

Agricultural Development and Advisory Service

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CONTRACT REPORT

No. AR/91/9

C011026

Leeks - Control of Volunteer
Potatoes Undertaken for HDC
(FV54d)
Year 1

Commercial - In Confidence



PRINCIPAL WORKER

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AUTHENTICATION

I declare that this work was done under my supervision according to the procedures described herein and that this report represents a true and accurate record of the results obtained.

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Commercial - In Confidence

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LEEKs - CONTROL OF VOLUNTEER POTATOES

Summary

Leeks cv. Verina were drilled on 9 April, then interplanted with a known quantity of potatoes cv Maris Piper. A range of herbicide programmes was subsequently applied, commencing at the first true leaf stage of the leeks. These programmes comprised Atlas Sonon, Fortrol, Starane 2 and Totril, applied either alone or in tank mixes up to three times from 17 June to 10 July.

When assessed on 2 and 19 July it was apparent that those treatments giving effective early control of the potatoes, whilst not reducing leek vigour, were the lower rates of Totril plus Fortrol as tank mixed applications. Higher rates of Totril in these mixes reduced leek vigour.

When assessed again on 3 September all of the treatments which had received three herbicide applications were generally free from potatoes, except where Starane 2 had been applied on three occasions.

At harvest on 21 October the mean yield of leeks over 10 mm was 27.1 t/ha. All treatments produced similar yields, except where Starane at 0.25 l/ha had been applied on 3 occasions where the yield was reduced to 22.5 t/ha. The mean yield of leeks over 25 mm was 20.9 t/ha and again, was similar for most treatments. Regimes comprising either three applications of Starane at 0.25 l/ha or three applications of a mixture of Fortrol at 0.35 or 0.7 l/ha plus Totril at 0.35 l/ha had significantly ($P < 0.05$) reduced leek vigour giving rise to lower yields than the handweeded control. The total number of leeks over 10 mm was similar for all treatments at a mean level of 196,200/ha, except where two applications of Totril at 0.5 l/ha had been applied at the first true leaf stage followed by a Totril plus Fortrol mix. In this case it was reduced to 178,600/ha.



The most promising herbicide programmes identified in this trial were a tank mix of Totrill at 0.35 l/ha + Fortrol at 0.35 l/ha applied at the first true leaf stage, repeated 7 days later and followed with an application of either Totrill at 0.7 l/ha + Fortrol at 0.7 l/ha or Starane at 0.5 or 0.75 l/ha at the late second true leaf stage in early July. These treatments successfully controlled the potatoes whilst not reducing yield of the leeks.

Objective

To evaluate a range of herbicides at various rates and timings for their effect on potatoes established at known populations within a drilled leek crop to represent 'volunteers', and to determine whether the herbicide programmes reduce leek vigour.



Introduction

The incidence of volunteer potatoes in vegetable rotations is an increasing problem. The succession of mild winters and the potato cultivars now widely grown have tended to increase the problem.

Many of the herbicides used in either leek or onion weed control programmes have some action against potatoes but the cumulative effect of sequential applications to target this problem weed specifically has not been studied in leeks.

A trial series, supported by the HDC, was begun in 1990 at both ADAS Arthur Rickwood and at HRI Wellesbourne to study the best herbicide programmes to control potatoes in onions. The value of Starane 2 was identified, particularly in programmes with Totril and Fortrol. An off-label approval for this use of Starane 2 was subsequently obtained. This experiment on leeks in 1991 sought to further evaluate Starane 2 in herbicide programmes.



Materials and Methods

Site

The trial was conducted on House Ground field at ADAS Arthur Rickwood, Mepal, Ely, Cambridgeshire. The soil type was a loamy peat 90 cm deep with 33% organic matter, over fen clay. (Adventurers' Shallow).

