MiG Basics: Grazing for Pasture & Livestock Needs

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Grazing in Balance

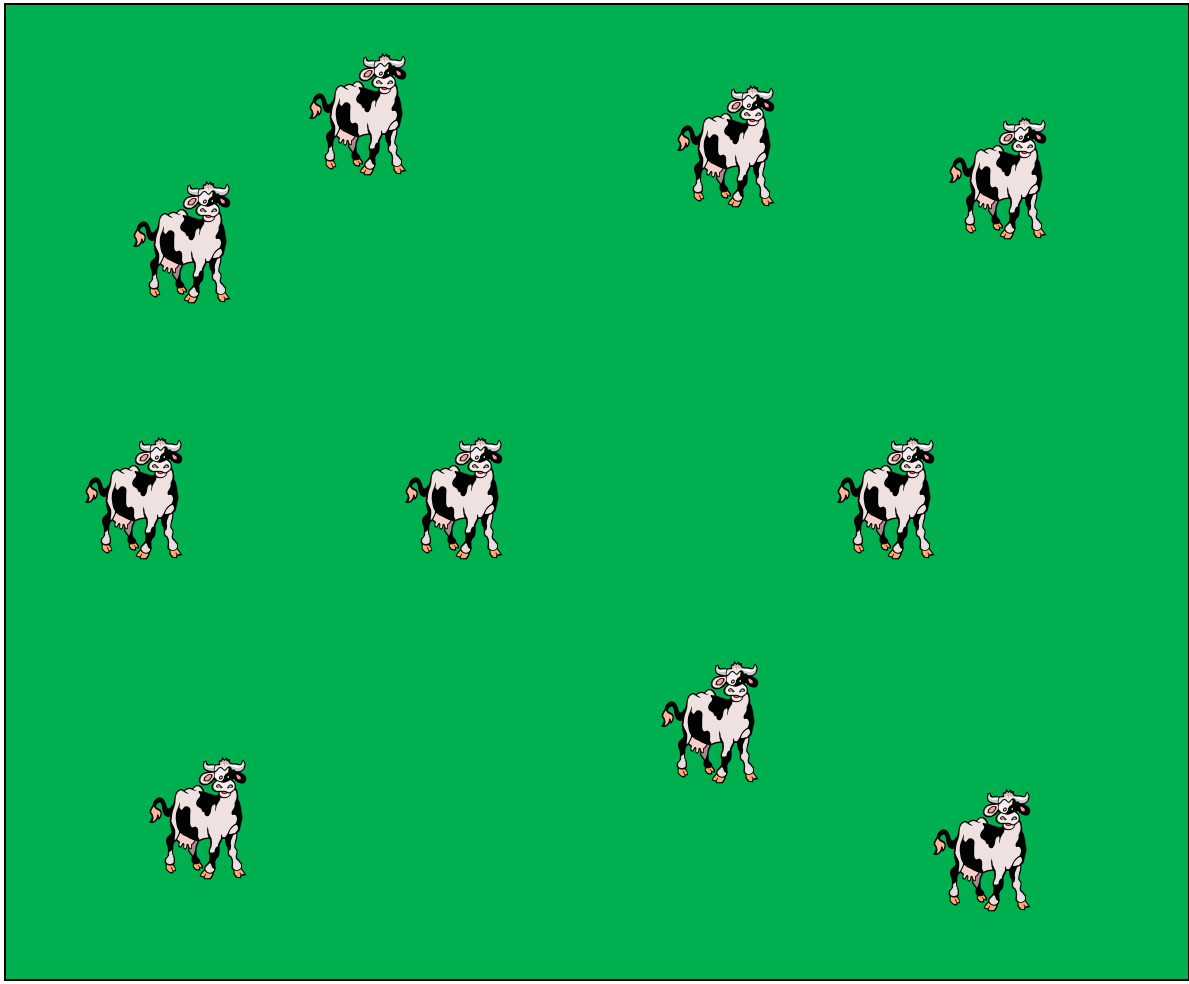
- **Pasture needs:** Managing the pasture to achieve vigorous pasture growth, a healthy water cycle, a dynamic mineral cycle, and maintain broad biodiversity.
- **Livestock needs**: Managing grazing to achieve the appropriate intake of nutrients for the current performance targets.

Some useful definitions

- **Stocking rate**: The number of animals or animal live weight assigned to a grazing unit on a seasonal basis.

Stocking rate illustration

- Ten head on ten acres
- Stocking rate = 1 hd/acre
- If cows weigh 1200 lb... stocking rate is 1200 lb/acre



Some useful definitions

- **Stocking rate**: The number of animals or animal live weight assigned to a grazing unit on a seasonal basis.
- **Stocking rate is simply what we choose to put out there!**

This pasture is stocked beyond what the resources will bear!


