

NO. 13. THE ERADICATION OF SERRATED TUSSOCK (NASSELLA TRICHOTOMA  
(NEES) HACK) ON SEMI-ARABLE AREAS BY THE USE OF CHISEL  
PLOUGH AND PASTURE IMPROVEMENT.

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Five chisel plough treatments were applied to separate areas of serrated tussock and an improved pasture sward established on each area.

16% to 72% of the adult tussocks remaining after chisel plough treatments were killed by pasture competition.

87% to 99% of seedling tussocks, which germinated with the improved species, succumbed to pasture competition in the first two years of the experiment.

The results show a comparison between the various chisel plough treatments for tussock removal, and emphasise the importance of spelling improved pasture in serrated tussock areas, if the weed is to be permanently controlled.

1. INTRODUCTION:

A great deal of the serrated tussock infestations in N.S.W. occur on non-arable and semi-arable areas.

A control campaign has been initiated on non-arable areas of serrated tussock in the Central Tablelands of N.S.W., by aurally spreading superphosphate and subterranean clover seed.

Due to the physical ease of applying this first step in the control campaign, many semi-arable areas are being regarded, and treated, as non-arable areas, instead of being ploughed and sown down to improved pasture.

Complete pasture improvement is the control measure advocated for serrated tussock (Campbell, 1960) on arable and semi-arable land, and is an infinitely

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surer, faster and cheaper method of eradication, than those being employed in non-arable areas (Campbell)<sup>++</sup>

Thus it is important that any area deemed semi-arable should be cultivated and sown to improved pasture.

This paper presents an experimental case history of a semi-arable area, treated by chisel ploughing and the sowing of improved species.

## 2. METHOD:

Five chisel plough treatments were applied to a semi-arable hillside of serrated tussock at Rockley, N.S.W.

- (a) C.P. 2 ways, at right angles, with wings, on July 7, 1957.  
C.P. 1 way, with wings, on February 27, 1958.
- (b) C.P. 2 ways, at right angles with chisel points on July 7, 1957.  
C.P. 1 way with wings, on February 27, 1958.
- (c) C.P. 1 way, with chisel points on July 7, 1957.  
C.P. 1 way, at right angles with wings on February 27, 1958.
- (d) C.P. 1 way, with chisel points on February 27, 1958.  
C.P. 1 way, at right angles with wings, on February 27, 1958.
- (e) C.P. 1 way, with chisel points, on February 27, 1958.

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C.P. = Chisel ploughed.

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"Wings" refer to attachments bolted behind chisel points.

Stump jump harrows were applied to the plots after each ploughing treatment.

Treatments were set out in randomised blocks with four replications.

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<sup>++</sup> A paper presented at this Conference entitled "Competition between Subterranean clover and serrated tussock on non-arable areas".

Plot size was 8 x 25 yards.

The following improved pasture mixture was drilled onto all treatments on February 28, 1958:-

N.Z. White Clover	Trifolium repens	$\frac{1}{2}$ lb/acre.
Alsike Clover	Tr. hybridum	$\frac{1}{2}$ lb/acre.
Red Clover	Tr. pratense	1 lb/acre.
Subterranean Clover	Tr. subterranean	4 lb/acre.
Phalaris tuberosa		2 lb/acre.

50 : 50 Mo. superphosphate, at the rate of 3.4 cwt/acre accompanied the seed. The area was later topdressed with 1 cwt/acre superphosphate on June 20, 1959.

Six permanent 1 sq. yd. quadrats were established per plot, and the number of tussocks present in these quadrats were recorded at various stages : -

- (1) On July 31, 1958 in accompaniment with the number of improved species to establish per quadrat.
- (ii) On May 13, 1959, after the pasture had been spelled during 1958, and grazed off in April 1959, by a stocking capacity of the order of 0.6 sheep/acre/year.
- (iii) On May 10, 1960, following an animal free period in 1959, and grazing off in March and April, 1960. The stocking capacity in March and April, 1960, was approximately 0.5 sheep/acre/year.

Thus the experimental area was kept free of animals during the winter, spring and summer of 1958, and 1959, to allow pasture species maximum chance of eradicating adult and seedling tussocks.

