



# Ministry of Agriculture



## Island of Atiu Coconut Tree Assessment

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Maja Poeschko  
Entomologist PhD

Takili Tairi  
Senior Policy, Planning & Projects Officer

Reboama Samuel  
GIS/ Mapping Expert

## Introduction

The coconut tree assessment survey on Atiu is funded by the GEF funded Cook Islands Ridge to Reef project based within the National Environment Services and is related to a current SRIC CC (Strengthening the Resilience of our Island communities to Climate Change) project. This is the building and purchase of a Virgin Coconut Oil press for the island to encourage economic growth and development.

The report will also address the damage done to coconut trees due to the stick insect. The coconut stick insect (*Graffea crouanii*) is recorded to be a major pest after the reduction/eradication programme of its natural enemy, the common Myna bird (*Acridotheres tristis*).

Coconut trees (*Cocos nucifera*) play an economical importance to the people of Atiu, it is consumed by people, animals and the use of making coconut oil. From the trunk of the trees to the nuts and leaves it has great contribution for food, medicine, construction, mulching, animal feed, beautification, wind breakers and more benefits.

The age of the coconut trees is a key factor to its high production level in order for sustainable use. Coconut trees normally bear fruit at the age of six years and starts to peak at 10 years plus depending on a given favourable surroundings. After 40 years the production is slower and constant which declines over time.

Based on the research of the coconut stick insect outbreak in Fiji and Samoa the worse damages were mainly on trees that are over 25 meter tall while younger trees are less infested. (jackson, 1987) This was a key note that was considered during the survey as a point in visualizing the infestation.

This report will show data on severity assessment and also an estimate of coconut production level surveyed in Atiu which shows at which category are most of the coconut trees are in. It also shows options to consider by the trend of data for each village. Village boundary is not followed by the exact boundary but more off road that breaks out to the coast. The island was broken up into three categories for the data collection process which was inland plots, roadside, and coastal plots.

## Methodology

Data collection process:

- Village by village sites of all accessible coconut tree plots were visited and by visual coconut trees were counted and with sample blocks distance were measure up to 3 – 5 blocks and the mean was taken to account as the mean distance between each tree. This method was mainly for uneven plots.
- Cultivated plots were counted visually and recorded on Microsoft excel for further analysis.
- GPS was also used to plot each accessible coconut plots
- Severity assessment was conducted by the team by rating the infestation damage from 0 – 3, 0 representing hardly infested and 3 being the worse in this case the wharf area category 3.
- Assessing the severity was based on two categories of the coconut leafs and from the centre point tip of the leafs down to about 45 degrees angle which is categorized as new leaves while below 45 degrees is categorized as old leaves.
- The severity level is mainly based on how bad the infestation is from the tip centre point of the tree down to 45 degrees angle.

- Counting of accessible coconuts were grouped as old and new productive age trees, in this case old will be trees beyond 40 years and below will be new productive trees.
- Counting of the road side map was undertaken through the use of GIS map using average spacing sample which samples were collected around the island.
- Sample distance between trees was taken from all over the island in two groups which are coastal road side and also inland roadside.
- Using GIS tools area were plotted accordingly to cited trees on GIS image and with mean average spacing from the collected samples for wild plots.

## Results

### Accessible coconut plots inland

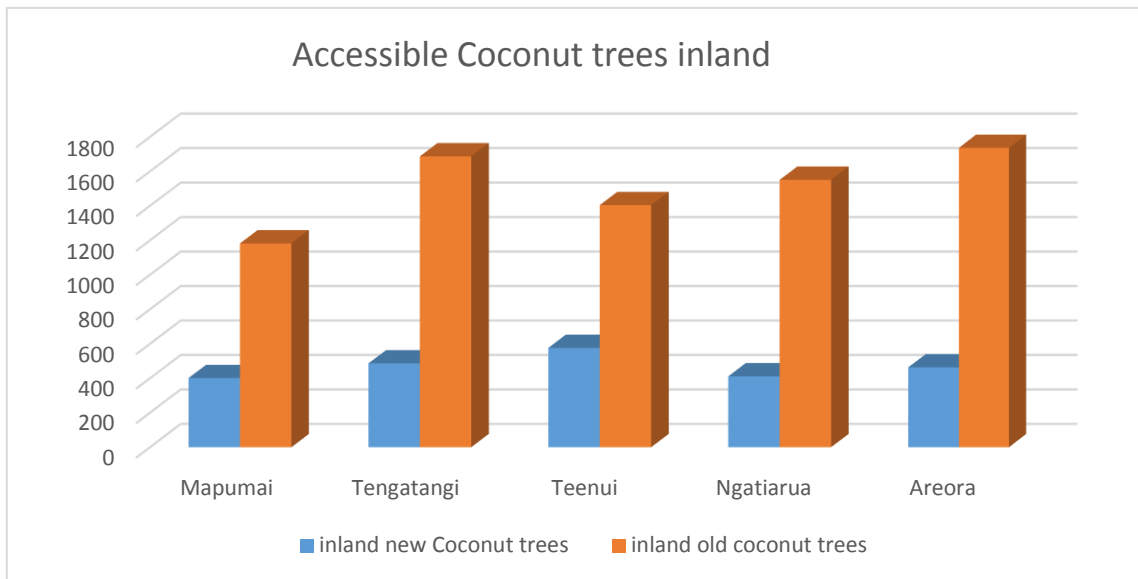
	Mapumai	Tengatangi	Teenui	Ngatiarua	Areora	Total
<b>Inland new productive Coconut trees (a)</b>	401	486	576	411	463	2337
<b>Inland old productive coconut trees (b)</b>	1182	1687	1404	1551	1736	7560
<b>Total</b>	<b>1583</b>	<b>2173</b>	<b>1980</b>	<b>1962</b>	<b>2199</b>	<b>9897</b>
<b>% (a)</b>	25.33	22.37	29.09	20.95	21.06	23.61
<b>% (b)</b>	74.67	77.63	70.91	79.05	78.94	76.38

