MINISTRY OF AGRICULTURE, FISHERIES AND FOOD

Research and Development

Final Project Report

(Not to be used for LINK projects)

Date project completed:

31/03/1999

Section 1 : Identification sheet

1. (a) MAFF Project Code: **OFT0115T**

(b) Project Title: Cultural methods for controlling docks in organically farmed grassland (extension 1998-99)

(c) MAFF Project Officer:

(d) Name and address of contractor: INSTITUTE OF GRASSLAND AND ENVIRONMENTAL RESEARCH, NORTH WYKE, OKEHAMPTON, DEVON EX20 2SB

(e) Contractor's Project Officer:

(f) Project start date: 04/01/1998 Project end date: 31/03/1999

(g) Final year costs:
- **approved** expenditure:
- **actual** expenditure:

(h) Total project costs / total staff input:
- **approved** project expenditure:
- **actual** project expenditure:
- ***approved** staff input:
- ***actual** staff input:

(i) Date report sent to MAFF:

(j) Is there any Intellectual Property arising from this project ?

***staff years of direct science effort**

Section 2 : Scientific objectives / Milestones

2. Please list the scientific objectives as set out in CSG 7 (ROAME B). If necessary these can be expressed in an abbreviated form. Indicate where amendments have been agreed with the MAFF Project Officer, giving the date of amendment.

(1) to investigate the effects of a third year (following two previous years) of mechanical soil aeration in spring, and its timing, on the subsequent development of docks in dock-infested areas of silage fields.

(2) to investigate for a second harvest year (1997 was the first harvest year) the effects of a range of defoliation measures on dock regeneration, growth and seed production, using a sward of micro-plots containing docks (established in 1996) at a high density. Defoliation treatments include timing, frequency, and height of cut, to be maintained throughout the 1998 growing season.

3. List the primary milestones for the final year.

It is the responsibility of the contractor to check fully that ALL primary milestones have been met and to provide a detailed explanation if this has not proved possible

Milestones		Target date	Milestones met?	
Number	Title		in full	on time

If any milestones have not been met in the final year, an explanation should be included in Section 5.

Section 3 : Declaration

4. I declare that the information I have given in this report is correct to the best of my knowledge and belief. I understand that the information contained in this form may be held on a computer system.

Signature _____ Date _____

Name _____

Position in Organistation _____

Section 4 : Executive summary

Docks are considered to be one of the main weed problems of grassland. The absence of an effective non-chemical control may be a deterrent to organic-conversion for farmers accustomed to using herbicides for dock control. This work addresses this problem in the context of MAFF policy to encourage more farmers to adopt organic farming, and to encourage a reduction in the use of herbicides in farming generally. The project was based around hypotheses that physical techniques and management strategies can affect the relative competitiveness of docks within the grass-based sward, and that by exploiting this relative competitiveness the problem can be reduced or contained within acceptable limits.

During the initial phase of the project (01/05/95 to 31/03/98) we investigated these hypotheses through a series of four linked experimental objectives. The results obtained during that period (i.e. the 1996 and 1997 seasons) were reported to MAFF in a CSG13 in 1998. In the case of two of these experiments in particular, it was apparent that the observation and recording periods were too short to draw meaningful conclusions, and that the value of the overall project would be improved by an additional recording period. This CSG13 updates the previous one and reports primarily on the results from these two experiments obtained during 1998-99 (the 1998 growing season). The outcomes of these two approaches (Objectives 2 and 3 on the original CSG7) are summarized below.

Objective 2: Trials were carried out to determine the effects of using a mechanical soil aerator in spring, and its timing, on the subsequent development of docks in existing dock-infested areas of silage fields (action through stimulation of grass growth in spring through improved soil physical conditions, and/or potentially deleterious effect on docks by severing their rooting systems). The findings of this experiment during 1996 and 1997 were encouraging but showed the need for evaluations over a longer period than two years. The experiment was conducted in a situation where docks were increasing and dock ramet density increased on all treatments. The greatest increase occurred on the non-aerated control. The most significant effect resulted from the aeration treatment made in April (compared with June or April-plus-June). In the third year, 1998, there were no significant differences between the control and the three aeration treatments. Our overall conclusion from the three years of results with this technique on just one site is that it is a technique which offers some control of dock, but refining of the management guidelines and evaluation on a field scale on different soils are required.

Objective 3: Micro-plot trials using transplanted, spaced dock plants (to provide uniform density in swards) were used to investigate the effects of a wide range of options for controlling dock plants by cutting. Treatments included cutting at different intervals and to different residual sward heights. Assessments of results from 1996 had shown that the proportion of dock in the total herbage DM was lowest in treatments which were defoliated at regular 4-5 week intervals, and highest under less frequently defoliated regimes which simulated silage and hay regimes. These assessments were repeated in 1997 and the differences widened. However, total herbage DM yield was also higher on the 'hay' and 'silage' treatments, though differences were proportionately less than for the dock component. The micro-plot trial recorded in 1998 had been established from dock plug plants transplanted in 1996 and recorded in 1997.

This method proved to be an effective one for establishment of experimental dock infestations of uniform density needed for investigations of this type, and one that would be practicable if required on a larger scale. The more frequently cut treatments had the lowest proportion of dock in the total herbage harvested, though this was in Year 2 only. This was a very similar result to that from the similar trial that had been recorded during 1996 and 1997. It seems likely that the effects resulting from cutting frequency may be cumulative, and at least two years of the frequent cutting may be required before dock plant size and vigor is reduced. The duration of these trials has not been long enough to determine whether long-term frequent cutting can eventually result in the elimination of dock plants.

The effect of cutting height, which had no significant effects in either year of the experiment recorded in 1996 and 1997, was a significant factor affecting docks in the second year of this experiment. The low cutting height was favourable to docks. It seems likely that docks either respond to the lower cutting height by morphological adaptation, or that the lower sward height reduces the relative competitiveness of the other sward components.

The results obtained from this suite of experiments (including the objectives completed before 1 April 1998) indicate that physical methods have a role in containing dock problems to an acceptable level, particularly in ensuring that flowering and seed dispersal does not occur. If resources were to be available for future work our recommendations would include the following:

(1) The use of the soil mechanical treatment has been encouraging though further on-farm field-scale evaluations and refinement of management guidelines are needed before this can be recommended for general use by farmers.

(2) As frequency of defoliation appears to be a factor affecting growth of docks and their total contribution to the sward, there is a need to establish whether docks can be eliminated, rather than being kept at a manageable level of infestation, and the management factors and timescale associated with this need to be determined.

(3) The effects of increased seed rate and cover crop on limiting the development of seedling docks at establishment (shown in sward box studies in the 1996-97 phase of this research contract) needs to be evaluated at the field scale and on different soil types.

Section 5 : Scientific report