Much of the cocoa in West Africa is now grown either with no shade or with sparse shade.
Much of the cocoa in West Africa is now grown either with no shade or with sparse shade.

Main themes of this talk are:

1. Absence of overhead shade trees leading to;
   - Increased risk of water stress during the dry season
   - Lack of nest sites for dominant carton-nesting ants and its consequences to the mealybug vectors of Cocoa Swollen Shoot Virus Disease (CSSVD)

2. Impact of new cocoa varieties.
The major entomological causes of crop loss in West African cocoa in order of importance are:

1. The mirids, *Sahlbergella singularis* and *Distantiella theobroma* in association with *Calonectria* induced die-back.

2. CSSVD spread by mealybug vectors

3. A range of minor and secondary pests dealt with by Tony Cudjoe
The major entomological causes of crop loss in West African cocoa in order of importance are:

1. The mirids, *Sahlbergella singularis* and *Distantiella theobroma* in association with *Calonectria* induced die-back.
‘Blast’ – square mile Tafo
MIRIDS

- Sustainable mirid control is essential
- Insecticides successful since the 1940’s
- Loss of mirids alternative hosts may accelerate the development of resistance to pesticides
- Ecologically sustainable control is market led
- Mirid-resistant varieties may not be sustainable with *Calonectria* die-back possible
- If effective, sex pheromones and mycopesticides should provide sustainable control
Organic cocoa with thin broken canopy
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COCOA SWOLLEN SHOOT VIRUS DISEASE

- Benefits from replanting with vigorous Upper Amazon hybrids partially resistant to CSSVD infection
- Partial-resistance also to mealybug vectors
- Resistance to the 2 most abundant vector species linked within progenies
- Relative abundance of mealybug species is changing – probably caused by climate
PLOT A23

THE EFFECT OF CSSV MILD STRAIN ON THE GROWTH AND YIELD OF COCOA

DATE PLANTED: 17TH-26TH JULY 1997

SPACING: 9 X 8

AREA: 3.105 ACRES
COCOA SWOLLEN SHOOT VIRUS DISEASE

• Benefits from replanting with vigorous Upper Amazon hybrids partially resistant to CSSVD infection

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• Resistance to the 2 most abundant vector species linked within progenies

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## CSSVD

**Changes in abundance of the mealybug vectors**

<table>
<thead>
<tr>
<th>Vector</th>
<th>Mature trees</th>
<th>Immature trees (progeny trials)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Strickland</td>
<td>Campbell</td>
</tr>
<tr>
<td></td>
<td>Late 1940's</td>
<td>1973-8</td>
</tr>
<tr>
<td><em>Planocococcoides</em></td>
<td>98.92</td>
<td>55.64</td>
</tr>
<tr>
<td><em>njalensis</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Planococcus</em></td>
<td>0.99</td>
<td>39.43</td>
</tr>
<tr>
<td><em>citri</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Phenacoccus</em></td>
<td>0.03</td>
<td>3.38</td>
</tr>
<tr>
<td><em>hargreavesi</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>0.06</td>
<td>1.54</td>
</tr>
<tr>
<td><strong>Total insects</strong></td>
<td>276735</td>
<td>15152</td>
</tr>
</tbody>
</table>
• The 50:50 ratio of *P. njalensis*: *P. citri* in Ghana in the 1980’s is similar to Nigeria in the 1960’s

• Decline of *P. njalensis* coincided with reduced shade but also with new varieties

• *P. citri* is probably now the dominant vector of CSSVD in West Africa

• *P. njalensis* is short-legged, sedentary and dependant on ant-attendance most often on old wood

• *P. citri*, *P. hargreavesi* and ‘others’ are more mobile and prefer tissues at the canopy edge
Impact of shade loss on the dominant ant mosaic

- The principal mealybug attending ants are not dependent on shade trees for nest sites

- Carton-nesting *Crematogaster* spp prefer coccid species other than mealybugs

- Carton-nesting *Crematogaster* spp also prefer shade-trees for nest sites

- *Oecophylla longinoda* prefers a good canopy
Conclusions

- Mirids and CSSVD have remained the key threats to cocoa production in West Africa for 70 years.

- Good control of mirids and vigorous new varieties allows cocoa to thrive in the absence of overhead shade

- Mirids and *Calonectria* are partners

- Reduced overhead shade and new varieties favour more mobile mealybug vectors of CSSVD

- Removal of shade boosts mealybug-tending ants