INTRODUCTION

The Secretariat of the Pacific Community (SPC) provides financial and technical assistance to the Niue Department of Agriculture, Forestry and Fisheries, for the design and implementation of an eradication programme of the weed *Wedelia trilobata*. The campaign was started in the first week of March 2001 (27 February - 8 March) with the first visit of the Consultant to Niue. Activities during this visit included identifying and marking the locations of the weed and determining the areas covered, and trial applications of the systemic herbicide Round Up (a.i. glyphosate; at 10ml/l) by knapsack sprayer. Simultaneously, public awareness was raised through a TV interview (both in English and translated into Niuean), and by designing and placing signboards at strategically located *Wedelia* infested sites around the island.

The Consultant visited Niue again from 25 - 29 March 2001 to monitor progress of the campaign and assess its impact. The effectiveness of the herbicide Round Up in controlling dense areas of the weed was found to be unsatisfactory, and the use of Gramoxone (a.i. paraquat) was advised to rapidly kill foliage and make underlying stems and shoots more accessible to following applications of Round Up.

This report provides details on the impact of the herbicide applications on controlling the weed, and in general the progress of the eradication campaign since the last visit of the consultant.


TERMS OF REFERENCE:

1. Monitor the progress of the eradication programme of *Wedelia trilobata*;
2. Determine the progress of the spraying programme that was commenced in the first week of March;
3. Assist and finalise the development of community awareness materials (e.g. leaflet, signposts and TV/Video information materials);
4 Provide recommendations to enhance the ongoing eradication programme and increase its effectiveness to achieve its objective;

5 Propose a programme for the eradication of other weeds such as *Antigonon leptopus* (Chain-of-Hearts) and *Mimosa invisa* (Giant sensitive plant).

**IMPLEMENTATION OF THE CONSULTANCY**

The eradication programme was successfully continued under supervision by 2 DAFF staff (Mr. Tom Misikea, Project Coordinator; Mrs. Crispina Konelio, Senior Plant Protection & Quarantine Officer). Mr. Colin Etuate of Quarantine Service supervised 2 labourers (Messrs. I. Mamaia and J. Tauvehi), who were hired from project funds to implement the eradication campaign. A pick up van is provided by DAFF to transport the team to the control sites.

The consultant visited most sites that had been treated with herbicide and assessed the impact on the weed.

1 Monitor the progress of the eradication programme of *Wedelia trilobata*;

*Number of Wedelia infested sites:* As awareness of the weed among Niueans increased, another 6 new sites were reported to DAFF in the last 3 months. The total number of sites now stands at 52, with a total weed coverage of approximately 14000 sqm2 (Table 1). All sites have been visited, measured and appropriate control measures of slashing, hand weed and/or spraying etc.) to determine and implement for each site.

<table>
<thead>
<tr>
<th>Date</th>
<th>No of villages</th>
<th>No of known <em>Wedelia</em> sites</th>
<th>Area infested (m2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 March 2001</td>
<td>11</td>
<td>35</td>
<td>10,000</td>
</tr>
<tr>
<td>29 March 2001</td>
<td>12</td>
<td>46</td>
<td>12,747</td>
</tr>
<tr>
<td>5 July 2001</td>
<td>13</td>
<td>52</td>
<td>13,500</td>
</tr>
</tbody>
</table>

2 Determine progress of the spraying programme that was commenced in the first week of March;

*Spraying of sites:* Using Round Up (10 ml/l) were applied until 23 March to 12 Wedelia sites, when stocks of the herbicide became critical. During the last week, Round Up (10 ml/l) mixed with a solution of Urea (30 gram/l) to enhance the impact of the herbicide on the weed, was applied to 6 sites. Following depletion of Round Up stocks on 26 March, Gramoxone (a.i. paraquat) has been applied by knapsack sprayer until Round Up stocks became available again in May 2001.
Following completion of a first application of herbicides (either Round Up, Gramoxone or both) at all sites (except those where handweeding was considered preferable or feasible), a second and, for some sites, a third application of herbicides was administered as spot sprays on surviving plants or regrowth.

Full details on the number of sites and the progress of the spraying programme are provided in Appendix 1.

The following two sites have not received any herbicide treatment:

(i) the Matavai Resort:
Concern was raised during the first visit of the consultant by the resort manager that the removal or spraying of *Wedelia* would reduce the greenery from areas frequented by guests (swimming pool, recreation area, main deck), rendering these less attractive. As such, the Resort has remained the major infestation site. Recently however the DAFF team, working with the Resort’s gardening staff, commenced handweeding of the weed around the pool areas. The eradication programme was discussed with the new resort manager (Ms Rojene Abbot), who confirmed her support to the programme, and consented to herbicide application to Wedelia sites in areas less frequented by guests. She also supported the intensification of handweeding of the weed.

(ii) E. Nemaia’s residence in Alofi:
The owner is operating a small organic nursery and greenhouse, and has objected to herbicides around his house. DAFF staff has agreed to work with him in hand weed and burning the weed.