This pasture is stocked appropriately for the available resource base!

Some useful definitions

- **Stocking rate**: The number of animals or animal liveweight assigned to a grazing unit on a seasonal basis.
- **Carrying capacity**: The stocking rate that provides a target level of performance while maintaining the integrity of the resource base.

Critical Concepts

- Carrying capacity is determined by the combination of environment and management

Critical Concepts

- **Water makes grass grow!**

Precipitation range (inches/year)	Expected growth (lb/inch-H_20)	Potential yield range (lb/acre/year)
< 10 "	50 - 100	500 - 1000
10 - 15	100 - 150	1000 - 2250
15 - 20	150 - 250	2250 - 5000
20 - 25	250 - 300	5000 - 7500
25 - 30	300 - 350	7500 - 10500
30 - 35	350 - 400	10500 - 14000
35 - 40	400 - 450	14000 - 18000
> 40"	Yields/inch H_2O begin to decline	

Carrying capacity of pasture is determined by four factors

$$\text{Carrying Capacity} = \frac{\text{Forage Production} \times \text{Seasonal Utilization Rate}}{\text{Daily Intake} \times \text{Length of the Grazing Season}}$$

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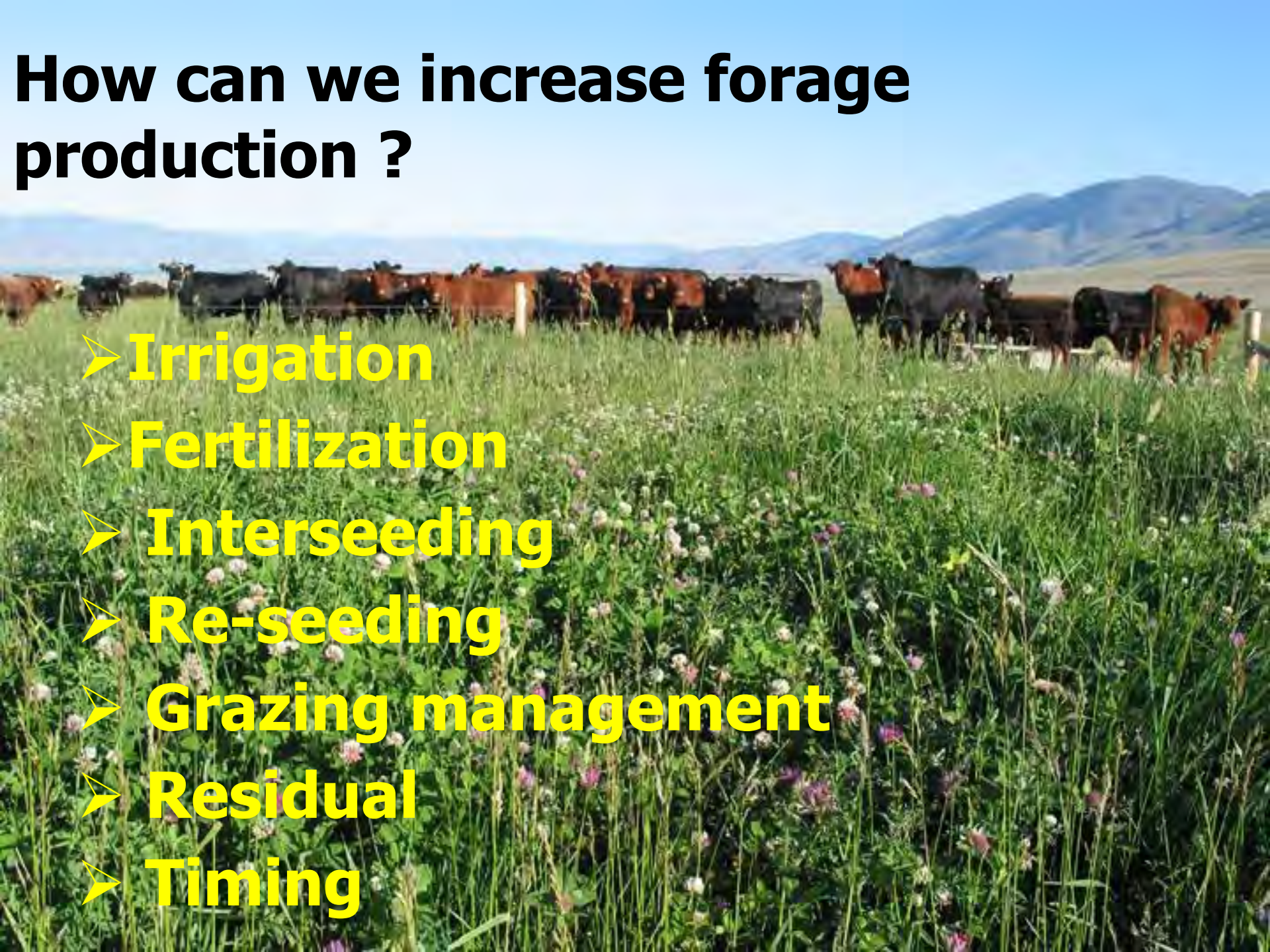
How can we increase forage production ?



