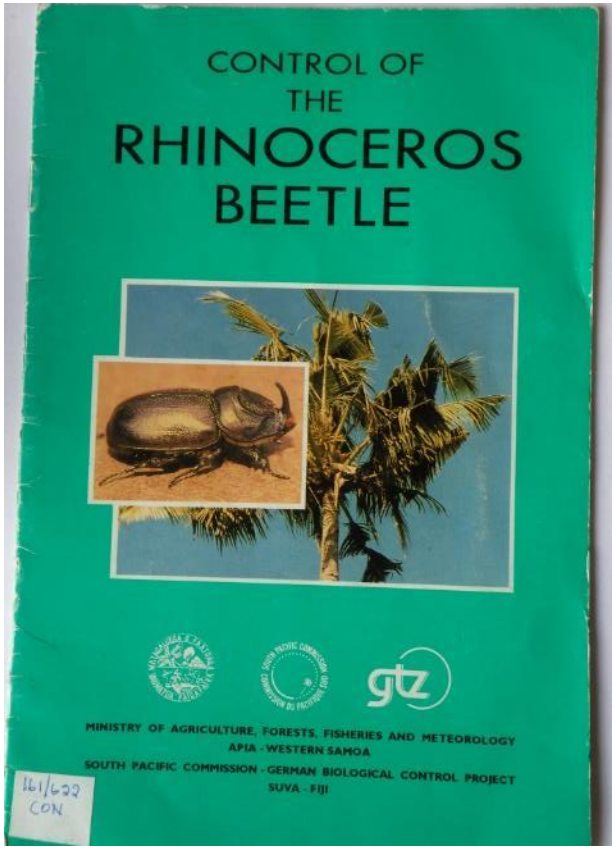
| PORTION | FROND NO. DURING TIME OF ATTACK | ESTIMATED MONTH OF ATTACK |
|---|---|---|
| 1 | −4 | −(F+4)/R |
| 2 | −4 | −(F+4)/R |
| 3 | −3 | −(F+3)/R |
| 4 | −3 | −(F+3)/R |
| 5 | −2 | −(F+2)/R |
| 6 | −2 | −(F+2)/R |
| 7 | −1 | −(F+1)/R |
| 8 | −1 | −(F+1)/R |
| 9 | 0 | −F/R |

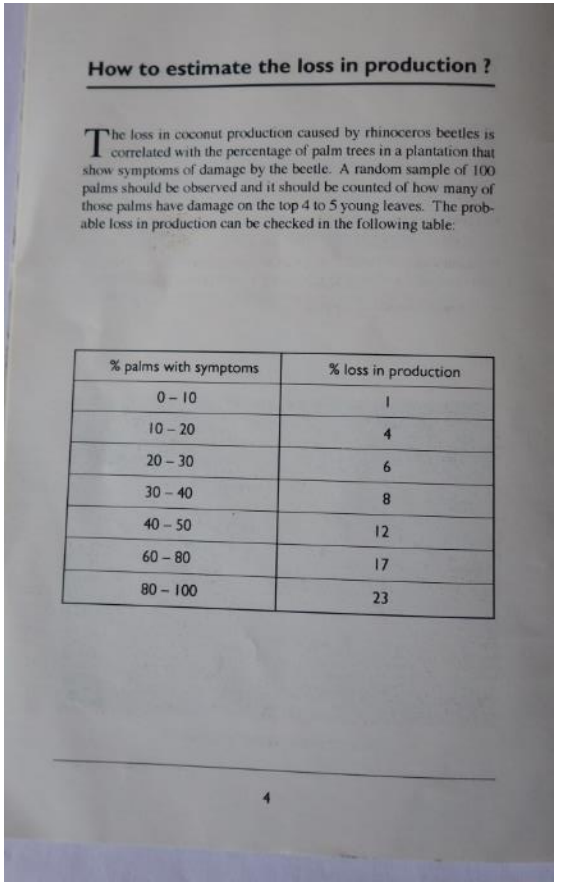
F : PRESENT FROND NUMBER

R : NO. OF FRONDS PRODUCED PER MONTH

FIG. 1. Example of *O. rhinoceros* damage on a coconut frond with division of the frond into nine portions used for recording and analysing the position of cuts. Two cuts are shown, the upper one in portion 2 has truncated the frond, the lower one in portion 6 has the shape of a double V. During a typical beetle attack the loca… the cat… frond was the fifth unfolded leaf ($F=+5$) and 1.1 fronds are produced per month ($R=1.1$) then the two cuts would be related to attacks 8 and 6 months before the time of observation. e.g. $-(5+4)/1.1=-8.2$.