Treatments

1. Hand weeded control
 2. Starane @ 0.5 l/ha at first leaf stage, repeated 7 days later
 3. Starane @ 0.25 l/ha at first leaf stage, repeated 7 days later and at second leaf stage
 4. Totril @ 0.5 l/ha at first leaf stage, repeated 7 days later and Totril @ 0.5 l/ha + Fortrol @ 0.5 l/ha at second leaf stage
 5. Totril @ 0.35 l/ha + Fortrol @ 0.35 l/ha at first leaf stage, repeated 7 days later and Totril @ 0.7 l/ha + Fortrol @ 0.7 l/ha at second leaf stage
 6. Totril @ 0.7 l/ha + Fortrol @ 0.35 l/ha at first leaf stage, repeated 7 days later and Totril @ 0.7 l/ha + Fortrol @ 0.7 l/ha at second leaf stage
 7. Totril @ 0.35 l/ha + Fortrol @ 0.35 l/ha at first leaf stage, repeated 7 days later and Totril @ 1.0 l/ha + Fortrol @ 0.5 l/ha at second leaf stage
 8. Totril @ 0.5 l/ha at first leaf stage, repeated 7 days later and Starane 2 @ 0.5 l/ha at second leaf stage
 9. Totril @ 0.35 l/ha + Fortrol @ 0.35 l/ha at first leaf stage, repeated 7 days later and Starane 2 @ 0.5 l/ha at second leaf stage#
 10. Totril @ 0.7 l/ha + Fortrol @ 0.35 l/ha at first leaf stage, repeated 7 days later and Starane 2 @ 0.5 l/ha at second leaf stage#
 11. Totril @ 0.35 l/ha + Fortrol @ 0.35 l/ha at first leaf stage, repeated 7 days later and Starane 2 @ 0.75 l/ha at second leaf stage
 12. Atlas Sonon @ 28 kg/ha at second leaf stage
 13. Unweeded control
- # see treatment modification below

Treatment modification

Due to the excellent control of the potato foliage in treatments 9 and 10 it was decided not to apply the Starane. However, treatment 11 was carried out with Starane 2 applied on 10 July.

Treatment application

All the treatments were applied in 400 l/ha water at 2 bar pressure using a hand held Oxford Precision sprayer, with 'T jet' 8002 nozzles.

Design

The experiment was of a randomised block design with four replicates. Plot size was 10.08 m² with 4 rows per 1.68 m bed.

Husbandry

The treatments were superimposed onto an area of leeks (cultivar Verina) when had been drilled on 9 April. Potatoes (cv Maris Piper) had been hand planted on 22 April to achieve a density of 3.2 tubers/m².

The crop received standard insecticide and fungicide inputs and these are detailed in Appendix I.

The trial was harvested on 21 October.

Assessments

Regular assessments of the vigour of both the potatoes and leeks were made throughout the season. The number of potatoes both prior to treatment application and in early September were recorded. At harvest the middle two rows of leeks were lifted, counted and graded according to stem diameter. The diameter grades used were <10, 10-25, 25-35 and over 35 mm.

Statistical analysis

All the data were subjected to a standard analysis of variance test. Due to the poor performance of the Atlas Somon it was not included in the analysis and neither was the unweeded control which was primarily used for comparative purposes during the vigour assessments.



Results

Establishment

The leeks had emerged well by the first week of May although populations were lower than had been anticipated. The hand planted potatoes started to emerge in early May but were severely affected by a sharp frost on 9 May. However, the potatoes did recover from this and were very vigorous on the untreated control plots. The plant populations were recorded on 10 June prior to the commencement of the treatments. Over the whole trial area the leek population was 29 plants/m² with an average of 29 potatoes per plot (2.9/m²). Although the population of leeks was lower than the target it was uniform over all the plots.

Leek and Potato Vigour

The vigour of both the leeks and potatoes was assessed on 2 July after the first two herbicide applications and again on 19 July at the end of the herbicide programme. The results are given in Table 1.

Table 1. Leek and potato plant vigour scores.