### Road side coconut tree counts

	Distance	# of coconut trees
<b>Coastal road side</b>	17 km	4374
<b>Inland road side &amp; back yard</b>	8 km	1025
<b>Total</b>	<b>25km</b>	<b>5399</b>

- Number of accessible coconut trees from inland to the swamp areas
- Tallied accordingly on Plot counts accessible by people
- Three categories of data collection were conducted
- Help of Agriculture department and Google Map to spot coconut plots.

- Each figure represents total for each village from 12 blocks with some blocks being combined while Tengtangi had less plots.



- All villages show that there are more old trees than newly

productive trees

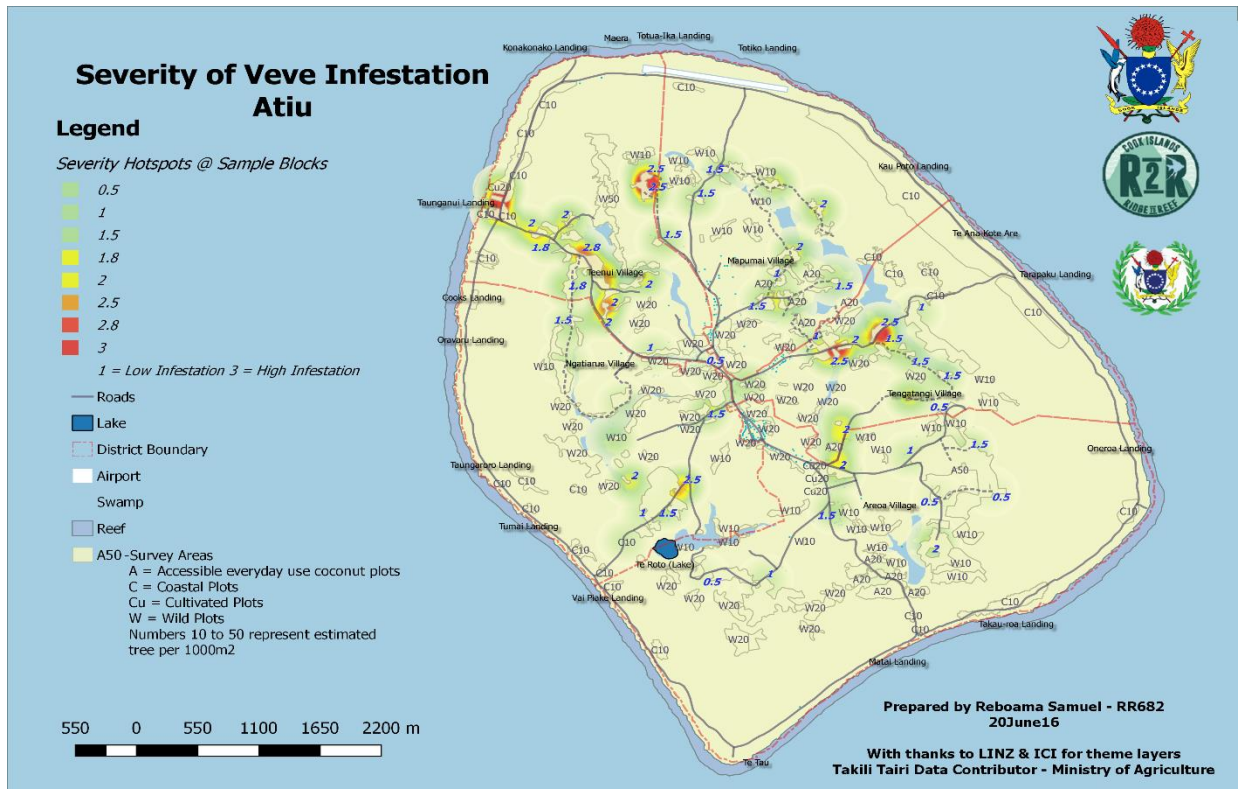
- Young productive trees are low in numbers due to competing with other trees and wild animals
- There are many slow growth and increasing non-productive trees