- Irrigation
- Fertilization
- Interseeding
- Re-seeding
- Grazing management
- Residual
- Timing

Carrying capacity of pasture is determined by four factors

$$\text{Carrying Capacity} = \frac{\text{Forage Production} \times \text{Seasonal Utilization Rate}}{\text{Daily Intake} \times \text{Length of the Grazing Season}}$$

Some useful definitions

- **Seasonal utilization rate**
  - The percentage of annual forage production actually utilized by grazing animals over the course of the grazing season

Carrying capacity of pasture is determined by four factors

- Seasonal utilization rate
  - Length of grazing period and frequency of grazing
  - Grazing distribution
  - Duration of the grazing season
  - Type of livestock
  - Single livestock species vs. multiple species

What are appropriate seasonal utilization rates ?

- Most desirable species in mixed range: 30-50%
- Wheatgrass dominant range: 40-50%
- Tame dryland pasture: 50% +/-
- Natural rainfall or irrigated pasture: 70-90%

Some useful definitions

- **Seasonal utilization rate**
  - The percentage of annual forage production actually utilized by grazing animals over the course of the grazing season

- **Temporal utilization rate**
  - The percentage of available forage used in a single grazing period

What are appropriate temporal utilization rates ?

- Most desirable species in mixed range: 30-40%
- Wheatgrass dominant range: 40-50%
- Tame dryland pasture: 50% +/-
- Natural rainfall or irrigated pasture: 50-60%

Carrying capacity of pasture is determined by four factors

$$\text{Carrying Capacity} = \frac{\text{Forage Production} \times \text{Seasonal Utilization Rate}}{\text{Daily Intake} \times \text{Length of the Grazing Season}}$$


Intake on cool season pasture is 75 % availability
…… and 25 % quality.

Intake on warm season pasture is 50 % availability

…… and 50 % quality.


Intake on native range is a combination of availability, quality, and foraging skill

Carrying capacity of pasture is determined by four factors

$$\text{Carrying Capacity} = \frac{\text{Forage Production} \times \text{Seasonal Utilization Rate}}{\text{Daily Intake} \times \text{Length of the Grazing Season}}$$

Carrying capacity of pasture is determined by four factors

- Length of the grazing season
  - For cow-calf or ewes-lambs, think 365 days
  - Short-season stockers offer more flexibility
  - Balance quantity with quality for dairy and finishing beef or lambs

Grazier's Arithmetic

$$\text{Carrying Capacity} = \frac{\text{Forage Production} \times \text{Seasonal Utilization Rate}}{\text{Daily Intake} \times \text{Length of the Grazing Season}}$$

If: Forage production = 8000 lb/acre/year

Seasonal utilization = 65 %

Daily intake = 2.6% (.026 lb forage/lb liveweight)

Length of grazing season = 200 days ……

Grazier's Arithmetic

Then ….

$$\text{Carrying Capacity} = \frac{8000 \text{ lb/acre} \times .65}{.026 \text{ lb forage/lb liveweight} \times 200 \text{ days}}$$

$$= 1000 \text{ lb liveweight / acre}$$

Grazier's Arithmetic

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Or 1.3 acres needed for one 1300 lb cow

Grazier's Arithmetic

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$$= 1000 \text{ lb liveweight / acre}$$