3 Assist and finalise the development of community awareness materials (e.g. leaflet, signposts and TV/Video information materials)

The Wedelia eradication programme information leaflet is now nearing its final form in both English and Niuean language. A disk copy of the leaflet has been brought to Fiji for review by the Information and Extension section of the PMP programme, followed by the printing of one thousand copies that will be sent to Niue DAFF.

A total of 5 signposts have been placed at strategic locations around the island to provide exposure of the campaign and increasing public awareness.

The Broadcasting Commission of Niue (BCN) has adequate footage of Wedelia infested areas and the eradication campaign. Areas where the weed is under control - which are clearly visible since most plants in the confined areas have been killed - should be filmed for inclusion in the final video. Footage from Fiji showing large Wedelia infestations should be included to show the potential threat of the weed. The forthcoming training in August by SPC media staff would be an excellent opportunity to develop and finalise the Wedelia video.
4 Provide recommendations to enhance the ongoing eradication programme and increase its effectiveness to achieve its objective

The eradication campaign has made excellent progress in reducing the Wedelia infestation. A survey in which 80% of sites were inspected has shown that the eradication of the weed has been achieved at most sites.

Following the successful implementation of the first phase in which control of the weed was exercised, the programme is now entering its second phase is focused on containment and eradication. This involves less time to apply herbicides to weed infested areas, although spot sprays of surviving Wedelia plants will remain necessary in areas. Handheld sprayers (2 litre capacity) will be supplied to the team to facilitate the application of spot sprays.

The team will maintain surveillance and inspection of ALL treated sites for any regrowth of the weed, and determine appropriate times for application of herbicides. Hand weeding may be necessary to remove the few remaining plants in some areas. Activities to maintain and increase public awareness and support should be intensified during this phase, and any reported sightings of Wedelia should be responded to immediately. The Wedelia leaflet and video should facilitate this.

The current activities of the Wedelia campaign should continue for at least another 3 months, and adequate funding should be made available to provide for labour, chemicals and materials. In view of the expenses in the last 4 months, financial assistance of an additional NZD 10,000.- should be adequate.

It appears that part of these funds have also been used to pay labour costs for the Mimosa eradication programme. The proposed amount would be adequate to also include labour and chemicals for the Mimosa, as well as for the Chain-of-Hearts eradication campaigns.

5 Propose a programme for the eradication of other weeds such as Antigonon leptopus (Chain-of-Hearts) and Mimosa invisa (Giant sensitive plant).

(a) Antigonon leptopus, the Chain-of-Hearts

The Chain-of-Hearts is a rapidly growing vine that is able to overgrow and smother large trees. It produces clusters of attractive pink flowers. Its heart-shaped leaves may be mistaken with those of Mikania micrantha, the mile-a-minute weed, but the leaf surface of the latter is more shiny and smooth than that of A. leptopus.

In Niue, the weed is only known from a few sites in Alofi. The most important sites are near the Lord Liverpool hospital in Alofi south (see Table 2). Other, minor infestations are found in gardens around the capital.
Table 2: Sites with infestations of Chain-of-Hearts, *Antigonon leptopus*.

<table>
<thead>
<tr>
<th>Site</th>
<th>Characteristics</th>
<th>Recommended Control measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roadside opposite Government housing, Alofi south</td>
<td>Largest infestation in Niue.</td>
<td>(1) Clearing of a 2 m wide boundary around infestation; clearing infestation with bushknives.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2) Incinerate removed weeds.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3) Treatment of regrowth with Round Up after 4-6 weeks</td>
</tr>
<tr>
<td>Ailiuki's house, Government housing area Alofi south</td>
<td>Initial infestation behind house was cleared in March; large regrowth observed on 4 July.</td>
<td>(1) Immediate treatment of regrowth with Round Up</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2) Follow up treatment of regrowth with Round Up after 4-6 weeks</td>
</tr>
<tr>
<td>Russell Kar’s residence, Alofi south</td>
<td>In front garden, On large coral rock along driveway</td>
<td>Sprayed with Round Up in March, regrowth observed. (1) Removal and destruction (incineration) of tubers in the ground; (2) thereafter regular (every 2 months) inspections for regrowth from surviving tubers, and removal of tubers, application of Round Up</td>
</tr>
<tr>
<td>Waimanu Guest House, Alofi south</td>
<td>few plants growing at 2 sites: under sign, and in front on rock wall</td>
<td>Removal and destruction (incineration) of tubers in the ground; thereafter regular (every 2 months) inspections for regrowth from surviving tubers, and removal of tubers, application of Round Up</td>
</tr>
<tr>
<td>Government Housing, Alofi south</td>
<td>seaside, one or few plants growing on rock wall along road</td>
<td></td>
</tr>
<tr>
<td>House of Niue Trading Company, Main Road, Alofi north</td>
<td>One or few plants growing on rock wall along road</td>
<td></td>
</tr>
</tbody>
</table>

(b) *Mimosa invisa*, the Giant sensitive plant

The spraying programme for this weed is continuing. Germinating seedlings are treated with Round Up every 2-3 months. The arrival of the herbicide Karmex (20 litres) which has a residual action that is effective for some 3 months will allow a reduction of applications of Round Up. The areas where control is currently implemented will be treated with this herbicide.

