

Grazing Management Can Improve Livestock Distribution

Ben Norton, USU

Matt Barnes, Shining Horizons

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How symposium topics fit together

- Stocking rate: kind and number of **livestock**
- Timing: controlling **when** animals graze
- Distribution: controlling **where** animals graze
- Nutrition: managing for **diet and intake**

The overall goal of grazing management:

For a given herd of livestock...

*Controlling **where** and **when** animals graze*

... to achieve desired production
with ecological sustainability

Fundamental Principles of Grazing

- **Spatial distribution of grazing animals is uneven but repetitive**
- **Severe selective defoliation can reduce the ability of a species to persist in range vegetation**
- **Production per animal is a function of quantity and quality of forage consumed**
- **Animals can learn to modify feeding behavior**

Fundamental Principles of Grazing

- **Spatial distribution of grazing animals is uneven but repetitive**, due to localized preference for previously grazed plants and areas
- **Severe selective defoliation can reduce the ability of a species to persist in range vegetation**
- **Production per animal is a function of quantity and quality of forage consumed**
- **Animals can learn to modify feeding behavior**

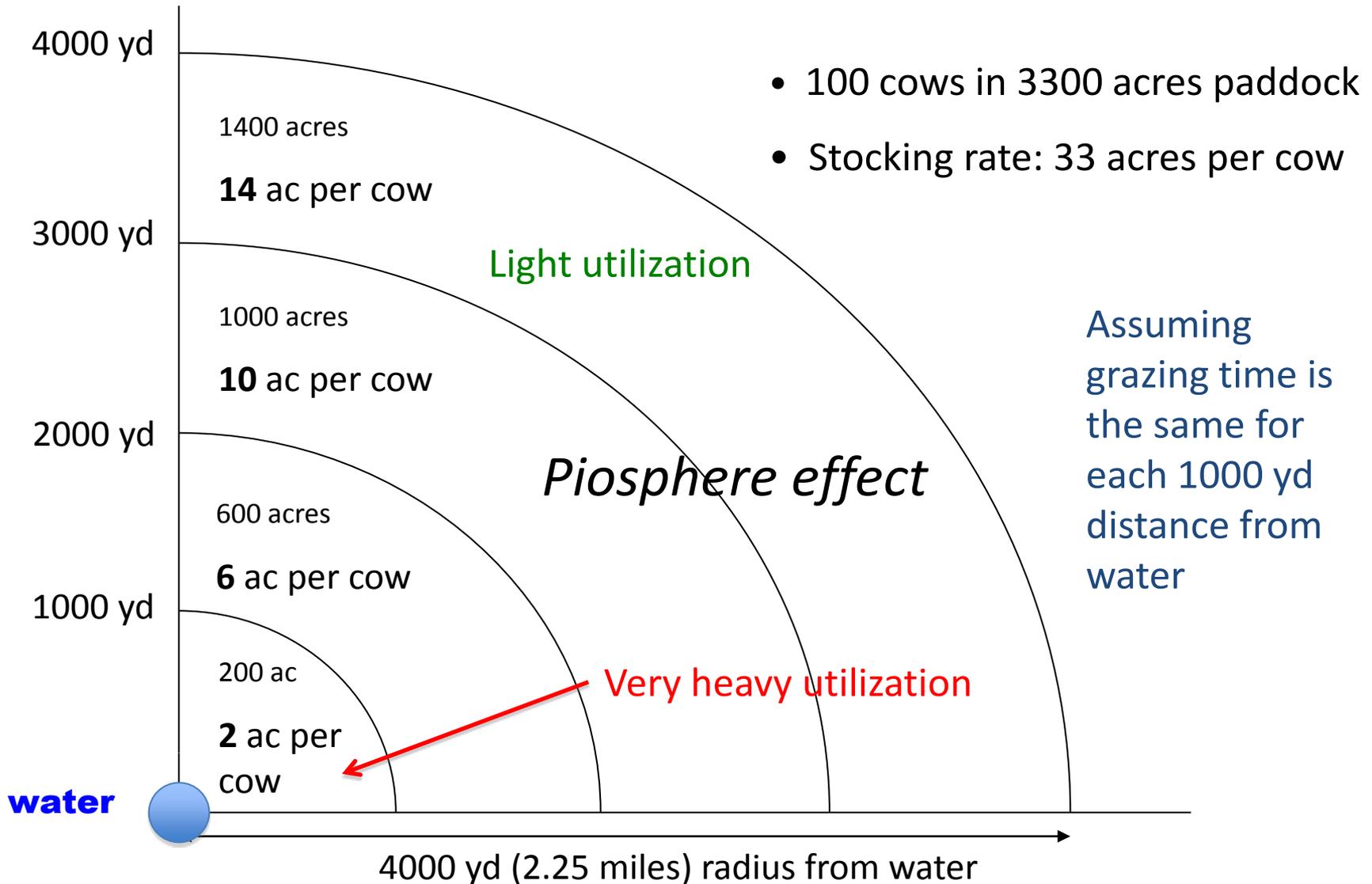
“the goal of grazing management is for every available forage plant... [to] contribute to animal intake under ecologically safe circumstances”

Marshall Frasier
Abstract, this symposium

In order to achieve that goal, every plant has to be examined by a grazing animal which has the option to eat it. This is the essence of managing for spatial distribution.

Is intensity of utilization a function of distance from water?

Stocking density in 1000 yd annular zones radiating from a corner water point



Under continuous stocking, degradation will always occur close to water



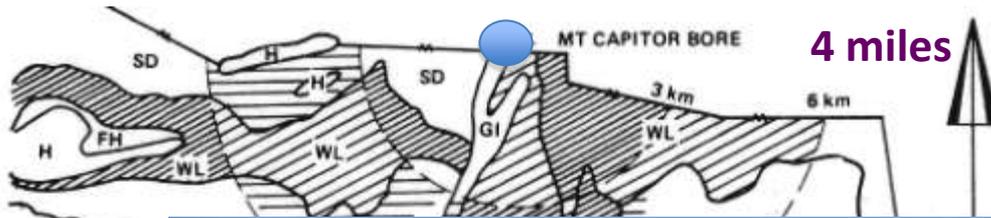
BUT... grazing distribution across the
landscape does not follow a
predictable pattern