### 3. RESULTS:

- (a) The Efficiency of Various Chisel Plough Treatments in Removing Serrated Tussock Plants.

- (i) Adult Tussocks.

As expected, treatments 1 and 2, each of which consisted of three chisel plough treatments, were more effective in removing adult tussocks than the remainder of the treatments. (see Table 1).

Treatments 3 and 4 consisted of an identical number of workings (2), but whereas treatment 4 had both workings applied on the one day, treatment 3 was allowed a seven months fallow, between workings.

By enlisting the aid of this fallow period treatment 3 proved to be twice as effective in removing serrated tussock, as treatment 4 (see Table 1).

Treatment 5 consisted of little more than a severe renovation to the serrated tussock area, removing very few tussocks.

(ii) Seedling Tussock.

Germination of serrated tussock seeds present in the soil, accompanied the germination and establishment of the sown species.

The number of serrated tussock seedlings to establish per sq. yd., was found to be greatest on the most thoroughly prepared seedbed, and least on the seedbeds where competition from adult tussocks was still a major factor, and/or seedbed preparation was of poor quality. (see Table 1).

(b) The Establishment and Survival of Sown Species.

The establishment of improved species was most successful on the more thoroughly prepared seedbeds (see Table 2).

However a satisfactory establishment of phalaris, and other species, was obtained, even on the rough seedbed of treatment 5.

(c) Competition between Sown Pasture Species and Serrated Tussock.

The foliage production of improved species, during the animal free periods of this trial, caused the smothering and resultant death of many serrated tussock plants.

TABLE 1

THE NUMBER OF SERRATED TUSSOCK PLANTS, PER SQ. YD.,  
REMAINING AFTER CHISEL PLOUGH TREATMENTS.

Treatment.	No. of Adult tussocks remaining after ploughing.	No. of tussock seedlings to establish with sown pasture.
1. Chisel plough, 2 ways with wings, July, 1957 - S.J.H. Chisel plough, 1 way, with wings, Feb. 1958 - S.J.H.	1.3	25.3
2. Chisel plough, 2 ways, chisel points, July, 1957 - S.J.H. Chisel plough, 1 way, with wings, Feb. 1958 - S.J.H.	0.6	18.0
3. Chisel plough, 1 way, chisel points, July 1957 - S.J.H. Chisel plough, 1 way, with wings, Feb. 1958 - S.J.H.	2.1	9.6
4. Chisel plough, 1 way, chisel points, Feb. 1958 - S.J.H. Chisel plough, 1 way, with wings, Feb. 1958 - S.J.H.	5.5	9.3
5. Chisel plough, 1 way, with chisels, Feb. 1958 - S.J.H.	14.6	7.0

S.J.H. - Stump Jump Harrows.

TABLE 2

THE ESTABLISHMENT AND SURVIVAL OF IMPROVED SPECIES SOWN ON  
VARIOUS CHISEL PLOUGH TREATMENTS.

Treat- ment.	Trifolium subterraneum		Trifolium repens		Trifolium pratense		Trifolium hybridum		Phalaris tuberosa	
	No. of plants /sq.yd.	% Es- tab- lish- ment <sup>+</sup>	No.	% E.	No.	% E.	No.	% E.	No.	% E.
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1	21.6	37.4%	13.3	17.0%	6.2	13.2%	4.1	13.1%	25.3	36.0%
2	18.3	31.8	14.1	18.3	5.6	11.8	4.3	13.5	24.8	35.4
3	21.7	37.7	14.4	18.8	6.3	13.3	3.7	11.5	22.8	32.2
4	19.2	33.2	12.6	16.4	5.8	12.2	4.3	13.5	17.1	24.3
5	17.1	29.7	9.6	12.6	4.4	9.3	3.9	12.3	12.8	18.1

++ see Table 1.

+ % establishment of viable seeds sown.

Seedling tussocks were substantially reduced in number on all treatments after the first year of spelling, and approximately 87% to 99% of seedlings were killed as a result of pasture competition, by the end of the second year (see Table 3).

Adult tussocks were more difficult to eradicate by pasture competition.

Where few tussocks were present after the chisel plough treatment, only small reductions in numbers resulted over the period of the trial.