Treatment	Plant vigour scores			
	2 July		19 July	
	Leeks*	Potatoes#	Leeks*	Potatoes#
1. Hand weeded	7.8	0	9.0	0
2. Starane @ 0.5 x 2	5.8	6.0	7.5	5.3
3. Starane @ 0.25 x 3	6.3	6.5	6.0	6.8
4. Totril @ 0.5 x 2, Totril + Fortrol @ 0.5	7.5	3.5	7.0	2.0
5. Totril + Fortrol @ 0.35 x 2, Totril + Fortrol @ 0.7	7.5	2.2	7.3	1.8
6. Totril @ 0.7 + Fortrol @ 0.35 x 2, Totril + Fortrol @ 0.7	6.8	1.0	6.3	0.8
7. Totril + Fortrol @ 0.35 x 2, Totril @ 1.0 + Fortrol @ 0.5	7.5	1.5	7.0	1.8
8. Totril @ 0.5 x 2, Starane @ 0.5	7.5	4.2	8.0	2.8
9. Totril + Fortrol @ 0.35 x 2	7.3	2.2	8.0	3.5
10. Totril @ 0.7 + Fortrol @ 0.35 x 2	6.5	1.0	7.3	2.3
11. Totril + Fortrol @ 0.35 x 2, Starane @ 0.75	6.0	2.0	6.8	1.8
12. Atlas Somon @ 28 kg at second leaf	6.3	8.5	4.0	8.5
13. Untreated	6.0	8.7	4.0	9.0
Mean	6.8	3.7	6.8	3.5
CV %	10	19	13	18
SED (36 df)	0.48	0.49	0.61	0.44
LSD (@ 5%)	0.98	0.99	1.25	0.90
Leeks*	Potatoes#			
0 = dead	0 = dead			
5 = leaves green, curled and twisted	3 = small, stunted and yellow			
9 = slight leaf tipping	5 = small, stunted and yellow but healthy growing point			
10 = vigorous and healthy	7 = yellow old leaves but green new leaves			
	10 = vigorous			

The vigour of the leeks on 2 July was generally good. However, all herbicide programmes except 4, 5, 7, 8, 9 had reduced leek vigour compared with the hand weeded crop. The early applications of Starane 2 significantly reduced leek vigour particularly where the higher rate of 0.5 l/ha had been used. The programmes including Totril and Fortrol at various rates gave good results. The vigour of the leeks was poor for the untreated control and also for the 'Atlas Somon' treatments due to potato and weed competition, as by this date no herbicide had been applied.



The vigour of the potatoes on 2 July was variable. The programme containing Starane 2 had reduced the height of the volunteers but they were still green. However, where Totril and Fortrol has been applied vigour was much reduced with very good control of the potato foliage. The programmes using Totril alone was inferior to those where a tank mix with Fortrol had been applied.

The assessment on 19 July was taken 14 days after the final herbicide application (except treatment 11 where it was only 9 days). Those herbicide programmes which appeared to reduce leek vigour were treatments 3, 6 and 11. The vigour of the potatoes had been substantially reduced in all treatments except 2, 3 and 12: potato vigour in the untreated control (13) was excellent indicating good recovery after the severe frosts in mid May.

Further vigour assessments were undertaken on 3 September when the number of potatoes per plot (plot area was 10.08 m²) and potato leaf area were recorded, Table 2.



Table 2. Leaf and potato vigour scores, number of potato stems per plot and potato leaf area cover (%) on 3 September.

Treatment	Vigour scores		No. of Potato stems/plot	Potato leaf area (%)
	Leeks	Potatoes		
1. Hand weeded control	8.8	5.0	3.0	3.8
2. Starane @ 0.5 x 2	8.0	4.5	15.3	13.0
3. Starane @ 0.25 x 3	7.0	6.8	25.3	27.5
4. Totril @ 0.5 x 2, Totril + Fortrol @ 0.5	7.8	4.5	5.8	5.3
5. Totril + Fortrol @ 0.35 x 2, Totril + Fortrol @ 0.7	8.3	4.5	6.5	7.3
6. Totril @ 0.7 + Fortrol @ 0.35 x 2, Totril + Fortrol @ 0.7	7.3	4.5	3.8	3.8
7. Totril + Fortrol @ 0.35 x 2, Totril @ 1.0 + Fortrol @ 0.5	8.3	4.8	7.0	7.0
8. Totril @ 0.5 x 2, Starane @ 0.5	8.5	3.8	3.8	4.5
9. Totril + Fortrol @ 0.35 x 2	8.0	6.3	11.3	14.0
10. Totril @ 0.7 + Fortrol @ 0.35 x 2	7.8	5.5	11.0	12.5
11. Totril + Fortrol @ 0.35 x 2, Starane @ 0.75	8.5	3.8	4.5	4.3
Mean	8.0	4.9	8.6	9.3
CV %	9	28	46	39
SED (30 df)	0.49	0.98	2.83	2.58
LSD (@ 5%)	1.00	2.00	5.78	5.27