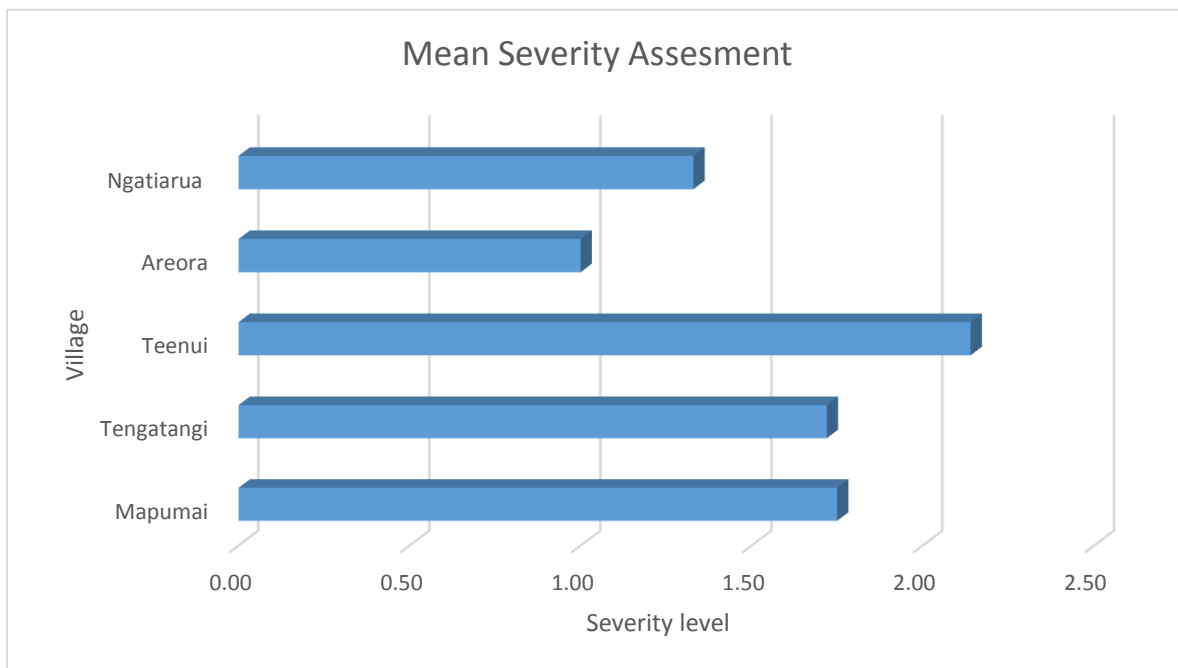
### Severity of damage due to the coconut stick insect on all visited sites of the island

	Mapumai	Tengtangi	Teenui	Areora	Ngatiarua
<b>B1</b>	2.5	1	2	2	1.5
<b>B2</b>	2.5	2.5	2	1	1
<b>B3</b>	1.5	2	2.5	0.5	1
<b>B4</b>	1.5	2.5	2.8	1.5	0.5
<b>B5</b>	1.5	1	3	0.5	1
<b>B6</b>	2	1.5	2.8	0.5	1.5
<b>B7</b>	2	1.5	2	0.5	1.5
<b>B8</b>	2	1.5	2	2	2
<b>B9</b>	1	2	1.8	1.5	1
<b>B10</b>	1.5	2	1.8	0.5	1
<b>B11</b>	1.5	1.5	2	1	1.5
<b>B12</b>	1.5	1.5	1	0.5	2.5
<b>Mean Average</b>	<b>1.75</b>	<b>1.72</b>	<b>2.14</b>	<b>1.00</b>	<b>1.33</b>

- B1 to B12 were plots of coconut trees accessible too
- All sites were assessed accordingly to the ranking of severity (0---1---2---3)
- Severity zero represents not infested and 1 represents infestation is not bad or minor
- 2 represents partly infested and 3 as badly infested

- The assessment of severity was analysed through random sampling of several trees depending on number of trees considering sampled group which represents 50% or more of the total group.
- Fundamentals of the assessment includes how to determine severity by observing the midpoint of the coconut leaves down to 45 degrees angle and marked as new leaves and below as old leaves.
- Assessing the infestation on leaves was observed on these two categories to determine severity.