Zelazny and Alfiler, 1987

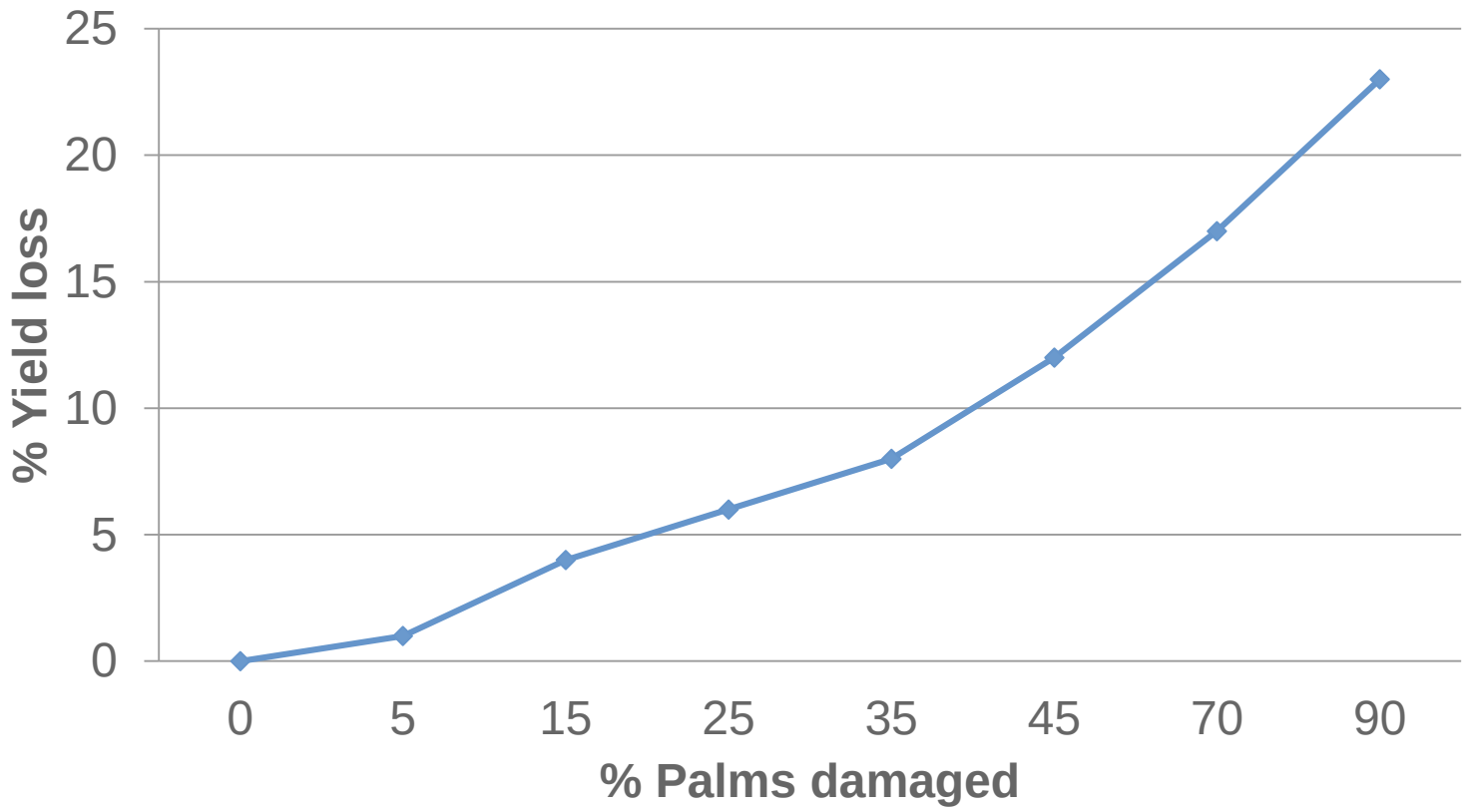



## How to estimate the loss in production ?

The loss in coconut production caused by rhinoceros beetles is correlated with the percentage of palm trees in a plantation that show symptoms of damage by the beetle. A random sample of 100 palms should be observed and it should be counted of how many of those palms have damage on the top 4 to 5 young leaves. The probable loss in production can be checked in the following table:

| % palms with symptoms | % loss in production |
|---|---|
| 0 – 10 | 1 |
| 10 – 20 | 4 |
| 20 – 30 | 6 |
| 30 – 40 | 8 |
| 40 – 50 | 12 |
| 60 – 80 | 17 |
| 80 – 100 | 23 |

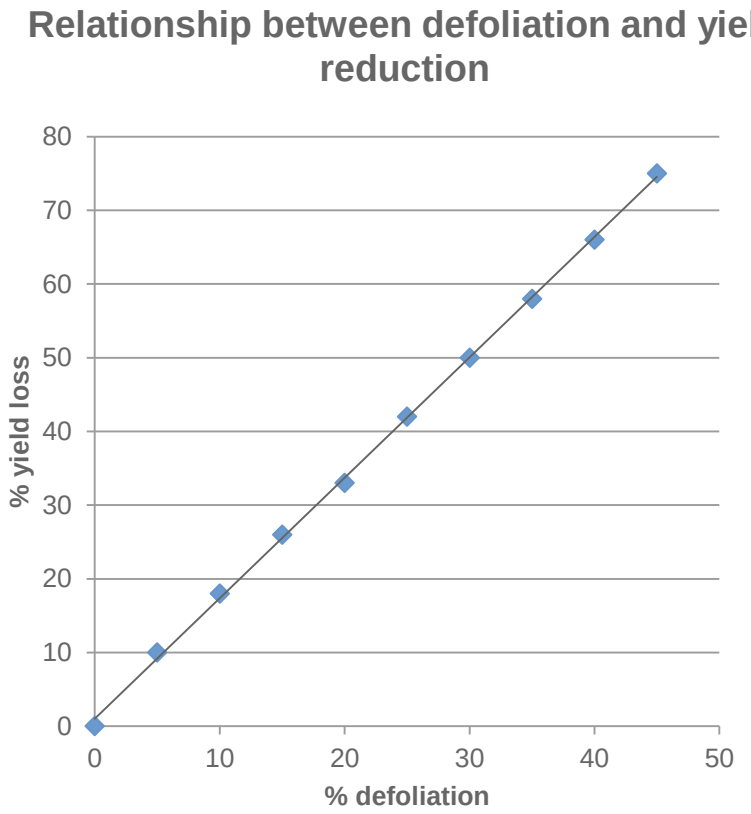
# Relationship between palms damaged and yield




SPC Undated
Hollingsworth 1984

# Damage to palms

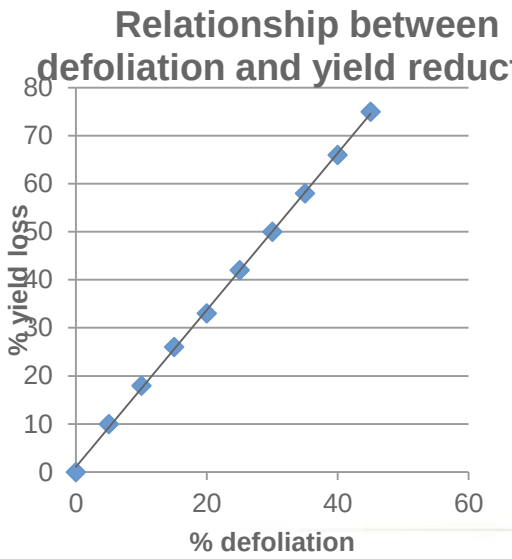
Loss of leaf area causes drop of coconuts of less than 10cm diameter




Data from Young 1975

# Cost of rhinoceros beetle

**65% Defoliation = Total loss**



# Conclusions

1. CRB causes distinctive damage symptoms
2. Damage assessment should be verified with GPS labelled digital photography
3. We can use damage assessment to define the extent and intensity of an outbreak.
4. Damage monitoring will allow impact of control actions to be verified.
5. The damage assessment programme needs to fit the objectives of CRB activities in any area.