(note: for vigour score keys see below Table 1)

The vigour of the leeks on 3 September was generally good with only treatments 3 and 6 significantly less vigorous than the hand weeded control. Potato vigour was significantly higher for treatments 3 and 9, indicating poor control of the volunteers.

The number of potatoes per plot ranged from 3 to 25, with the leaf area cover from 4 to 28%. Treatments 2 and 3 allowed a higher number of potato plants to survive. Treatments 4, 6, 8 and 11 gave the lowest number of surviving potato plants per plot and also the lowest percentage of potato leaf area cover.



The final vigour assessments were taken on 18 October (Appendix IV). The vigour of the leeks was similar for all treatments except treatment 3 where it was significantly poorer. Potato vigour was uniformly low as the leeks had achieved almost 90% crop canopy cover.

Yield

At harvest on 21 October the middle two rows of each plot were cut and trimmed. The leeks were graded according to stem diameter, counted and weighed. The results are given in Table 3 (see also Appendix III).

Table 3. Yield (t/ha) at harvest on 21 October.

Treatment	Yield (t/ha)		
	over 10 mm	over 25 mm	over 35 mm
1. Handweed	30.4	23.9	7.3
2. Starane @ 0.5 x 2	27.7	22.3	7.1
3. Starane @ 0.25 x 3	22.5	14.7	3.1
4. Totril @ 0.5 x 2, Totril + Fortrol @ 0.5	25.0	19.8	7.2
5. Totril + Fortrol @ 0.35 x 2, Totril + Fortrol @ 0.7	26.6	21.7	5.0
6. Totril @ 0.7 + Fortrol @ 0.35 x 2, Totril + Fortrol @ 0.7	25.2	17.3	2.6
7. Totril + Fortrol @ 0.35 x 2, Totril @ 1.0 + Fortrol @ 0.5	25.1	19.5	6.5
8. Totril @ 0.5 x 2, Starane @ 0.5	27.3	22.0	6.1
9. Totril + Fortrol @ 0.35 x 2	30.2	24.4	7.9
10. Totril @ 0.7 + Fortrol @ 0.35 x 2	29.6	22.3	6.4
11. Totril + Fortrol @ 0.35 x 2, Starane @ 0.75	29.1	22.2	4.9
Mean	27.1	20.9	5.8
CV %	14	20	56
SED (30 df)	2.75	2.97	2.31
LSD (@ 5%)	5.62	6.06	4.71

All the treatments gave similar total yields over 10 mm except treatment 3 where a significant ($P < 0.05$) reduction, compared to the hand weeded control, was recorded.

In the over 25 mm grade all treatments gave similar yields except 3 and 6 which were significantly ($P < 0.05$) lower than the control. Yields in the over 35 mm category were similar except for treatment 6 which was significantly ($P < 0.05$) lower than the control.

Market Sizes

The number of leeks in the various size grades are given in Table 4.

Table 4. Number of leeks (thousands/ha) in each size grade.