Or 1.3 acres needed for one 1300 lb cow

Or .7 acres for one 700 lb steer

Grazier's Arithmetic

Carrying Capacity = 1000 lb liveweight / acre

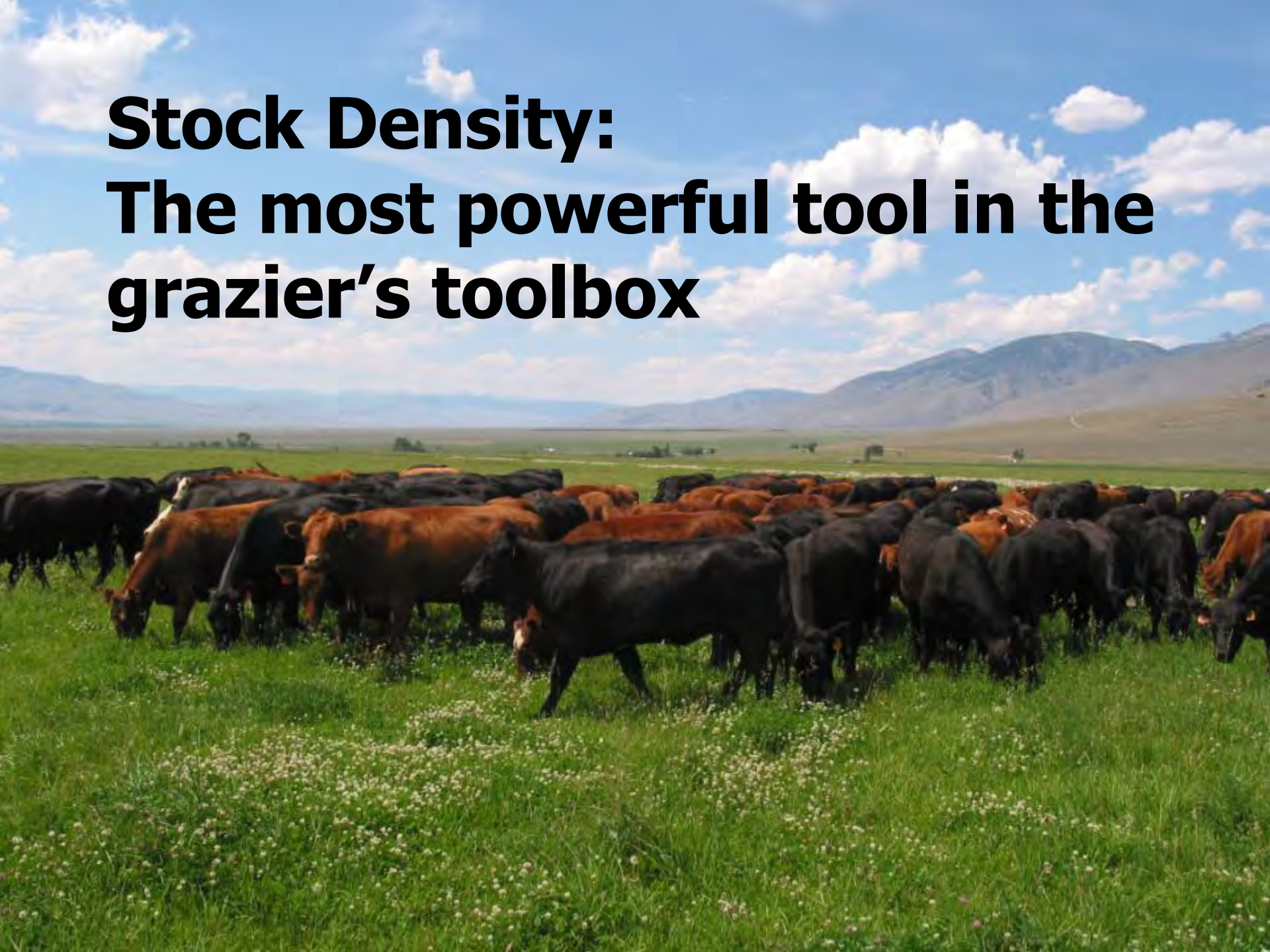
Assuming**…..**

- Uniform forage distribution through the season
- Constant intake level

…… This is only a ball park estimate, not your farm plan !!

Critical Concepts

- Carrying capacity is not constant year around, so why should stocking rate be fixed?


Stock Density:
The most powerful tool in the grazier's toolbox

Some useful definitions

- **Stocking rate**: The number of animals or animal liveweight assigned to a grazing unit on a seasonal basis.