And is not necessarily related to location of
water points

Livestock in large paddocks often graze in small groups when far from water



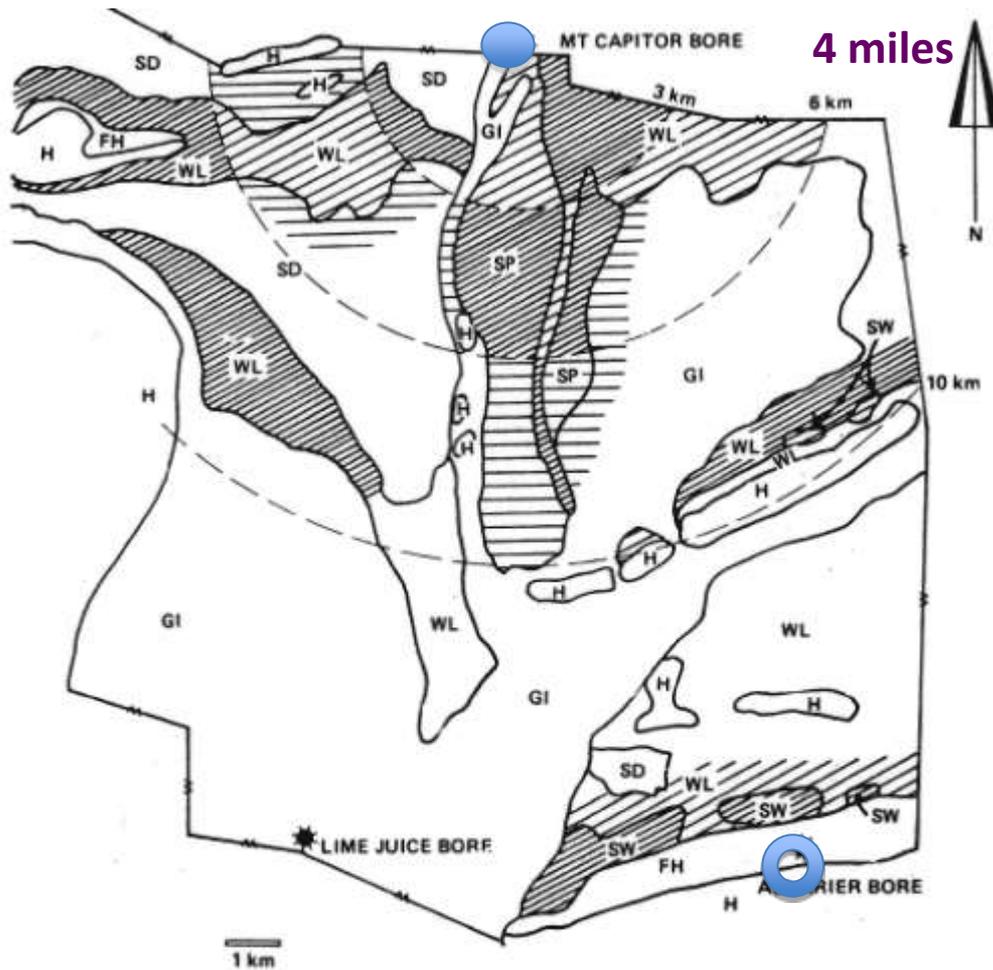
... causing localized degradation



Capitor Bore paddock,
Todd River Station,

Central Australian landscape at 10 inch average rainfall





Capitor Bore paddock,
Todd River Station,
Central Australia

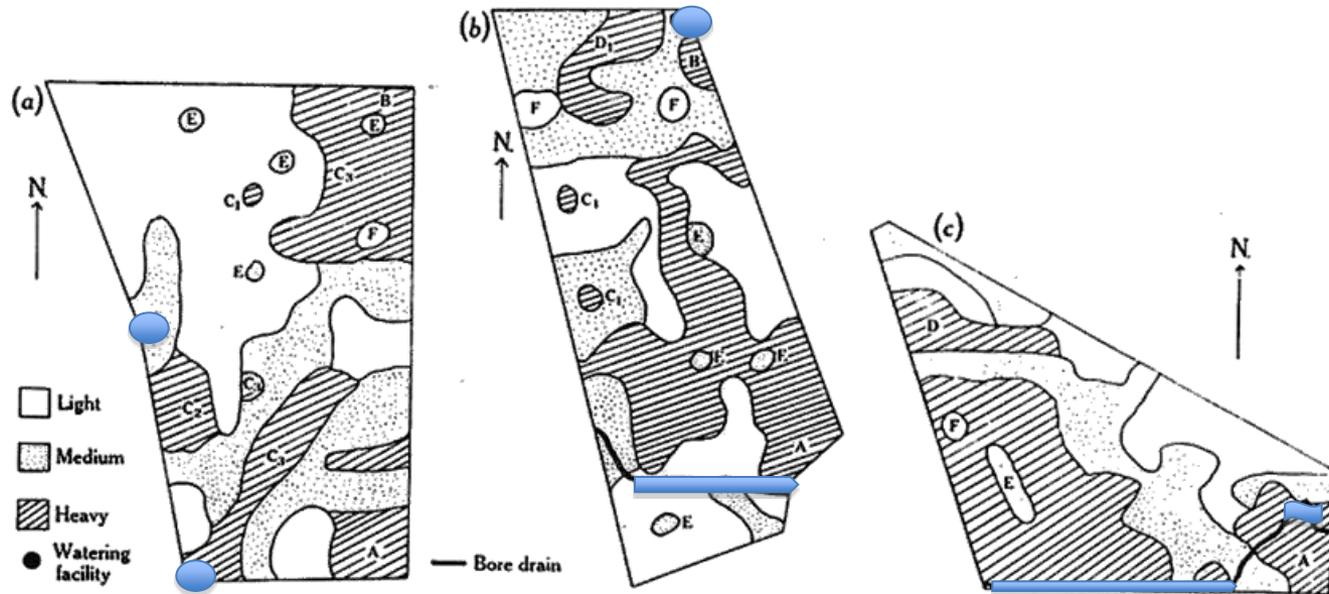
45,000 acres
1000 cattle
45 acres per AU