Treatment	Number of leeks (000)		
	over 10 mm	over 25 mm	35+ mm
1. Hand weeded control	212.8	130.9	26.8
2. Starane @ 0.5 x 2	184.6	120.5	26.8
3. Starane @ 0.25 x 3	185.3	87.1	11.2
4. Totril @ 0.5 x 2, Totril + Fortrol @ 0.5	178.6	110.9	29.8
5. Totril + Fortrol @ 0.35 x 2, Totril + Fortrol @ 0.7	185.3	128.7	20.1
6. Totril @ 0.7 + Fortrol @ 0.35 x 2, Totril + Fortrol @ 0.7	203.1	104.9	8.9
7. Totril + Fortrol @ 0.35 x 2, Totril @ 1.0 + Fortrol @ 0.5	180.1	111.6	23.1
8. Totril @ 0.5 x 2, Starane @ 0.5	198.7	119.1	17.9
9. Totril + Fortrol @ 0.35 x 2	201.7	131.0	28.3
10. Totril @ 0.7 + Fortrol @ 0.35 x 2	216.5	127.2	23.8
11. Totril + Fortrol @ 0.35 x 2, Starane @ 0.75	212.0	127.2	17.1
Mean	196.2	118.1	21.2
CV %	11	16	58
SED (30 df)	15.67	13.71	8.7
LSD (@ 5%)	32.0	27.99	17.77

The number of leeks over 10 mm ranged from 178,600 to 216,500/ha. All treatments were similar except for treatment 4 where the number of leeks was significantly ($P < 0.05$) lower compared to the handweeded control.

In the over 25 mm grade only treatment 3 was significantly ($P < 0.05$) lower than the control. In the over 35 mm category treatment 6 gave fewer leeks than the control.



Discussion

The application of either 0.25 or 0.5 l/ha Starane 2 (programmes 2 + 3) at the first leaf stage reduced leek vigour when recorded on 2 July but the plants recovered by late July.

There was only minimal leaf twisting of the leeks following Starane 2 application compared to the extreme twisting usually seen with onions. Although the potatoes were slightly stunted by the three lower rate applications of Starane they still remained vigorous with large numbers of potato plants surviving, compared to where tank mixes of Totril and Fortrol had been used. At harvest in mid October this poor control of the potatoes was reflected in a lower yield of leeks. However, the total number of leeks which were marketable was similar to the hand weeded control.

Two sequential applications of Totril alone during the first true leaf stage (programmes 4 + 8) were not as effective in controlling potato vigour as a regime comprising low rate combinations of Totril and Fortrol. However, an application of either Starane 2 (programme 8) or higher rates of Totril plus Fortrol combined (programme 4) at the second true leaf stage improved the potato control whilst not adversely affecting leek vigour compared with continuing with the low rate Totril plus Fortrol mixture. At harvest these yields were similar to the control.

The application of a tank mix containing Totril and Fortrol gave good early control of the potatoes whilst not significantly reducing the vigour of the leeks, except for where Totril at 0.7 l/ha had been used rather than 0.35 l/ha at the first true leaf stage. An application of either Totril, Fortrol or Starane 2 in early July was necessary to complete the subsequent control of the potatoes despite their apparent poor vigour at that date. Where no third application was made some of the potato plants subsequently recovered and set tubers. All the early Totril and Fortrol treatment combinations gave similar yields to the control except where the

higher rate of Totril had been applied in mid and late June.

The use of Starane 2 in early July (programme 8) did not adversely affect the vigour of the leeks and at harvest gave similar yields to where Totril plus Fortrol had been applied at the second true leaf stage. A single application of Atlas Somon in early July proved too late and the potato plants remained uncontrolled.

Potato tubers were collected from all the plots and will be grown on in 1992 to assess whether any of the treatments affected tuber viability.



Conclusions

1. Starane applied alone from the first true leaf stage reduced leek vigour, and where three sequential applications were used actually gave a yield reduction. Potato control was not achieved using the Starane only regimes.
2. Starane 2 did prove useful when applied in programmes at the second true leaf stage. It gave a similar result to the higher rate applications of Totril plus Fortrol.
3. The Totril plus Fortrol tank mix combinations gave good control of the potatoes. This was in the absence of damage or yield reduction to the leek crop, except where higher rates of Totril were used in the mix at the first true leaf stage.
4. A third application of herbicides at the two true leaf stage proved necessary to complete the control of the potatoes. The final response in terms of daughter tuber viability will be assessed in 1992.
5. The use of a single applications of Atlas Somon in early July was too late to be of any value.