Stocking rate illustration

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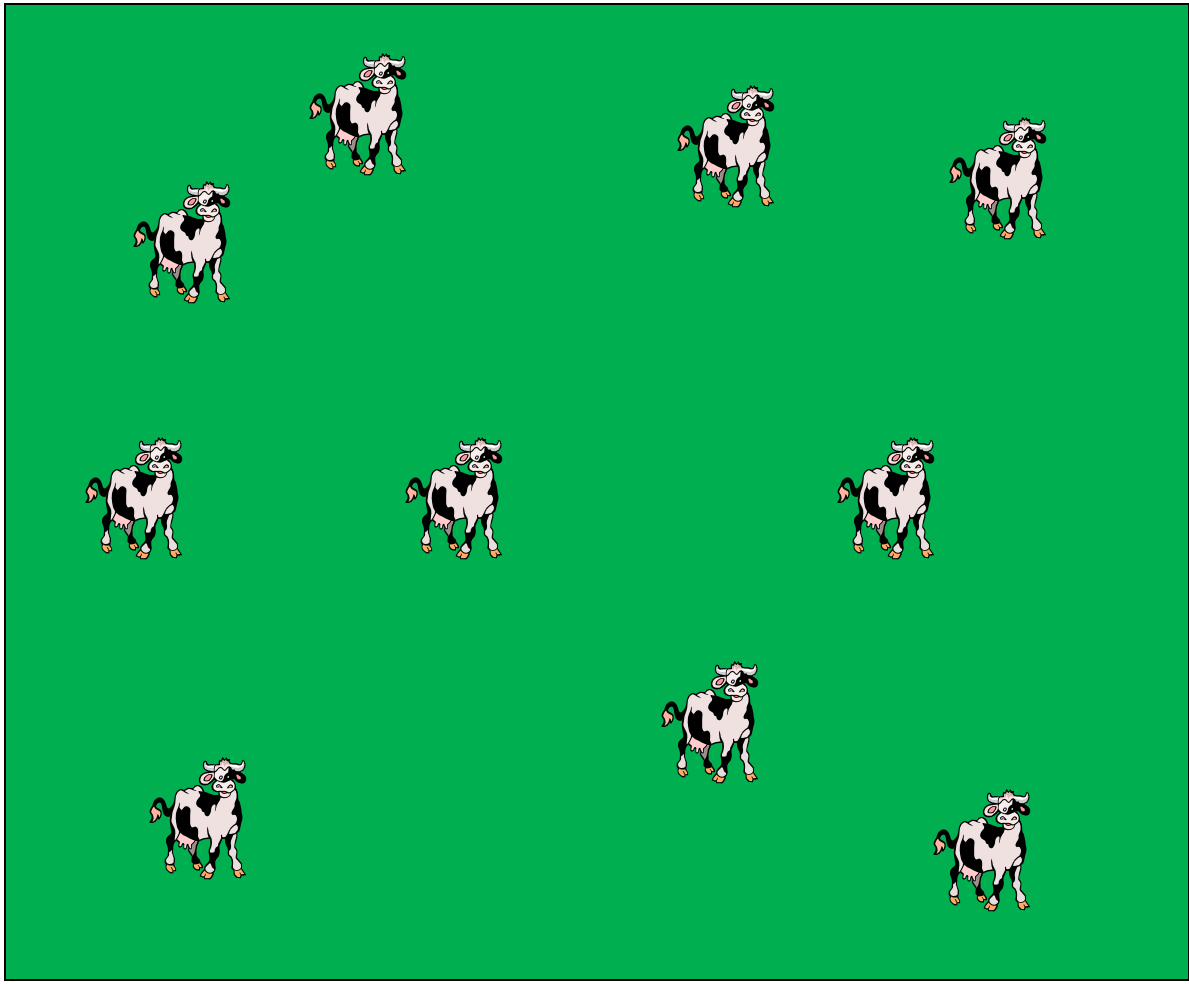
- If cows weigh 1200 lb... stocking rate is 1200 lb/acre




This pasture is stocked
beyond its carrying capacity !
Producing about 120-140 CDA