5-year study
observing cattle
locations

SD = SAND-DUNE
SP = SAND-PLAIN
GI = GIDGEE
H = HILL
FH = FOOTHILL
WL = WOODLAND
SW = SWAMP
— FENCE
* WATERPOINT

HEAVILY GRAZED
MODERATELY GRAZED
LIGHTLY GRAZED
NOT GRAZED

Distribution of utilization on semi-arid grassland after 15-20 years



3125 acres

4.5 acres/sheep

3050 acres

3.5 acres/sheep

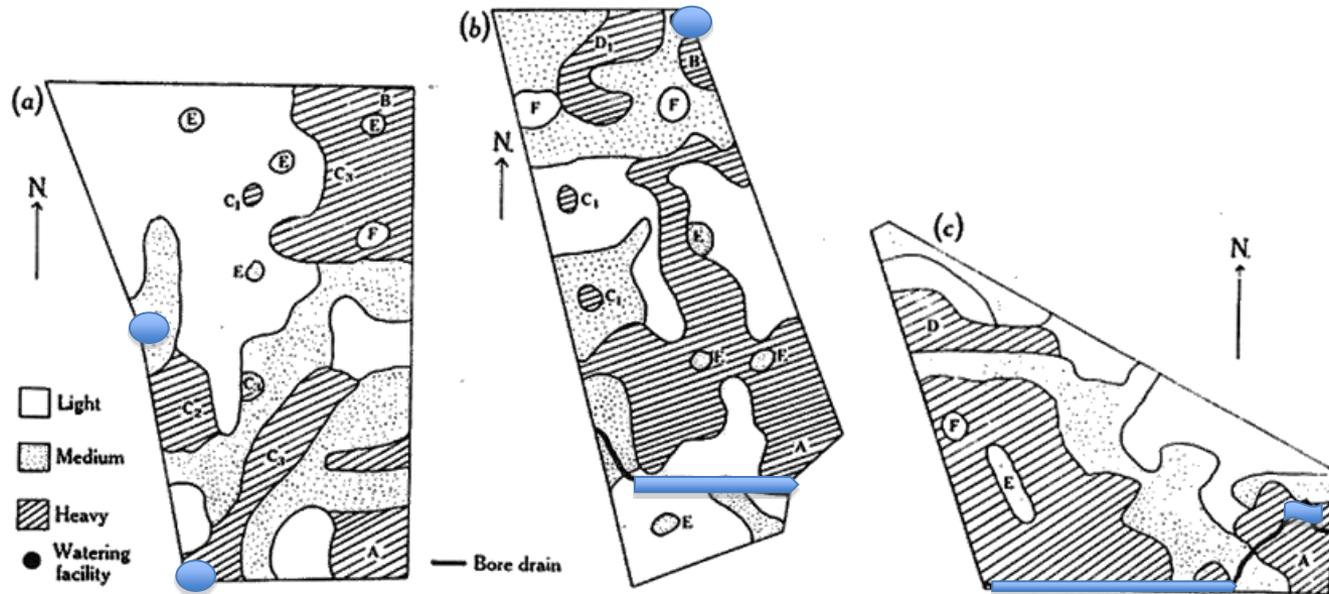
1425 acres

2.5 acres/sheep

Mitchell grassland (*Astrebla* spp) in central Queensland



Distribution of utilization on semi-arid grassland after 15-20 years



3125 acres

4.5 acres/sheep

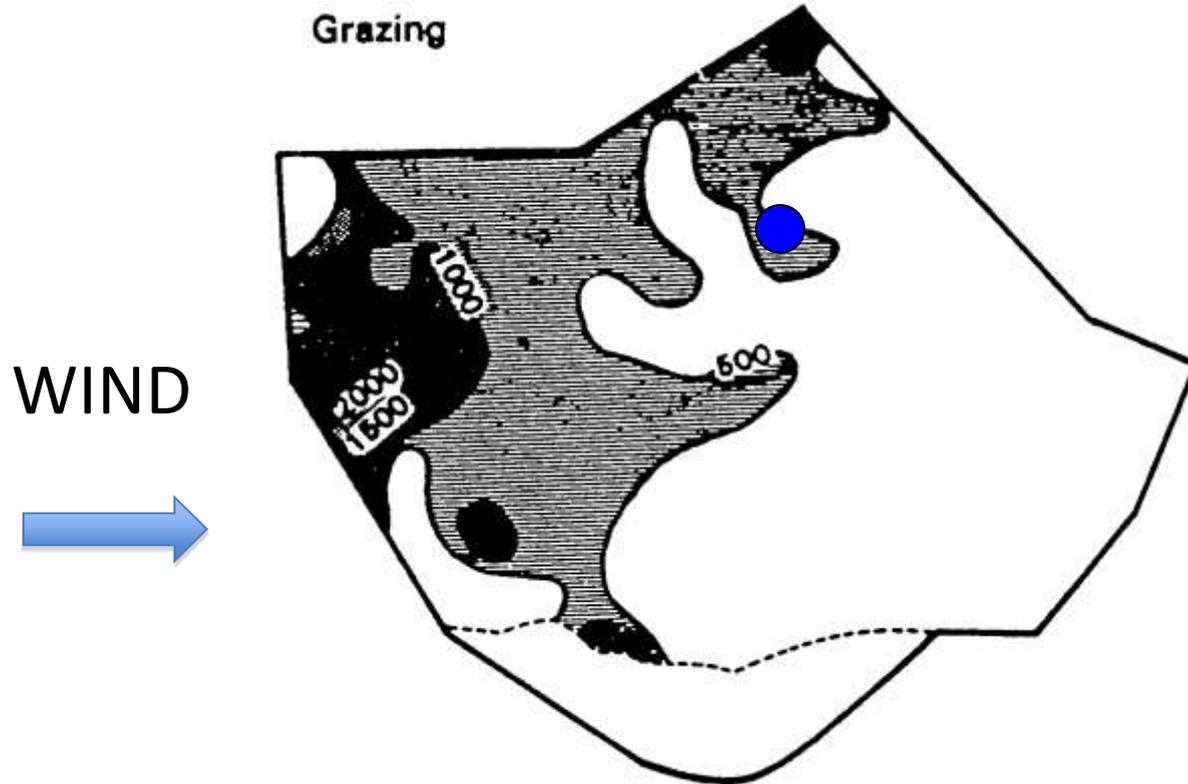
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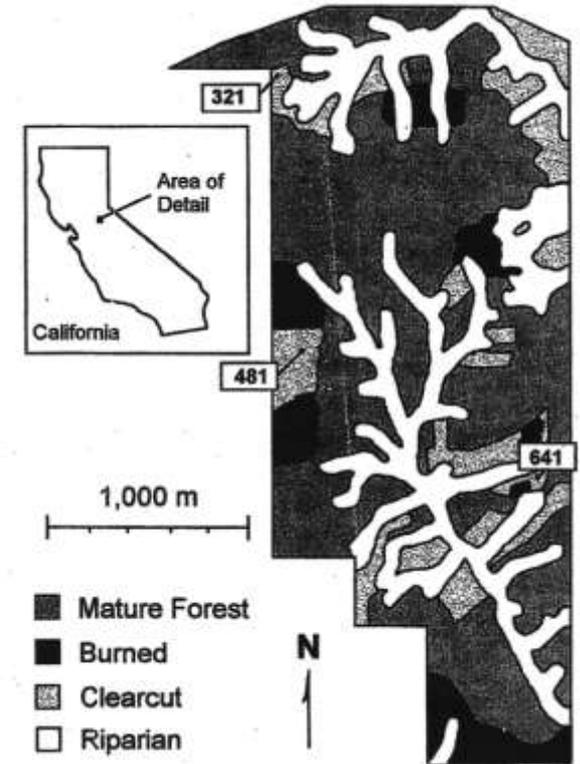
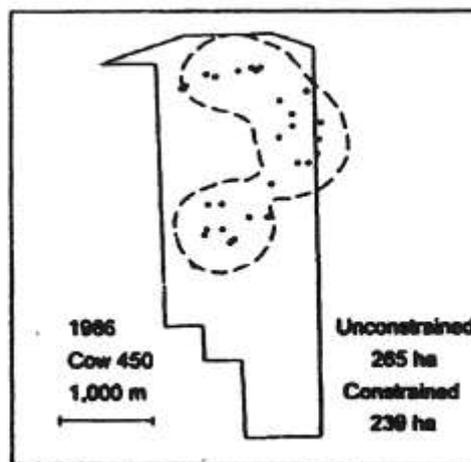
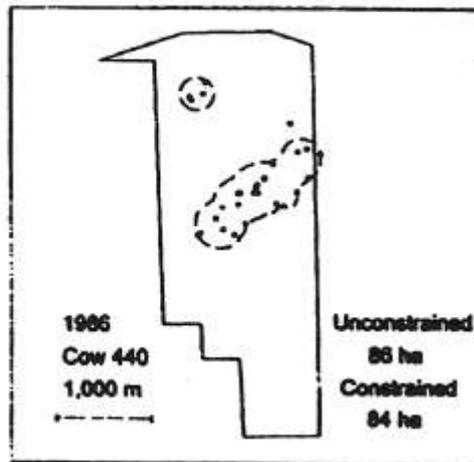
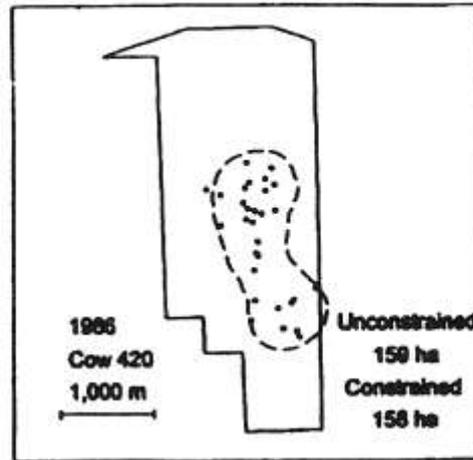
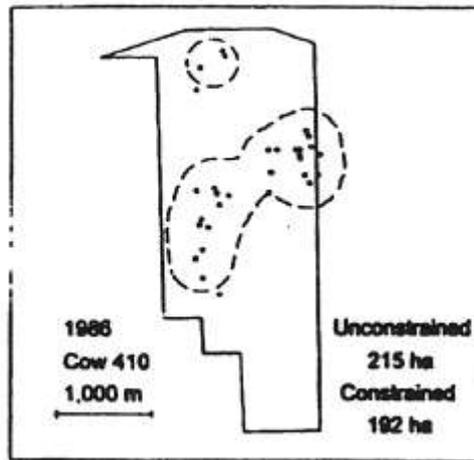
2000 acre paddock in New Zealand



Blodgett Forest, Sierra Nevada, CA

40 AU in 1650 acres for 4-5 months – 41 acres per AU

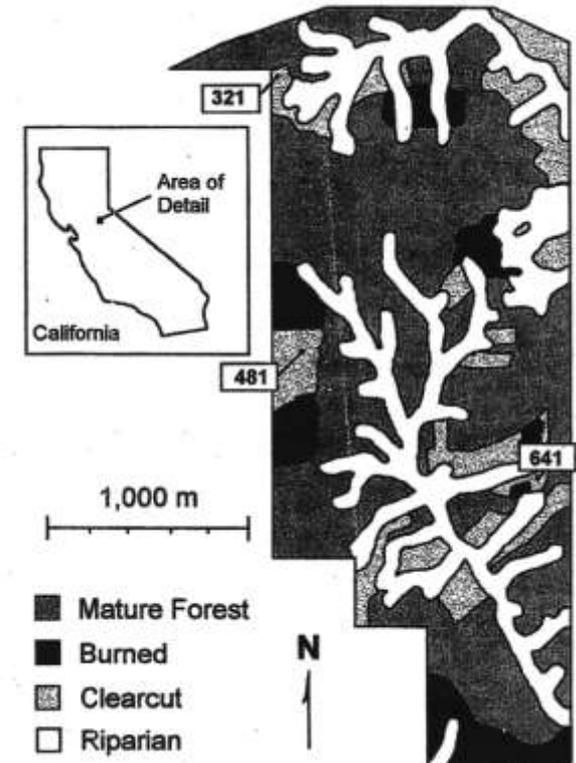
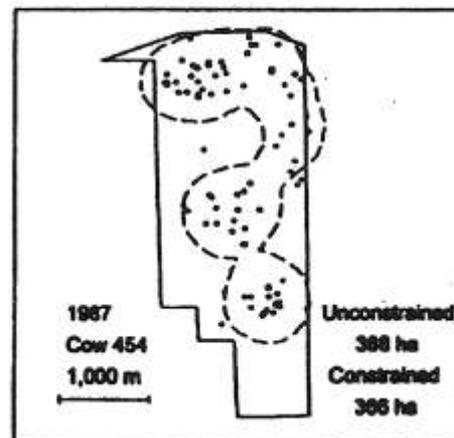
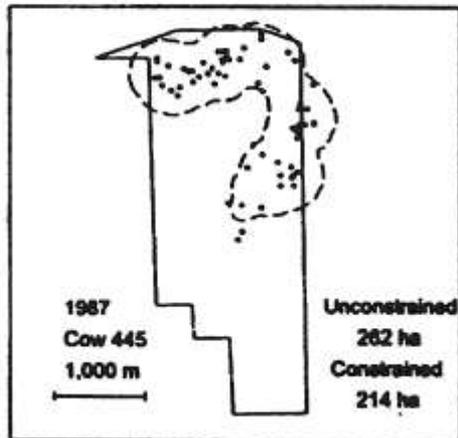
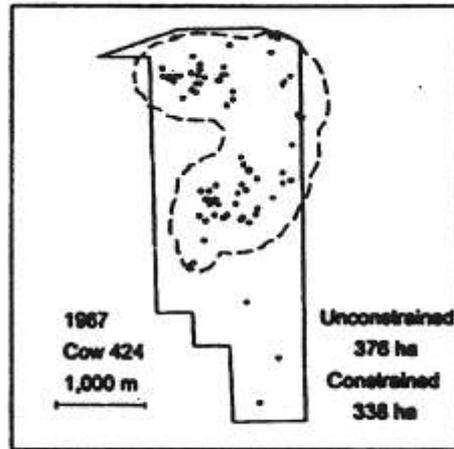
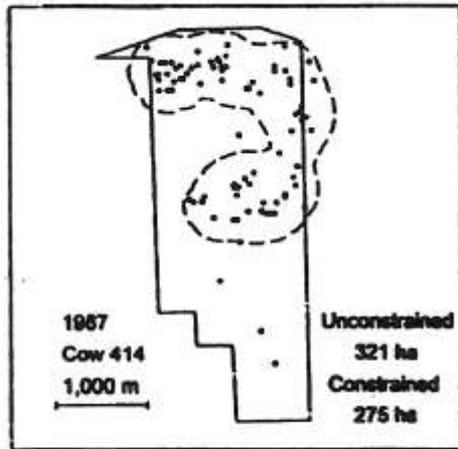
Home range for 4 individual cows: 1986