Recommendations

1. The trial has indicated that Totril and Fortrol applied as a tank mix is very effective in controlling potatoes. This good control may have been partly influenced by the frost in mid May and therefore requires repeating.
2. The use of Starane 2 early on does not appear to be very promising but it may be useful when applied after the first true leaf stage. Higher rates should be investigated between the one and two true leaf stages.
3. An alternative to the above could be to develop an integrated approach to the problem of volunteers. This could involve crop rotations and the application of herbicides in the autumn prior to the vegetable part of the rotation to aid control of volunteers.



Storage of Data

The data will be stored at ADAS Arthur Rickwood, Mepal, Cambridgeshire for a period of 10 years. The HDC will be consulted before its disposal.



Appendix I

Field	House Ground	
Previous cropping	1990	Sugar beet
	1989	Winter wheat
	1988	Winter wheat
Crop diary		
Cultivation	20 December	ploughed
	25 February	power harrowed
Husbandry	9 April	drilled with Stanhay drill
	22 April	potatoes planted by hand
	21 June	treatment 1 hand weeded
	4 July	treatment 1 hand weeded
Insecticides	18 July	7.5 g/ha ai deltamethrin as 300 mls/ha water (cutworm control)
	31 July	as above
	25 September	as above
Herbicides	22 April	0.6 kg/ha ai paraquat as 3 l/ha cp Gramoxone 100 in 250 l/ha water
	23 April	4.32 kg/ha ai propachlor + 2.24 kg/ha ai chlorpropham as 9 l/ha cp Ramrod Flo + 5.6 l/ha cp CIPC 40 in 500 l/ha water
	30 May	0.45 kg/ha ai chlorbufam + 0.56 kg/ha ai chloridazon as 2.25 kg/ha cp Alicep in 450 l/ha water
	17 June	treatments applied as appropriate
	24 June	treatments applied as appropriate
	5 July	treatments applied as appropriate
	10 July	treatments applied as appropriate
	10 July	1.92 kg/ha ai propachlor as 4 l/ha cp Ramrod Flo in 400 l/ha water
Fungicides	30 July	0.75 kg/ha ai fenpropimorph as 1 l/ha cp Corbel in 400 l/ha water
	19 August	as above
	27 September	as above
Fertiliser	4 December	80 kg/ha P ₂ O ₅ + 120 kg/ha K ₂ O
	29 May	70 kg/ha N
	9 July	70 kg/ha N
Trace elements	14 June	9 kg/ha MnSO ₄ in 250 l/ha water
	28 June	9 kg/ha MnSO ₄ in 250 l/ha water
	16 July	9 kg/ha MnSO ₄ in 250 l/ha water

Irrigation

7 August 25 mm
13 September 25 mm

Harvest

21 October

Appendix II

Table A. Yield 10-25 mm and 25-35 mm, number of leeks >25 mm and plants/m² at harvest on 21 October.

Treatment	Yield (t/ha)		No. of leeks (000)		Plants/m ²	
	10-25	25-35	10-25	25-35	Total	Marketable
1. Hand weeded	6.5	16.6	81.8	104.2	24.9	21.3
2. Starane @ 0.5 x 2	5.4	15.2	64.0	93.8	28.9	18.5
3. Starane @ 0.25 x 3	7.9	11.6	98.2	75.9	24.6	18.6
4. Totril @ 0.5 x 2, Totril + Fortrol @ 0.5	5.1	12.6	67.7	81.1	22.2	17.9
5. Totril + Fortrol @ 0.35 x 2, Totril + Fortrol @ 0.7	4.9	16.7	56.6	108.6	24.6	18.6
6. Totril @ 0.7 + Fortrol @ 0.35 x 2, Totril + Fortrol @ 0.7	7.9	14.7	98.2	96.0	25.6	20.3
7. Totril + Fortrol @ 0.35 x 2, Totril @ 1.0 + Fortrol @ 0.5	5.6	13.0	68.4	88.5	29.3	18.0
8. Totril @ 0.5 x 2, Starane @ 0.5	5.3	15.9	79.6	101.2	26.6	19.9
9. Totril + Fortrol @ 0.35 x 2	5.9	16.5	70.7	102.7	26.4	20.1
10. Totril @ 0.7 + Fortrol @ 0.35 x 2	7.3	15.9	89.3	103.4	26.9	21.7
11. Totril + Fortrol @ 0.35 x 2, Starane @ 0.75	6.9	17.3	84.8	110.1	26.5	21.2
Mean	6.2	15.1	78.1	96.9	26.0	19.6
CV	29	15	31	159	24	11
SED (30 df)	1.29	1.61	16.99	10.92	4.40	1.55
LSD (@ 5%)	-	3.28	-	22.30	-	3.17