In June 2001 an infestation consisting of several large flowering *M. invisa* plants, was discovered some 20-30 m near the treatment site at the airport (Vaiea and Hakupu). DAFF staff acted immediately by slashing all plants in the area and the immediate perimeter, followed by an application of Round Up. During a site inspection on 4 July a few young plants were observed in the vicinity of the ‘mother’ plant, which were removed by hand. Means of treating the dead plant materials (from the slashing and spraying) were discussed with DAFF staff: burning followed by application of Karmex or Round Up was suggested.

During the last visit of the Consultant in March 2001, a significant decline in *M. invisa* seedlings was noted in the main treatment site near the area, where seedlings have been treated with Round Up every 2-3 months. This indicates a decline in the number of surviving seeds in the soil. In view however of the
viability for several years (up to 30 years - G. Rapp, pers.comm.) of *M. invisa* seed, a more sustainable control should be considered. This may involve an initial larger, and more costly efforts, but should ensure that the risk of survival of the weed for a prolonged period is nil. In discussion with various people in Niue efforts that may be considered include:

1. Pave the infested areas with a 10 cm layer of compacted coral rock aggregate.

2. Bulldozing the topsoil to a single heap at each of the infested areas, followed by paving the bare rocks with a layer of compacted coral rock aggregate, and/or paving the heap of topsoil with compacted coral rock aggregate.

**RECOMMENDATIONS**

1. That the intensive Wedelia eradication campaign is continued at its current level for another 3 months, during which more effort must be allocated to inspection and follow up treatment of infested Wedelia sites.

2. That 1000 leaflets each of the Wedelia and Mimosa leaflets are printed for distribution to the people of Niue to enhance awareness of both weeds.

3. That a short (5 minute) video on the Wedelia eradication programme is developed by staff of the Broadcasting Corporation of Niue from footage recorded since February 2001, for the purpose of increasing awareness of the weed among Niueans, and people in Pacific Island countries in general.

4. That DAFF urgently commences an eradication programme of the Chain-of-Hearts, *Antigonon leptopus*, weed, with technical and financial support from SPC.

5. That discussions are initiated to identify, discuss and develop long term control measures for *Mimosa invisa*.

6. That progress of the eradication campaigns against *Wedelia trilobata*, *Mimosa invisa* and *Antigonon leptopus* is assessed in 3-4 months by specialist SPC staff.
APPENDIX 1:


Notes:
Estimated duration of the eradication program for each weed:
1. Wedelia: 18 months
2. Mimosa: 25 years
3. Antigonon: 18 months


**Labour:**
2 labourers
(25 wks @ $ 150.- per week per person) 7,500

**Materials and Equipment:**
Herbicides, sprayer maintenance - est. 1,500

**Preparation of Awareness Materials:**
Video production 2,500

**Backstopping support (3 visits):**
**Costs per visit:**
Fee: 6 days @ $ 350.- = $ 2,100.-
Travel: $ 1,250.-
Per Diem (5 days Niue @ $ 120.-; 2 days Tonga @ $ 180.-)
Total per visit: 4,310
TOTAL 3 VISITS 12,930

**Development of awareness materials:**
Printing of Wedelia leaflets 500
Development and printing of leaflets on *Antigonon leptopus* 1,000

Total 25,930

**Labour:**
2 labourers  
(40 wks @ $150.- per week per person)(* ) 12,000

**Materials and Equipment:**
Herbicides, sprayer maintenance - est. 4,000

**Preparation of Awareness Materials:**
Video production 1,500

**Backstopping support (3 visits):**
**Costs per visit:**
Fee: 6 days @ $350.- = $2,100.-
Travel: $1,250.-
Per Diem (5 days Niue @ $120.-; 2 days Tonga @ $180.-)  
Total per visit: 4,310
TOTAL 3 VISITS 12,930

**Development of awareness materials:**
Development and printing of leaflets on Mimosa 700

**Total** 33,930
Estimated expenditure for the financial year (1 November 2000 - 31 October 2001) for the programme

**Labour:**
2 labourers
(13 wks: 1/8 - 31/10) @ $150.- per week per person)(*) 3,900

**Materials and Equipment:**
Herbicides, sprayer maintenance - est. 1,000

**Preparation of Awareness Materials:**
Video production 1,000

**Total:** 5,900

(*)&: includes work on Mimosa invisa and Antigonon leptopus

**ADDITIONAL PROJECT-RELATED EXPENDITURE:**

**Backstopping visit:**
Fee: 8 days @ $350.- = $2,800.-
Travel: $1,250.-
Per Diem (7 days Niue @ $120.-; 2 days Tonga @ $180.-) 5,250

**Development of awareness materials:**
Printing of Wedelia leaflets 500
Development and printing of leaflets on Mimosa invisa and Antigonon leptopus 1,500

**Total** 7,250