Blodgett Forest, Sierra Nevada, CA

40 AU in 1650 acres for 4-5 months – 41 acres per AU

Home range for 4 individual cows: 1987



Shortgrass prairie in Colorado

320 acres carrying 10-12 steers

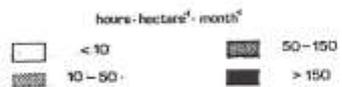
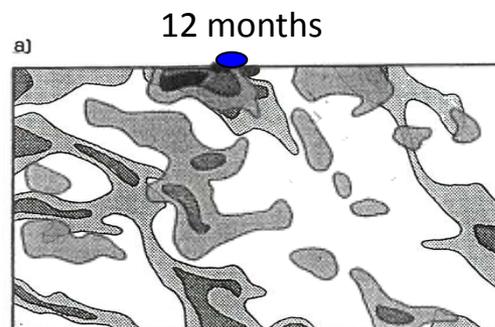
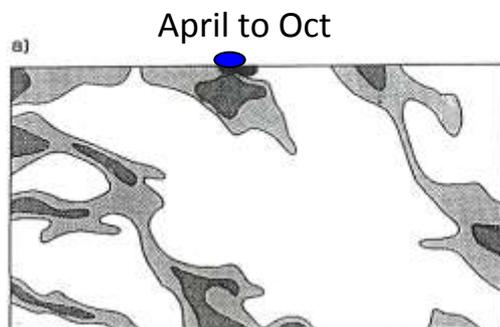
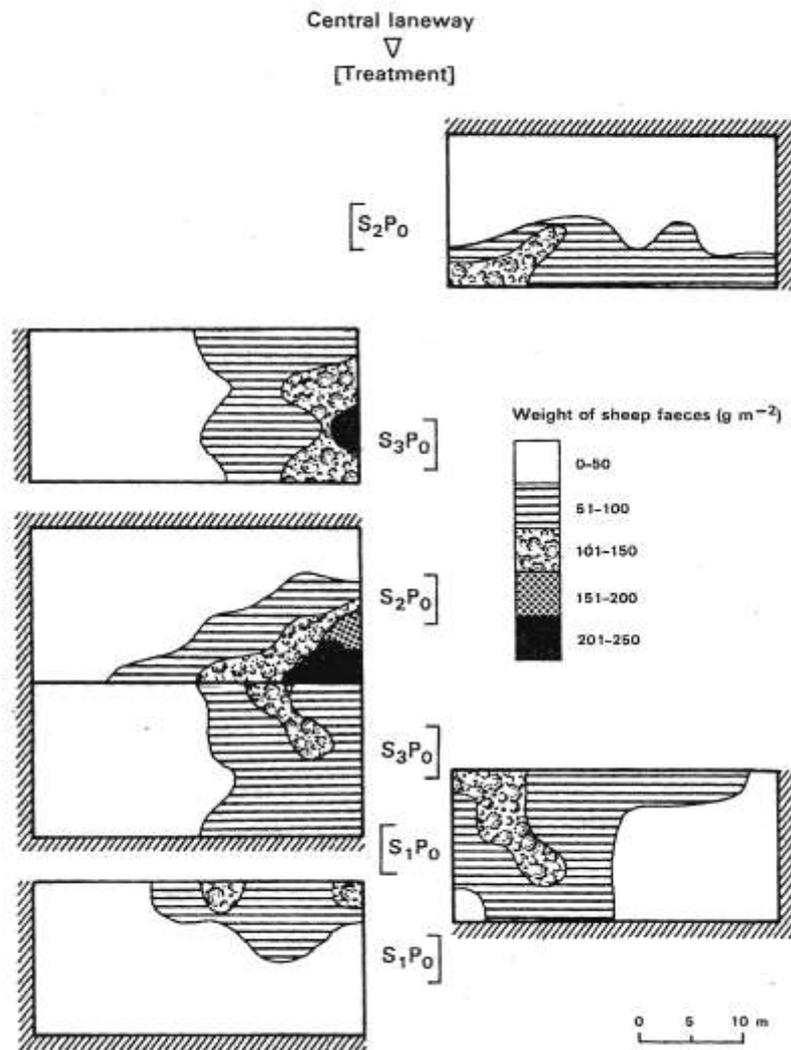


Fig. 2. Observed spatial patterns of grazing on the study area.
(A) growing season (April through October);
(B) dormant season (November through March).