Appendix III

Table B. Leek and potato vigour on 18 October.

Treatment	Vigour scores	
	Leeks	Potatoes
1. Hand weeded	7.5	1.0
2. Starane @ 0.5 x 2	7.3	2.8
3. Starane @ 0.25 x 3	6.0	0.8
4. Totril @ 0.5 x 2, Totril + Fortrol @ 0.5	6.8	1.0
5. Totril + Fortrol @ 0.35 x 2, Totril + Fortrol @ 0.7	6.5	2.3
6. Totril @ 0.7 + Fortrol @ 0.35 x 2, Totril + Fortrol @ 0.7	6.8	1.3
7. Totril + Fortrol @ 0.35 x 2, Totril @ 1.0 + Fortrol @ 0.5	6.5	2.0
8. Totril @ 0.5 x 2, Starane @ 0.5	7.5	1.3
9. Totril + Fortrol @ 0.35 x 2	7.3	2.0
10. Totril @ 0.7 + Fortrol @ 0.35 x 2	7.0	2.5
11. Totril + Fortrol @ 0.35 x 2, Starane @ 0.75	6.8	2.3
Mean	6.9	1.7
CV %	14	71
SED (30 df)	0.68	0.87
LSD (@ 5%)	1.39	-

Appendix IV

General Comments on Herbicide Programmes on 25 July.

Treatment

2. Potato regrowth apparent
Some control of annual meadow grass
3. Potato regrowth apparent
Some control of annual meadow grass
4. Slight potato regrowth
Annual meadow grass present
5. Good control of potatoes
Annual meadow grass present
6. Good control of potatoes
Annual meadow grass present
7. Good control of potatoes
Annual meadow grass present
8. Good control of potatoes
Annual meadow grass present
9. Potato regrowth apparent
Annual meadow grass present
10. Good control of potatoes
No annual meadow grass
11. Good control of potatoes
Some annual meadow grass present
12. Neither potatoes or weeds controlled, programme not suitable
13. Weeds present were Black bindweed, Hemp nettle, Chickweed,
Knotgrass, Thistle, Annual Meadow grass, Charlock plus potatoes.

Contract between ADAS (hereinafter called the "Contractor") and the Horticultural Development Council (hereinafter called the "Council") for a research/development project.

PROPOSAL

1. **TITLE OF PROJECT** Contract No: FV 54d

LEEKS: CONTROL OF VOLUNTEER POTATOES

2. **BACKGROUND AND COMMERCIAL OBJECTIVE**

Volunteer potatoes have become one of the most serious problems in onion and leek production areas across the whole range of soil types where potatoes are grown. In 1990 the Arthur Rickwood EHF undertook a trial for HDC to obtain information on the use of fluroxypyr (as Starane 2) for control of volunteer potatoes in onions. In discussion with the HDC, leek growers and advisers considered that the work on onions should also be carried out on leeks. At present there are no safe herbicides to fully overcome this problem.

3. **POTENTIAL FINANCIAL BENEFIT TO THE INDUSTRY**

The incidence of volunteer potatoes in leek crops is on the increase. Farmers have dealt with the problem within the leek crop only by using clopyralid (approval now withdrawn) or by hand hoeing. If a regime could be devised which would be safe to the crop but yet control the volunteer potato shoots and reduce daughter tubers viability then the problem of volunteer potatoes could be reduced at a comparatively low cost compared to hand hoeing.