This pasture is stocked near its carrying capacity !
Producing over 300 CDA

Some useful definitions

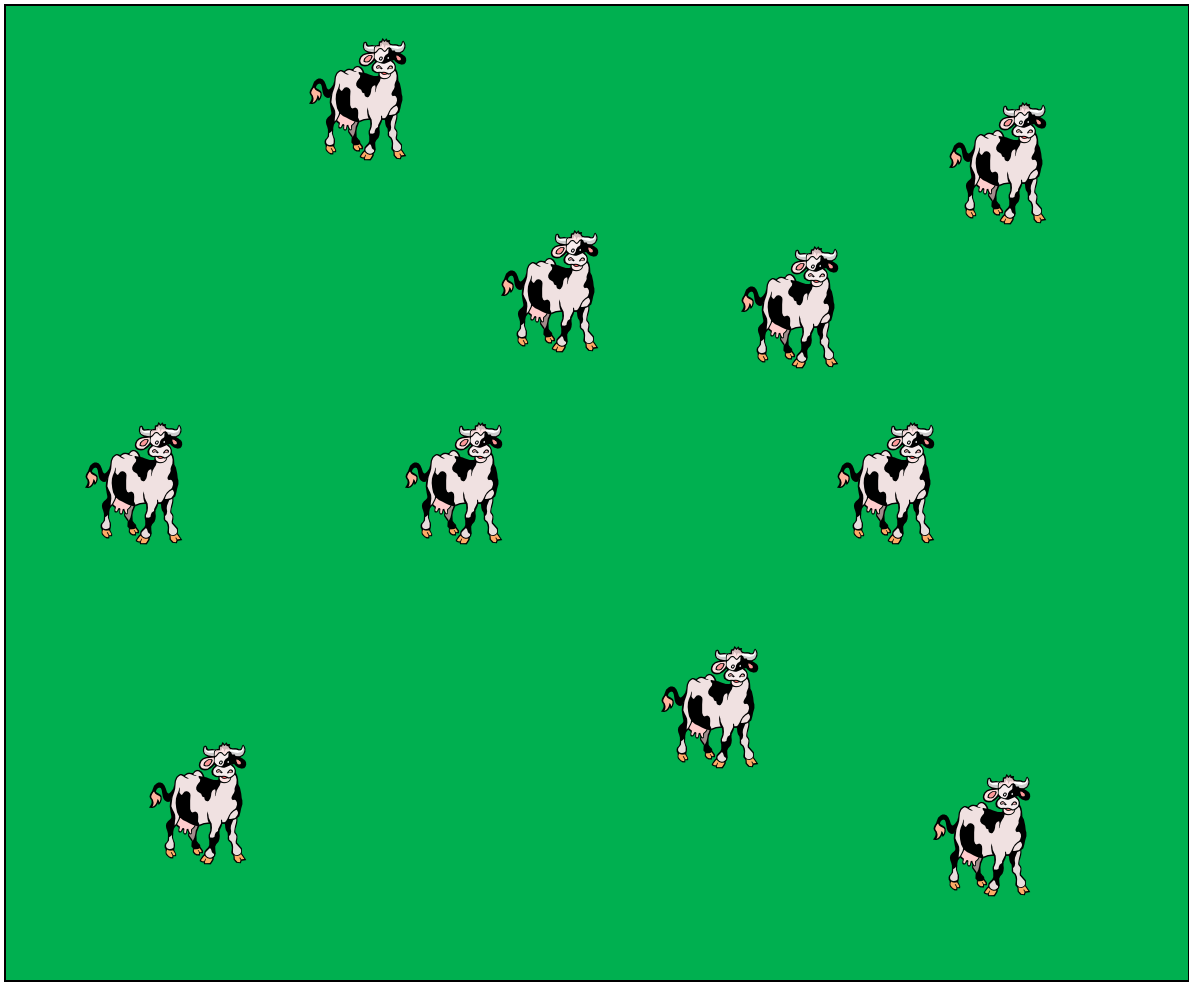
- **Stocking rate**: The number of animals or animal live weight assigned to a grazing unit on a seasonal basis.