darkest area > 5 hr grazing per day
lightest area < 20 min grazing per day

Senft et al. 1985

Influence of social interaction on grazing behavior



Distribution of sheep manure in 0.005 acre plots over 3-year trial

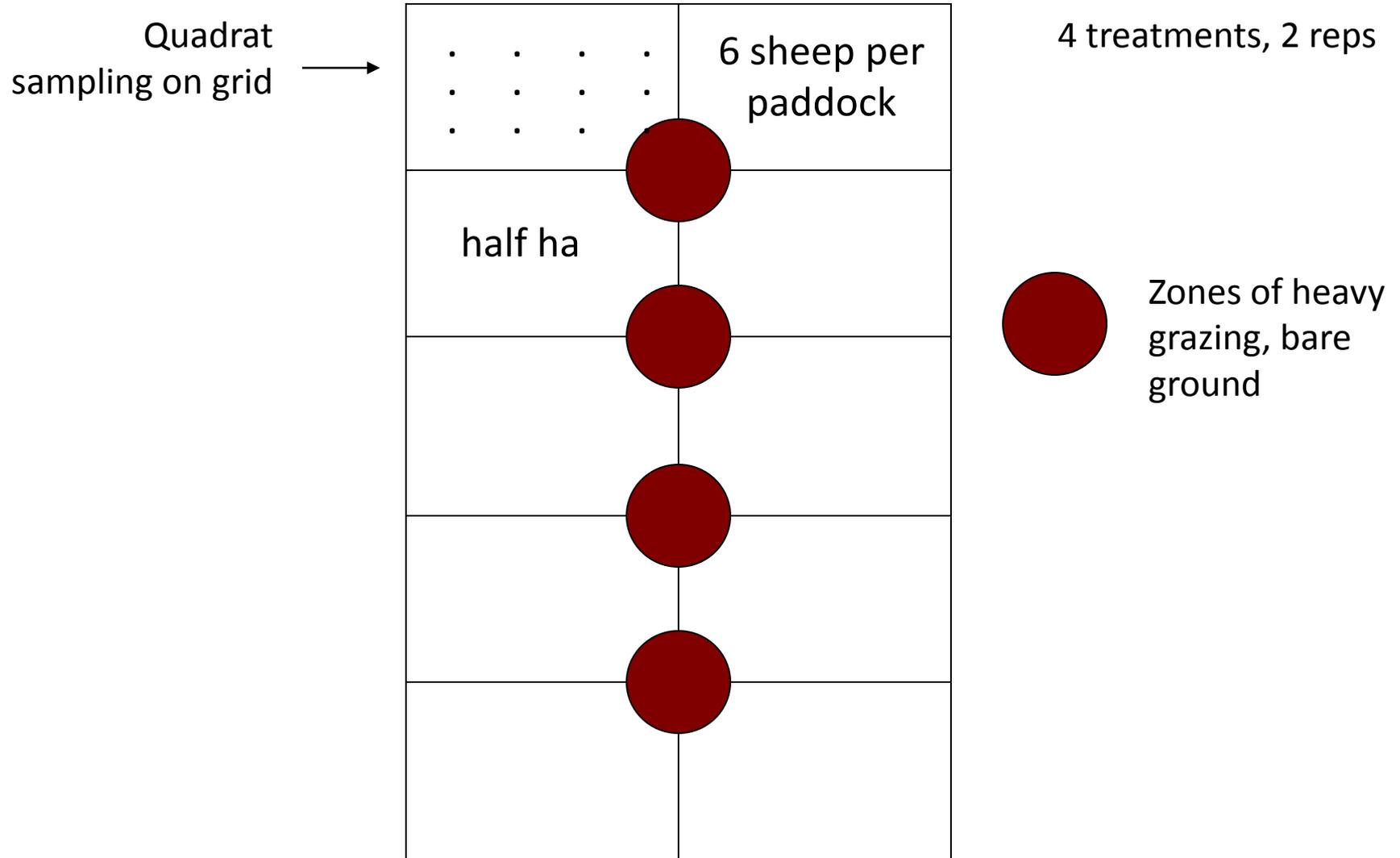
no water or shade

Stocking rates of 200, 400 and 600 sheep per acre for one day each week

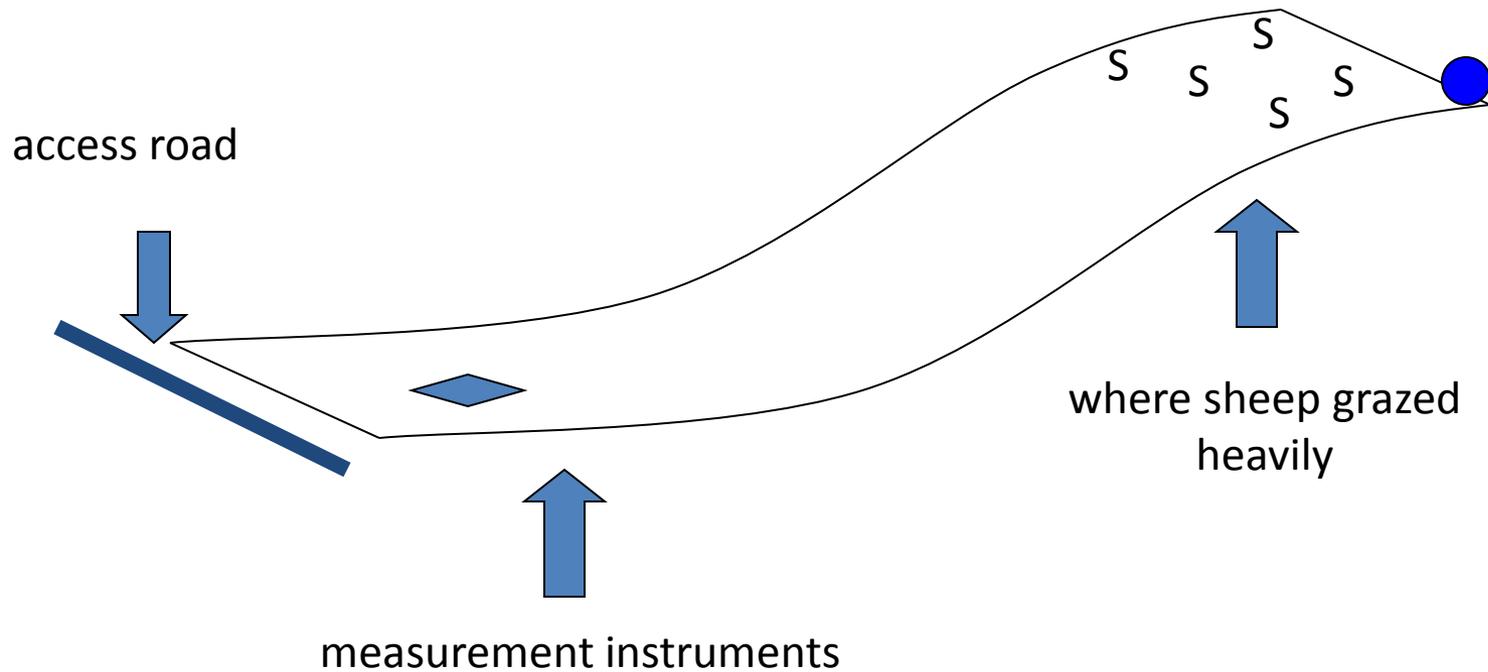
achieved by

stocking with 1, 2 or 3 sheep per plot.

Rotational grazing study at Iranian research station



Sheep grazing trial on half ha paddocks, Chiswick research station, Australia



Most grazing research trials assume experimental pastures offer a homogenous amount and composition of forage

They also assume that utilization is homogeneous across the pasture

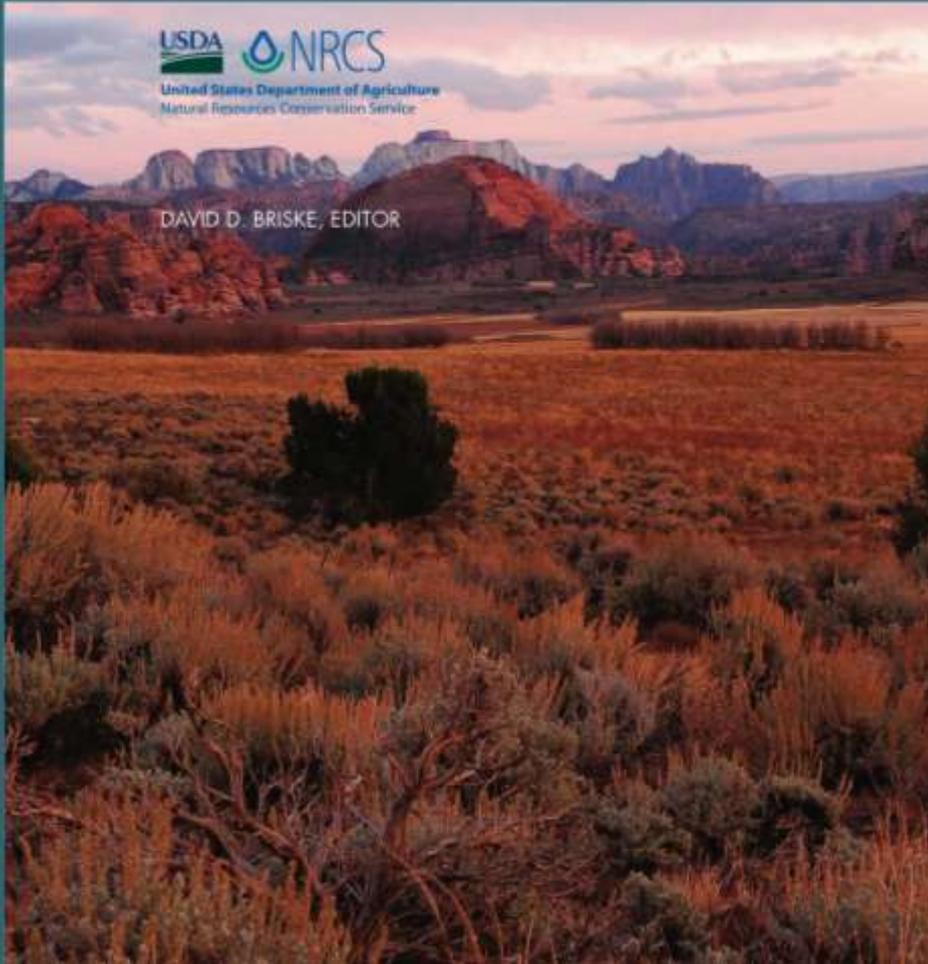
Given assumptions of spatial homogeneity, researchers can concentrate on variables such as frequency of defoliation and animal impacts

Conservation Benefits of Rangeland Practices

Assessment, Recommendations, and Knowledge Gaps



DAVID D. BRISKE, EDITOR



Chapter 1 on Prescribed Grazing, Conclusions:

“Stocking rate, in conjunction with appropriate temporal and spatial distribution, is a key **management** variable...”

However, the review does **not** contain any evidence that spatial distribution is an important management variable in the context of strategic grazing practices.

Chapter 1 on Prescribed Grazing

The authors define their terms of reference in such a way that grazing distribution, particularly at the landscape scale, was excluded from consideration.