4. **SCIENTIFIC/TECHNICAL TARGET OR WORK**

To identify efficacious, safe and cost-effective programmes of chemical control of volunteer potatoes in a leek crop.

5. **CLOSELY RELATED WORK COMPLETED OR IN PROGRESS**

Preliminary work has been carried out at Arthur Rickwood EHF on onions to identify the best ways of using Starane 2 in the herbicide programme. Other potentially useful herbicides have also been identified from other MAFF-funded herbicide trials, and from field observation and these will be tested on leeks. The Sugar Beet Research and Education Committee are sponsoring a major study on integrated control of potatoes in sugar beet at ADAS EHF's which commenced in November 1990.

6. **DESCRIPTION OF THE WORK**

Potatoes cv Maris Piper would be hand planted in a crop of leeks to simulate a volunteer population of about 3/m². The potatoes would be controlled from the first true leaf stage of the leeks using a range of broad leaved herbicide programmes aiming to keep the plots weed free. The

suggested herbicide treatments are:-

1. Unweeded control
2. Hand weeded control
3. Starane @ 0.5 1/ha at first leaf stage, repeated 7 days later
4. Starane @ 0.25 1/ha at first leaf stage, repeated 7 days later and at second leaf stage
5. Totril @ 0.5 1/ha at first leaf stage, repeated 7 days later and Totril @ 0.5 1/ha + Fortrol @ 0.5 1/ha at second leaf stage
6. Totril @ 0.35 1/ha + Fortrol @ 0.35 1/ha at first leaf stage, repeated 7 days later and Totril @ 0.7 1/ha + Fortrol @ 0.7 1/ha at second leaf stage
7. Totril @ 0.7 1/ha + Fortrol @ 0.35 1/ha at first leaf stage, repeated 7 days later and Totril @ 0.7 1/ha + Fortrol @ 0.7 1/ha at second leaf stage
8. Totril @ 0.35 1/ha + Fortrol @ 0.35 1/ha at first leaf stage, repeated 7 days later and Totril @ 1.0 1/ha + Fortrol @ 0.5 1/ha at second leaf stage
9. Totril @ 0.5 1/ha at first leaf stage, repeated 7 days later and Starane 2 @ 0.5 1/ha at second leaf stage
10. Totril @ 0.35 1/ha + Fortrol @ 0.35 1/ha at first leaf stage, repeated 7 days later and Starane 2 @ 0.5 1/ha at second leaf stage
11. Totril @ 0.7 1/ha + Fortrol @ 0.35 1/ha at first leaf stage, repeated 7 days later and Starane 2 @ 0.5 1/ha at second leaf stage
12. Totril @ 0.35 1/ha + Fortrol @ 0.35 1/ha at first leaf stage, repeated 7 days later and Starane 2 @ 0.75 1/ha at second leaf stage
13. Atlas Somon @ 28 kg/ha at second leaf stage.

7. COMMENCEMENT AND DURATION

Start date 1.3.1991; duration of 10 months
(An interim report of weed control effects will be provided in August 1991).

8. STAFF RESPONSIBILITIES

Experiment Leader - Sally Runham/Julian Davies

Contract Manager - ~~P. C. Rickard~~

C Speller

9. COST

£4100 for a one year study

10. PAYMENT

On each quarter day the Council will pay the Contractor in accordance with the following schedule:

Quarter/Year	1991	1992
1	410	-
2	1230	-
3	1230	-
4	1230	-



TERMS AND CONDITIONS

The Council's standard terms and conditions of contract shall apply.

Signed for the Contractor (s) Signature..... *M. J. Guff*
Position..... *Asst. Manager*
Date..... *18/4/91*

Signed for the Contractor (s) Signature.....
Position.....
Date.....

Signed for the Council Signature..... *A. Annan*
Position..... CHIEF EXECUTIVE
Date..... *18.4.91*