However, where a high density of tussock remained after chisel plough treatment, the reduction in number was of a very high order (see Table 3).

TABLE 3.

THE EFFECT OF PASTURE COMPETITION IN KILLING SERRATED TUSSOCK,  
REMAINING AFTER INITIAL CHISEL PLOUGH TREATMENTS  
 (NO. OF TUSSOCKS PER SQ. YD.)

Treat- ment	1958		1959				1960				Total % kill from 1958-60		Total tussocks killed per acre by pasture competition	
	Adult tussocks remaining after ploughing	Seedling tussocks established with sown pasture	Tussocks remaining		% Kill		Tussocks remaining		% Kill		Adult	Seedlg		
			Adult	Seedlg	Adult	Seedlg	Adult	Seedlg	Adult	Seedlg				
*														
1	1.3	25.3	1.3	1.5	-	94.1%	0.6	0.1	54.8%	5.5	54.8%	99.6%	124,011	
2	0.6	18.0	1.3	3.1	-	82.8	0.5	1.9	160.0	6.6	16.7	89.4	84.595	
3	2.1	9.6	1.8	1.7	14.4%	82.3	1.0	1.1	38.0	6.2	52.4	88.5	46.510	
4	5.5	9.3	4.1	2.8	25.5	69.9	2.3	1.2	32.7	17.2	58.2	87.1	54.710	
5	14.6	7.0	9.3	1.4	36.2	80.0	4.0	0.04	36.4	19.4	72.6	99.4	82.056	

\* see Table 1.

+ The increase in number of tussocks in this case is attributed to the splitting of large tussocks into numbers of small ones, due to overgrowth by improved species.

#### 4. DISCUSSION:

The most successful method of mechanical removal of serrated tussock, used in this experiment, included three chisel plough treatments. These treatments were insufficient to completely remove serrated tussock.

Thus it appears that four chisel plough treatments would be necessary to completely remove serrated tussock from an area.

The provision for a summer fallow in treatment 3, greatly enhanced the kill of serrated tussock obtained by two chisel plough treatments. This fallow, if practicable, would thus become an integral part of the seedbed preparation on arable and non-arable areas, alike.

Where non-arable areas are very steep and only one chisel plough treatment is possible, the results obtained from treatment 5 clearly exhibit the advantages of rough ploughing and sowing down when compared with aerial sowing alone\* on these areas. A feature of treatment 5 was the establishment of the perennial grass, Phalaris tuberosa, which has proved a major guard against serrated tussock infestation. The establishment of this grass from aerial treatment is a very difficult task.

A high proportion of serrated tussock seedlings was smothered, in all treatments by improved pasture growth, during the first year of spelling. This bears out the wisdom of the recommended annual spell (Campbell 1960) after sowing an improved pasture, on an area previously infested with serrated tussock.

On semi-arable areas where improved pasture may produce less foliage, than on strictly arable areas, the spelling period will have to be extended.

To ensure a complete kill of serrated tussock seedlings, the improved pasture must cover every sq. yd. of the paddock. Thus it may be necessary to spell the area concerned, during spring and summer, for three or four years, to completely eradicate seedling tussock. In the case of this trial, tussock seedlings remained after two years' spelling.

To completely eradicate adult tussocks, after a rough seedbed preparation, the area will have to be spelled, during spring and summer, for a number of years after sowing

\*Campbell, M.H. A paper presented at this conference entitled "Competition between Serrated Tussock & Subterranean Clover on non-arable areas".



of the improved species. Pasture competition reduced the number of adult tussocks from 14 to 4/sq. yd., in two years, under conditions provided in treatment 5 of this experiment.

The ability to use pasture competition as a method of eradication of serrated tussock, will depend on many factors, such as the proportion of the property infested with serrated tussock, and the financial status of the farmer concerned, etc.

However there are many cases where chisel ploughing combined with pasture competition over a period of years, will convert semi-arable areas infested with serrated tussock to first class improved pasture.

#### 5. REFERENCE:

Campbell, M.H. (1960). - Sown pastures provide permanent tussock control. Agric. Gazette of N.S.W. 71 : 9.