“... only relatively homogeneous site conditions meet the traditional experimental requirements of replication and comparison with controls” [page 24]

Reinforced more explicitly on page 29:

“... constraints of experimental research, including the need for relatively homogeneous site conditions necessary for replication and comparison with experimental controls... are unable to – and therefore do not – address livestock distribution in heterogeneous landscapes...”

In practice, livestock graze more or less evenly only when stocking density is very high

... higher than has occurred in most tests of rotational grazing employing 4-10 pastures in the rotation

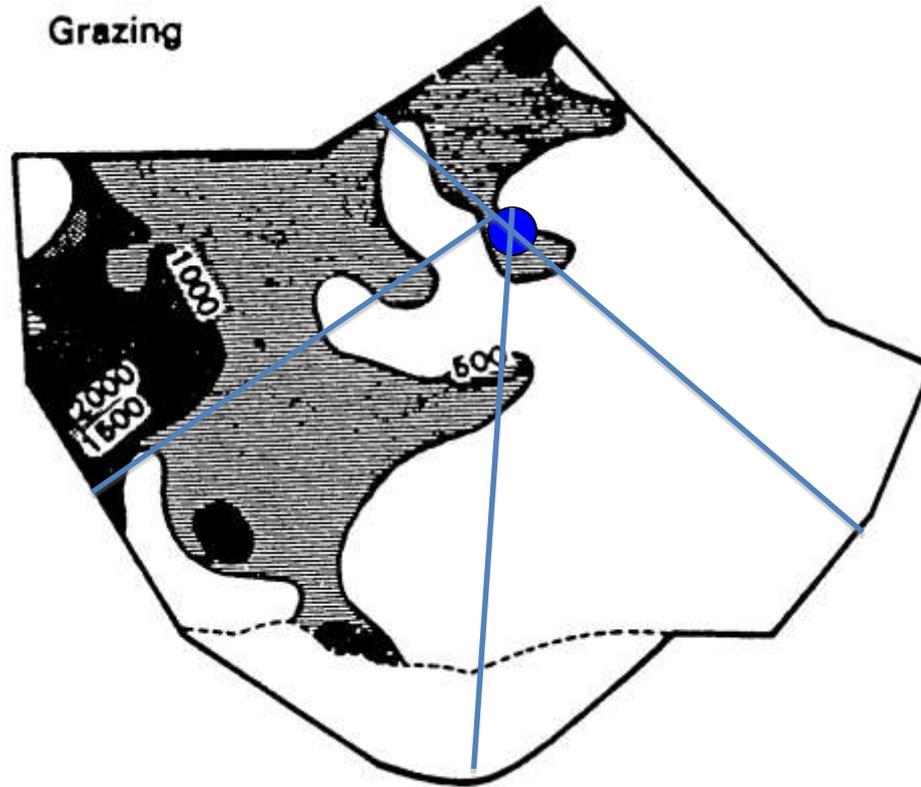
“Hillview” station, Intensive Rotational Grazing



Two ways to improve distribution

1. Subdivide landscape, creating paddocks in areas previously neglected
2. Stock paddocks at high density: large numbers for short periods

2000 acre paddock in New Zealand potential for paddock subdivision

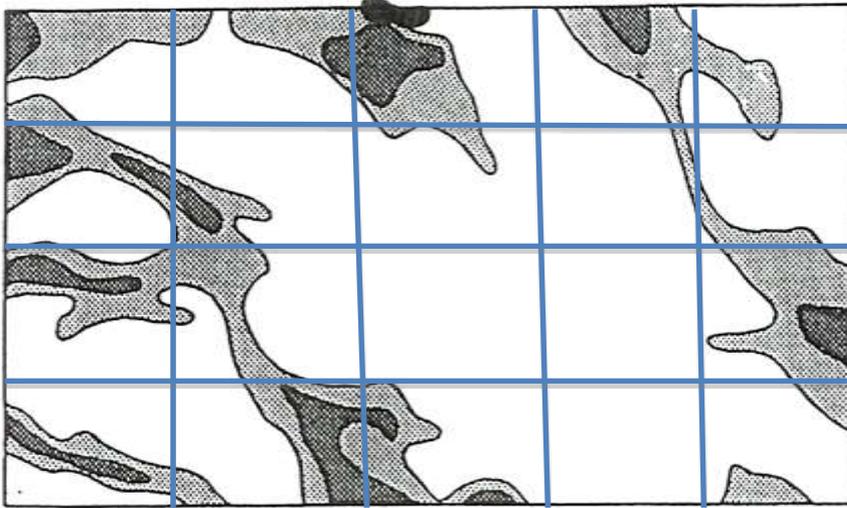


4 pastures of 500 acres average

Shortgrass prairie in Colorado

320 acres carrying 10-12 steers

a)



20 pastures of 16 acres

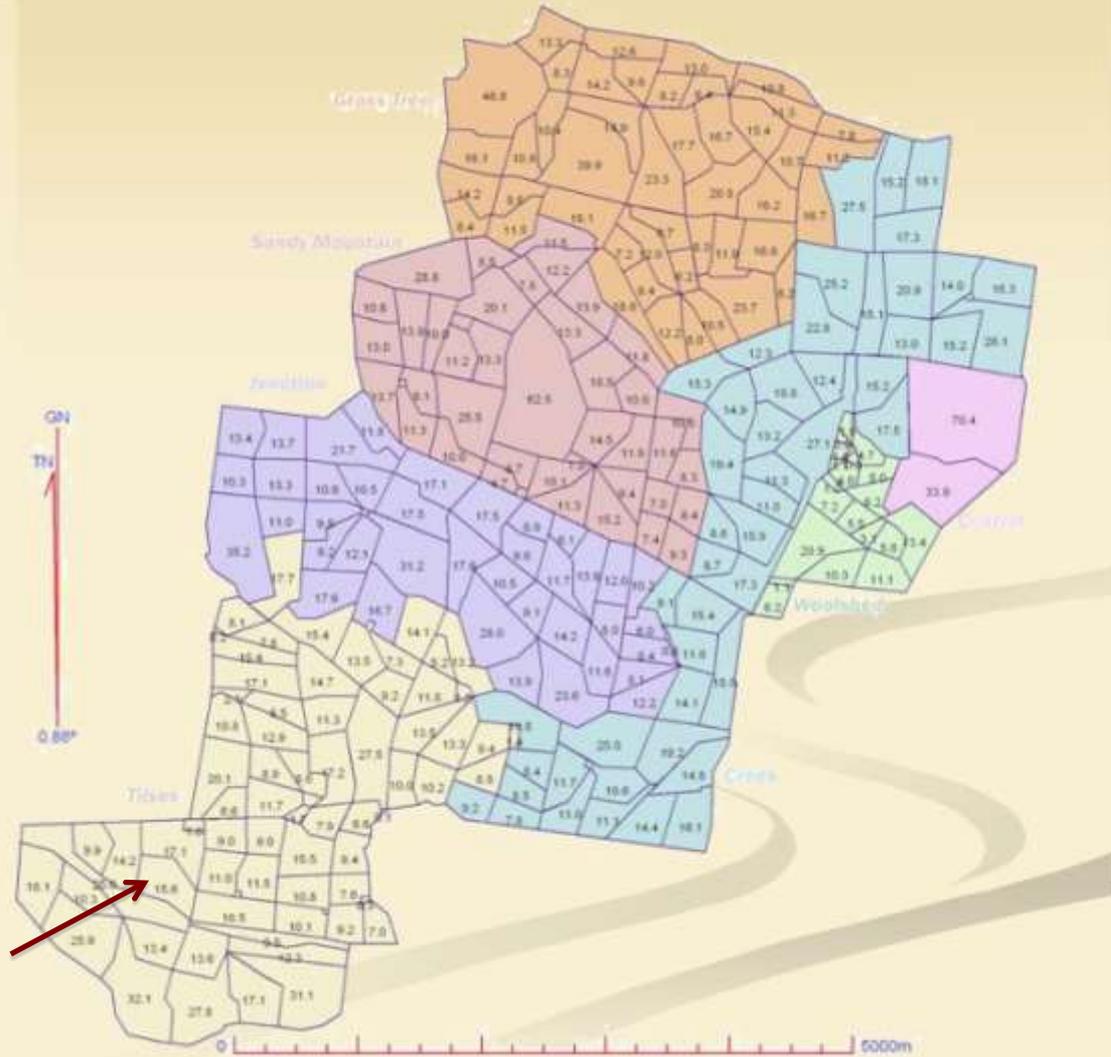
9 days average grazing period

Each pasture grazed **once** in spring-summer (6 months)

Each pasture grazed **once** in fall-winter (6 months)

“Lana” station (ranch), 8,000 ac in New England region, Australia

- From 35 paddocks (averaging 240 acres each) to 250 paddocks (averaging 32 acres each)
- Five major farmlets and one minor farmlet
- 3500 DSE per ‘farmlet’
- 1 DSE = 1x45kg dry sheep



“the penny drops”
Oct 1996

Water point serving several paddocks in former bracken-infested site





Verbascum thapsus
Common Mullein

Weed control at
high Stock Density
with long rest
periods

After 5 yr of rotational grazing, SR had doubled, forage abundant, weeds controlled



Yesterday, Marshall Frazier presented the relation between Stocking Rate and animal production, per animal and per acre.

