A COMPARISON OF ROTATIONAL GRAZING AND SET-STOCKING OF DRYLAND LUCERNE

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Summary
Three grazing management systems, each stocked at 5 wethers/ac (12.5/ha) were compared on dryland lucerne: (i) eight paddock rotation with 5 days grazing per paddock; (ii) four paddock rotation with 12 days grazing per paddock; (iii) set-stocking. All lucerne plants in the set-stocked area died within seven months. Sheep removed from the treatment at this stage weighed 25.4 kg while those on the rotational areas weighed 47.2 kg. Differences in first year wool production were not significant, the averages being 17.7 kg clean wool per acre from the eight paddock rotation and 17.0 kg from the four paddock rotation. Lucerne plant density declined significantly in the four paddock compared with the eight paddock rotation.

I. INTRODUCTION
In a pilot experiment at the Agricultural Research Station, Trangie, a 10 paddock rotation on lucerne (one week grazing in each paddock) carried 4 dry sheep/ac (10/ha) during the 1965-66 drought. Similar sheep on natural pasture were stocked at less than 1 sheep/ac (2.5/ha) and were hand fed for three months (Robards and Peart 1967). During much of the year the lucerne had flowered and set seed before the end of the nine week recovery period. Thus it may be possible to give shorter rest periods and so reduce the number of paddocks needed.

An experiment was commenced in 1966 to compare a four paddock and an eight paddock rotation with set-stocking. Any alterations in the number of paddocks would allow variation in grazing time or recovery time, or in both. In this case, recovery time was held constant at five weeks so that two grazing periods of 5 and 12 days were compared. Results from the first year of this experiment are reported here.

II. MATERIAL AND METHODS
Three grazing management systems were compared in two replications on dryland lucerne pasture stocked at 5 wethers/ac (12.5/ha). The systems were: (i) an eight paddock rotation with a 5 day grazing period and a 35 day recovery period; (ii) a four paddock rotation with a 12 day grazing period and a 36 day recovery period; and (iii) set-stocking. All paddocks had an area of 1 ac (0.4 ha) so that 40, 20 and 5 sheep, respectively, were used.

Lucerne seed was sown in 1963 at 1.1 kg/ha with a cover crop of oats and was grazed intermittently after establishment. By May 1966 when the experiment began, plant density varied widely over the area and it was necessary to stratify paddocks to give each system in the comparison an approximately equal lucerne density of 9.7 plants/m².

The sheep were shorn on May 23, 1966, and placed on the experimental area next day. Eight month old Merino wethers were used and all groups averaged 32.7 kg bodyweight at the beginning of the experiment. Sheep were weighed

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every 10 days in the eight paddock rotation and the set-stocked treatment, and
every 12 days in the four paddock system. At shearing on May 29, 1967, fleeces
were weighed and samples were taken for estimation of clean scoured yield.

The yearly bodyweight figures were averaged over six 60-day periods and the
average weights of each period were analysed separately by analysis of variance.
Differences in clean wool weight were examined using analysis variance.

Lucerne plant density was checked monthly on maps of plants in permanent
0.84 m² quadrats. Each rotational treatment contained 20 quadrats while the
set-stocked treatments contained 10 per replicate.

III. RESULTS

Sheep on the set-stocked areas were removed at the end of seven months
when they weighed 25.4 kg. Fifty percent of the sheep commencing this treatment
had died and been replaced. Lucerne was eliminated under the set-stocking regime.

Clean wool production at the end of the first 12 months was 3.5 and 3.4
kg/head from the eight and four paddock systems respectively, the difference
being non-significant.

Seasonal bodyweight changes and weekly rainfall are shown in Figure 1.
Average bodyweights were significantly greater ($P<0.05$) in the eight paddock
rotation in each of the three 60-day periods from May 24 to November 21.

Lucerne plant density declined to a significantly greater extent ($P<0.05$) in
the four paddock rotation from 6.5 to 5.4 plants/m², than in the eight paddock
rotation, from 6.6 to 6.2 plants/m².

IV. DISCUSSION

Elimination of lucerne under the set-stocking regime within seven months
demonstrates the inability of the plant to survive this management treatment. It
has been shown that there is a correlation between the level of storage material
in the tap root of lucerne and the productivity and longevity of the plant (Feltner
and Massengale 1965; Graber et al. 1927). In addition, Grandfield (1935) found
that after cutting there was a rapid decline in total carbohydrates and nitrogen in
lucerne roots. Values reached a minimum in 20 days, but this was followed by
accumulation of root storage material until flowering. The constant grazing under
set-stocking at 5 sheep/ac (12.5/ha) probably did not allow the new shoots to
develop to the stage where root storage material could be replenished.

With a standard five weeks recovery time, the differences in wool production
between the two rotational treatments were not significant. However, the eight
paddock rotation appeared to have a number of advantages. Sheep were better
able to maintain their bodyweight during stress periods, with the more regular feed
supply provided by the five day move (Graham 1967). It appeared that where
sheep were in a paddock for 12 rather than 5 days there was sufficient time for
new shoots to be produced and eaten and this could cause depletion of lucerne root
reserves and perhaps death of the plants. The 17% decline in plant density in
the four paddock rotation was shown to be significantly greater than the 6%
decline which occurred in the eight paddock system.

These results, and those obtained by Moore, Barrie and Kipps (1946), sug-
gest that plant density could continue to decline in the four paddock rotation as
the experiment continues, giving rise to large differences in production between
Fig. 1.—Mean bodyweight for sheep in each system and weekly rainfall for the period of the experiment.
systems. If this is so, then four paddocks will not be sufficient for a long term rotational grazing system in the Trangie environment.

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VI. REFERENCES