- Although Areora and Ngatiarua showed the lowest severity the infestation covers the whole island with some areas as minor damage and some with extreme within these two villages.
- Based on the mean severity in the above graph, the assessment was based on the sample surveyed trees in land starting at the swamp area up to the centre of the island.
- Areora in total showed less infested trees compared to the rest.
- Teenui shows the most affected area on the island with its severity level exceeding 2.

## Discussion

Infestation is not a spreading cause effect but is the effect of stick insects within its own area which has increased in population. Since they prefer older and taller trees due to physiological aspects, the data shows that there are a lot of older trees than young productive trees in Atiu.

New trees are struggling to increase in numbers due to competition with other trees e.g acacia *Acacia mangium*.

It appears that the effect of the acacia is more damaging compared to the coconut stick insect infestation. Based on some comments from the locals the problem of the stick insect is common and it comes and goes in past. Just this time the recovery is slower compared to the past outbreaks due to the removal of the myna birds. Compared to the acacia it showed the ability to kill the coconut tree is very significant. This has also alerted the community who wants to remove these trees.

During our field survey we have found that damages are worse on older trees compared to younger trees which are assumed that they are safer on higher trees and also away from its predators. Dwarf trees are also affected which was reported that dwarf trees are not infested. Pandanus and ornamental palms are also affected but coconut leaves are favoured by the coconut stick insect.

A monitoring program will be conducted by the school (6 elected candidate over a 6 month period alongside with the Agriculture department here in Atiu). This program will overview the trend of infestation severity. Due to no monitoring program in the past 2 – 3 years the infestation level is difficult to say it's recovering or getting worse. Proper intervention will be commencing once infestation trend line shows negative trend.

### Closing Remarks

- Based on the surveyed sample area there are more old coconut trees inland which are the most accessible areas for the people for animal consumption and also home use.
- New coconut trees are struggling to grow due to competition with other trees such as *Acacia mangium*.
- By judging the whole island, old trees are more infested by the stick insect while the younger trees are less infested which appears to be in all 5 villages
- Locals believe that the minor birds are still around but are small in population and have moved out of the inland area into the makatea while others claim that there are none left on Atiu.

### Community Feed back

- Conduct a survey of *Acacia mangium* on Atiu to implement control program due to dominating over other trees and also killing coconut trees
- Conduct research on Mitiaro island to find predators of the *Veve (Graeffea crouanii)*
- Bring back myna birds – some said no and some said yes but with a proper control program.
- Implement a coconut planting scheme – to support the proposed Atiu Virgin Oil Factory
- Taro survey – to measure the use of coconut leaves.

### Implemented action – monitoring program

The following diagram will be used by the selected students and also the agriculture department for monitoring the infestation based on selected areas which have a good representative coverage of Atiu and also selected coconut trees

	Block 1	Block 2	Block 3	Block 4	Block 5	Block 6	Block 7	Block 8	Block 9	Block 10
<b>1. Location</b>										
<b>2. Severity</b>										
<b>3. Damage level (old leaves) Tick boxes below</b>										
<b>i. Partly infested</b>										
<b>ii Not infested</b>										

<b>iii. Badly infested</b>										
<b>4 Damage level (new leaves) Tick boxes below</b>										
<b>i. Partly infested</b>										
<b>ii. Not infested</b>										
<b>iii. Badly infested</b>										

## Recommendations

### Immediate

Awareness and monitoring of infestation to be put on an ongoing base for the agriculture department in order to measure positive and also the negative impact. This will give immediate action once infestation have been measured and monitored over time.

Local knowledge application is encouraged as an action to control or reduce the number of stick insects which involves cleaning under the coconut trees so eggs can be exposed to the sunlight reducing the chances of hatching due to overheating. In addition organic matter can be burnt under the coconut trees which cause the coconut stick insects to fall to the ground where they are likely to be eaten by wild chickens.

### Long term Commitment

Monitoring outcomes to be addressed immediately based on the monitory trend. If trend shows the severity level is getting worse then Ministry of Agriculture will come in and address the problem with further planning with the support of R2R.

The Ministry of Agriculture in Rarotonga will provide support to the Atiu Agriculture division within the Atiu Island Administration to further strengthen their management programmes and plans.

## Bibliography

Jackson, G. (1987). *Biological Control Pacific Prospects*. Retrieved from <http://www.pestnet.org>

### **BUDGET EXPENDED**

**Total spent : \$ 6,688.00 (includes Airfares, Accomodation, Transport, Meals, TA fees)**