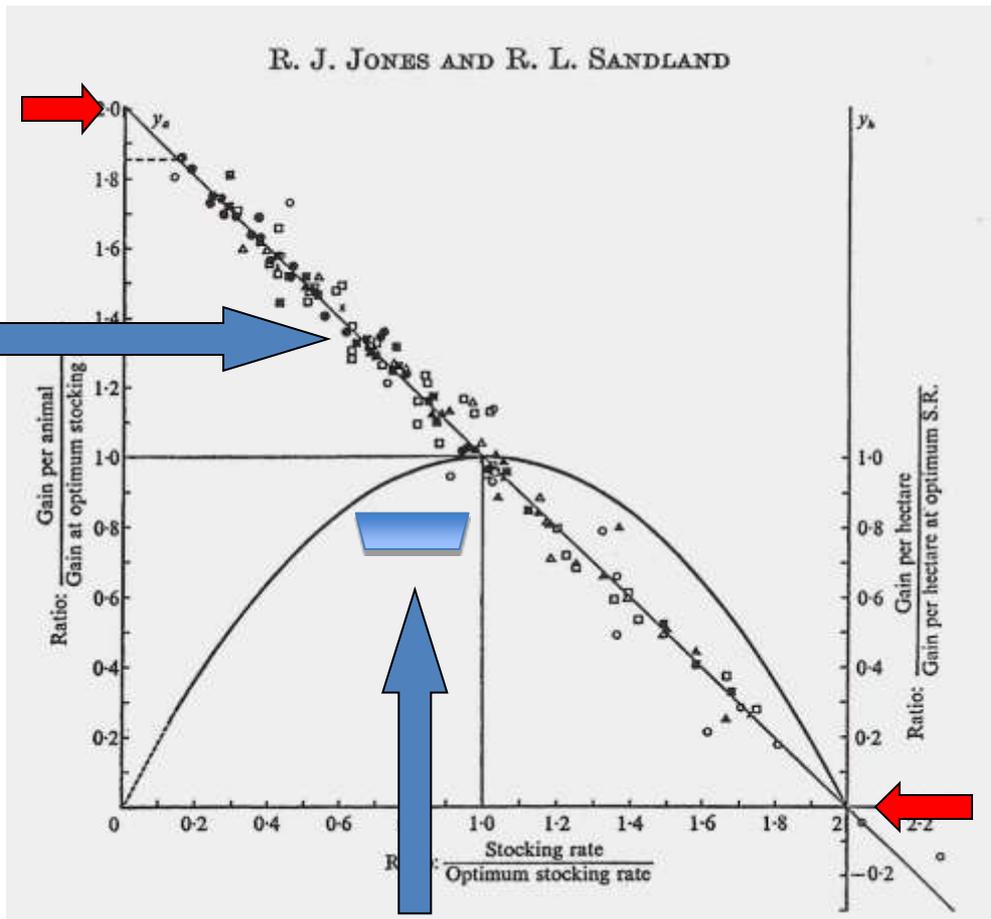
He suggested that management such as rotational grazing could change the production curves.

This can happen in two ways:
by improving forage quality, and
by increasing forage available

Production Relationship to Stocking Rate

Governed by
forage quality

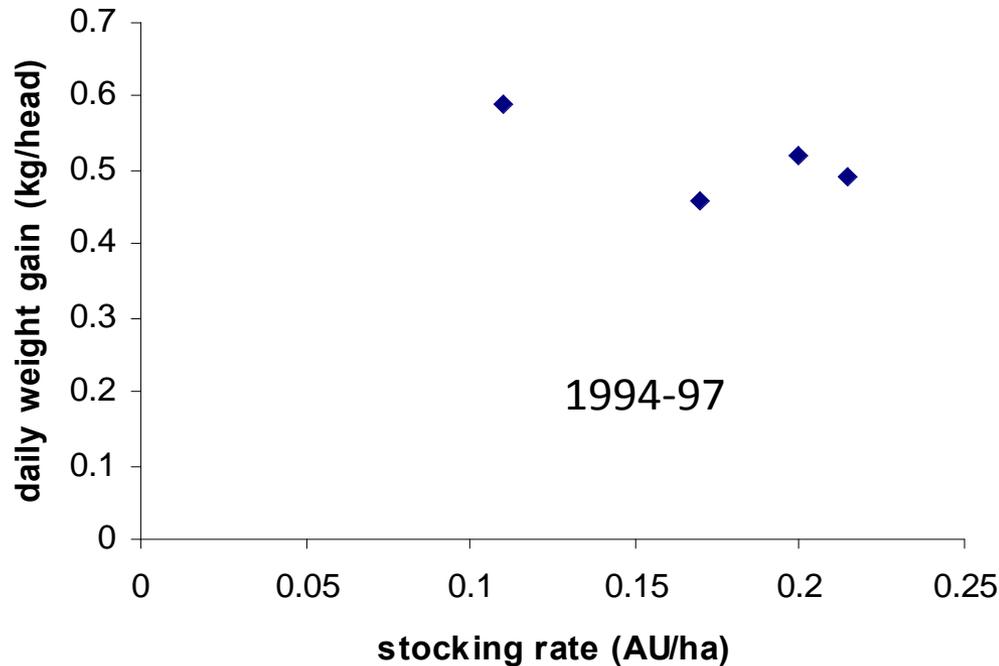
Production
per head
declines
linearly as SR
increases



Governed by
forage quantity

Optimal SR

Abbott Unit of Rex Ranch, Nebraska



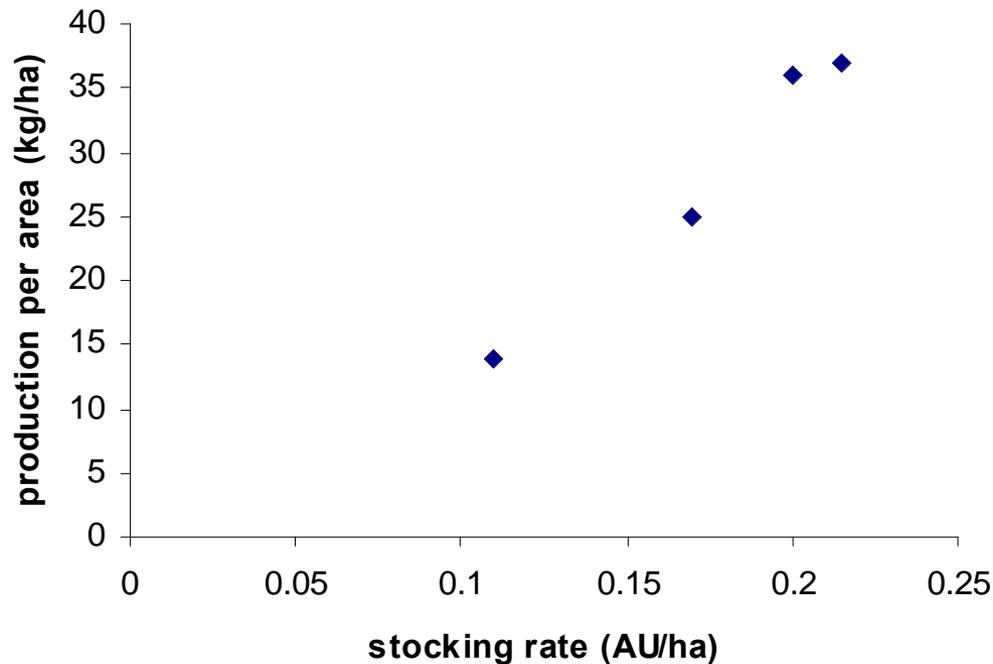
Breeding herd maintained calving rate above 90%

From 1994 to 1997, a multi-paddock rotation was introduced and number of paddocks was increased from 60 to 100.

Overall SR increased from 0.11 AU/ha to 0.22 AU/ha, but

gain per head declined by only 12%.

Abbott Unit of Rex Ranch, Nebraska



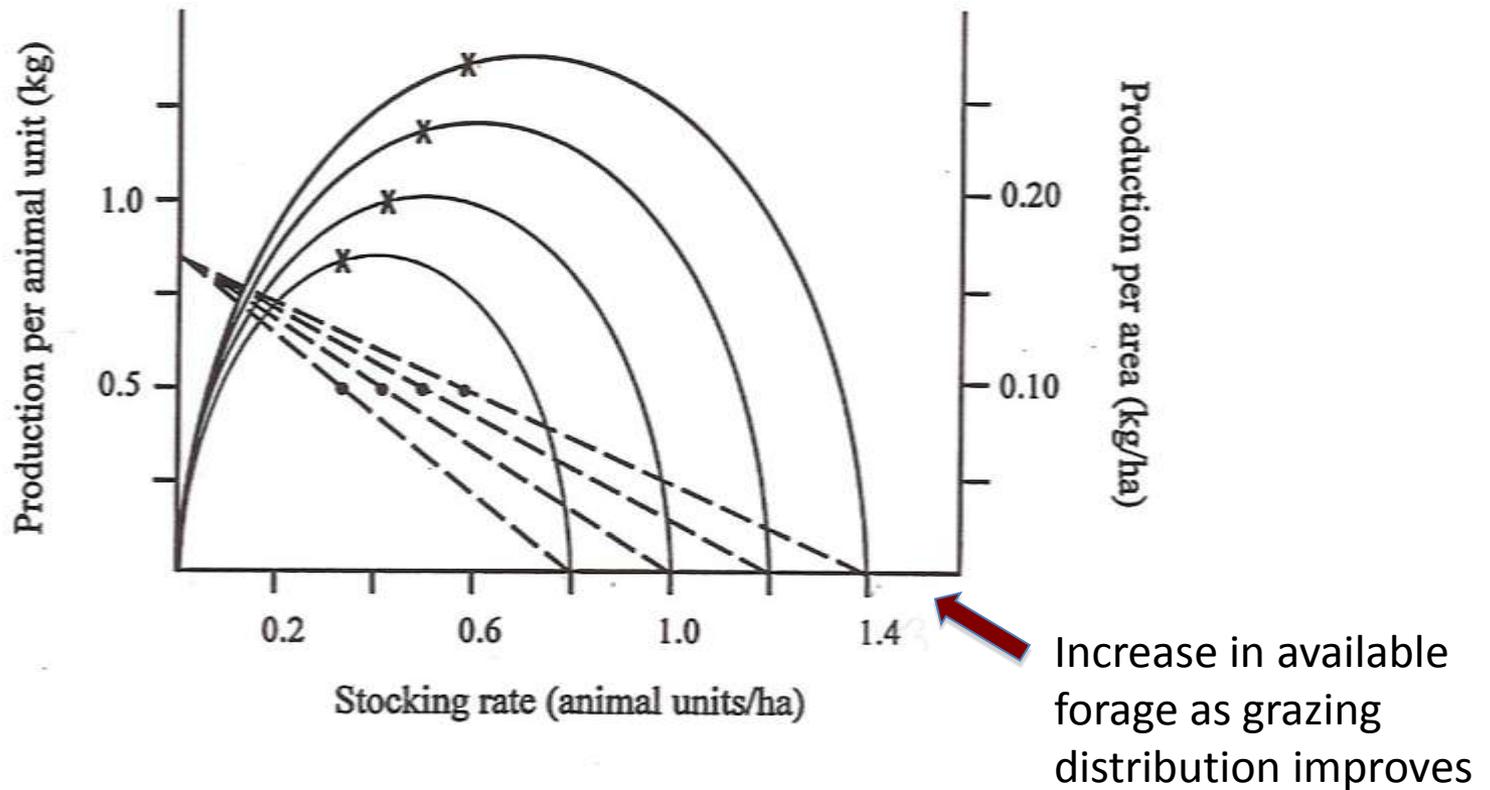
As SR doubled and weight gain scarcely changed,

production per ha increased from 14 to 38 kg/ha.

Ranch manager reported no adverse ecological effects.

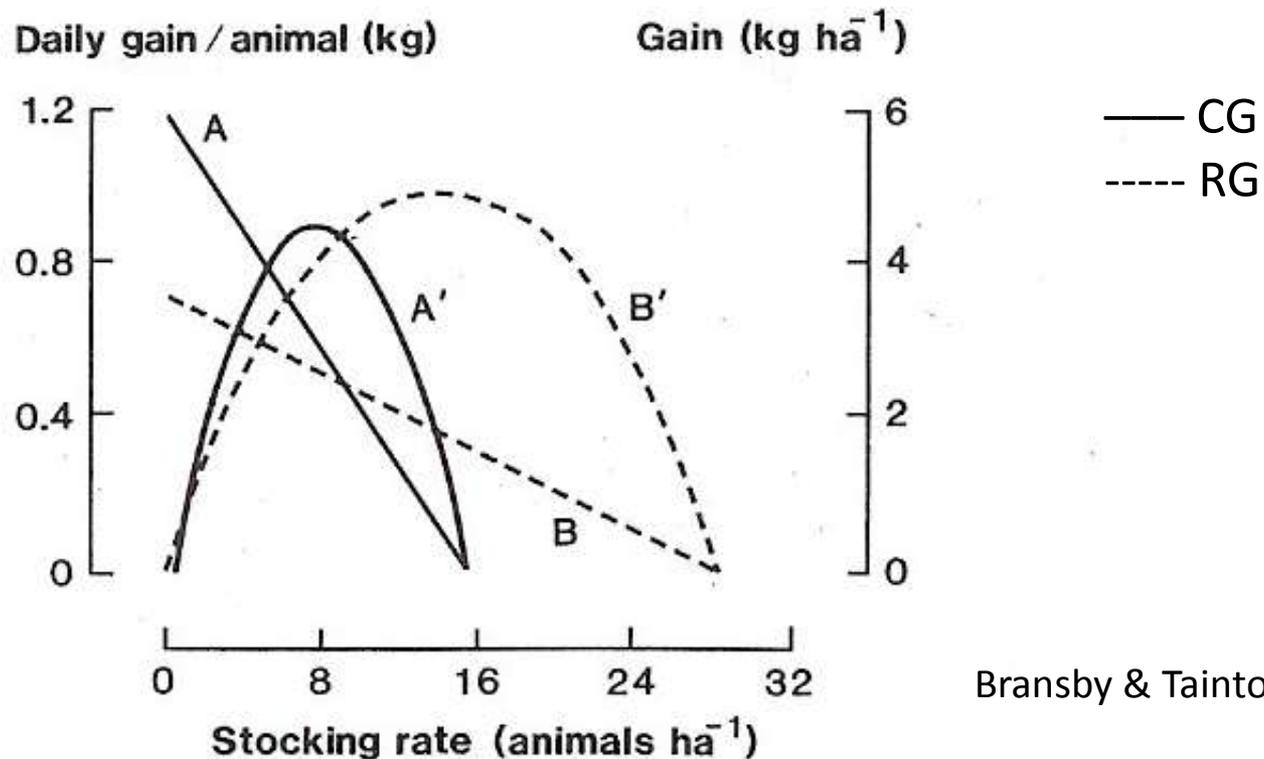
Soap bush weed (*Yucca* sp) declined.

A family of production curves reflecting an increase in effective available forage due to changes in grazing management



Another example of effect of rotational grazing on production

Figure 1. Relationships between daily gain per animal and stocking rate (A, B) and between gain/ha and stocking rate (A', B') for continuous (—) and rotational (---) grazing on Coastcross II Bermudagrass.



Bransby & Tainton 1986

Behavioral Changes in Large Flocks

- more even distribution over the paddock
- calmer when disturbed, less pressure on fences
- affiliation with flock rather than grazing areas



Check-list of Benefits

from exercising control over where and when
livestock graze using rotational grazing

- Increase in carrying capacity
- Higher livestock production
- Behavioral changes: animals calmer, easier to handle
- Better planning capability, especially during drought
- Lower fixed costs of production
- Favorable changes in range vegetation
 - Increase in desirable species
 - Decline in weedy species
- **More money in the bank**

This is the Raw Material
that creates opportunities and
options for adaptive management

QUESTIONS & DISCUSSION?



Twenty+ paddocks provides management flexibility with safety

- Imagine a rotation with 25 paddocks.
- Stock Density ratio is 25 times the overall SR.
- Only about 14.6 days grazing per year, or 7.3 days in a 6 month season.
- With 2 grazing periods per year of 7.3 days on average, each paddock has 175 days of rest.
- Drop out 2 paddocks in a rotation cycle, with 7.3 days grazing, and each grazed paddock at least 160 days rest.
- Shorten the grazing period to 5 days in a faster rotation, and each paddock still has 120 days of rest on average.