- **Stock density**: The number of animals or animal live weight assigned to a *specific pasture area* at a *specific point in time*

Stocking rate and stock density with continuous grazing

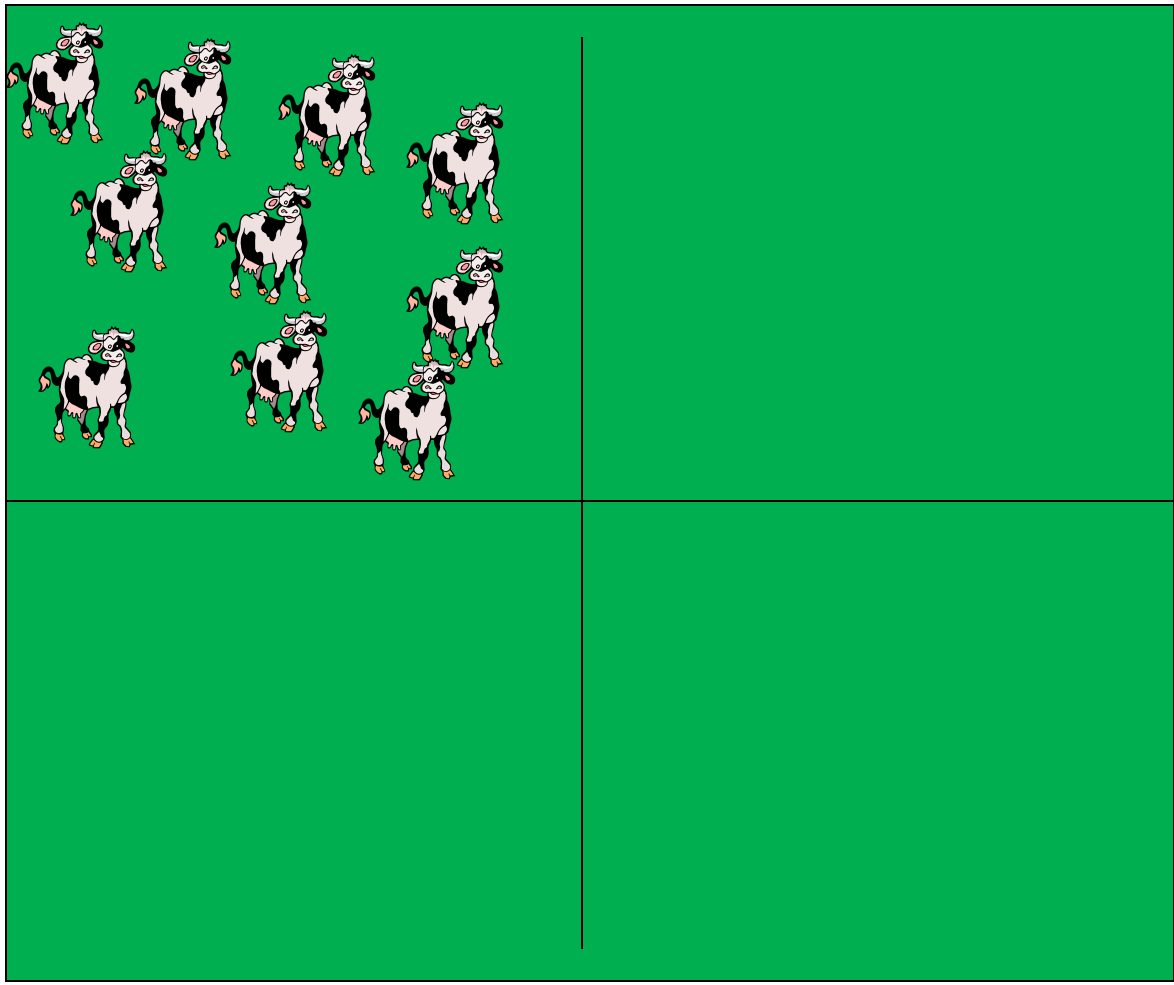
- Ten head on ten acres
- Stocking rate = 1 hd/acre
- With continuous grazing:

  stock density = stocking rate
- Both are still 1200 lb/acre



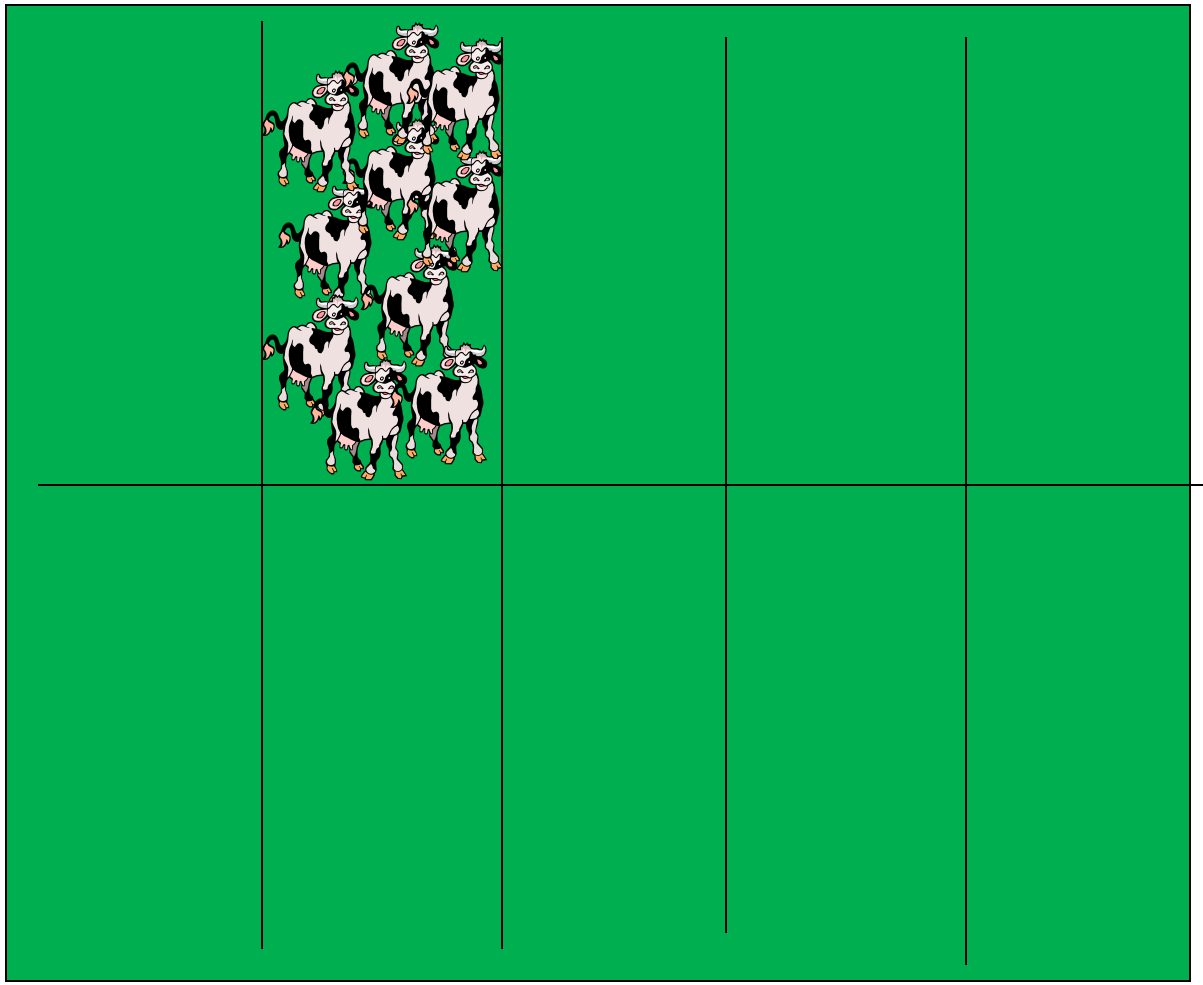
Pasture subdivision and stock density

- With pasture subdivision stocking rate may not change but stock density does !
- Stock density is 10 hd/2.5 acres or 4800 lb/acre



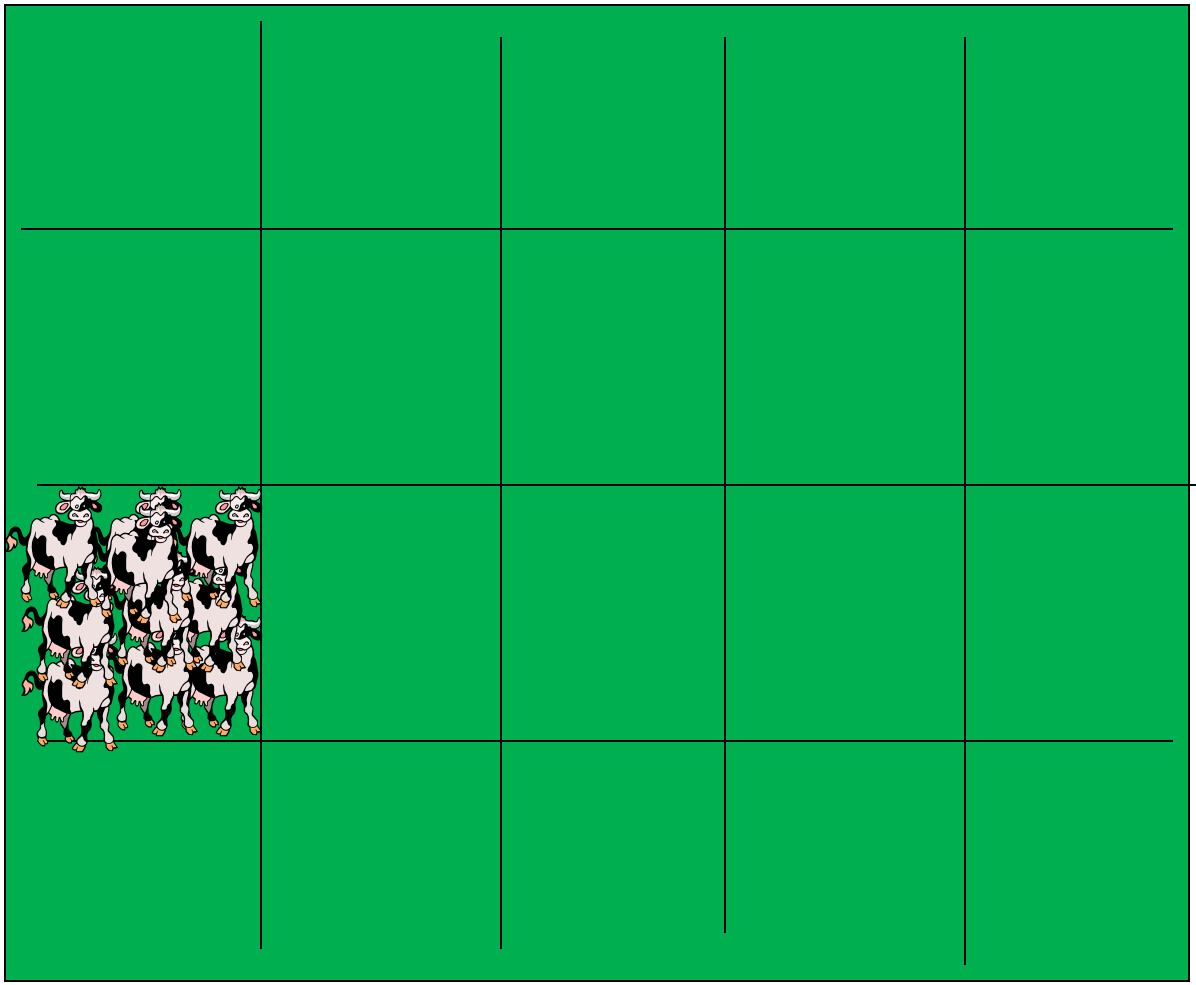
Pasture subdivision and stock density

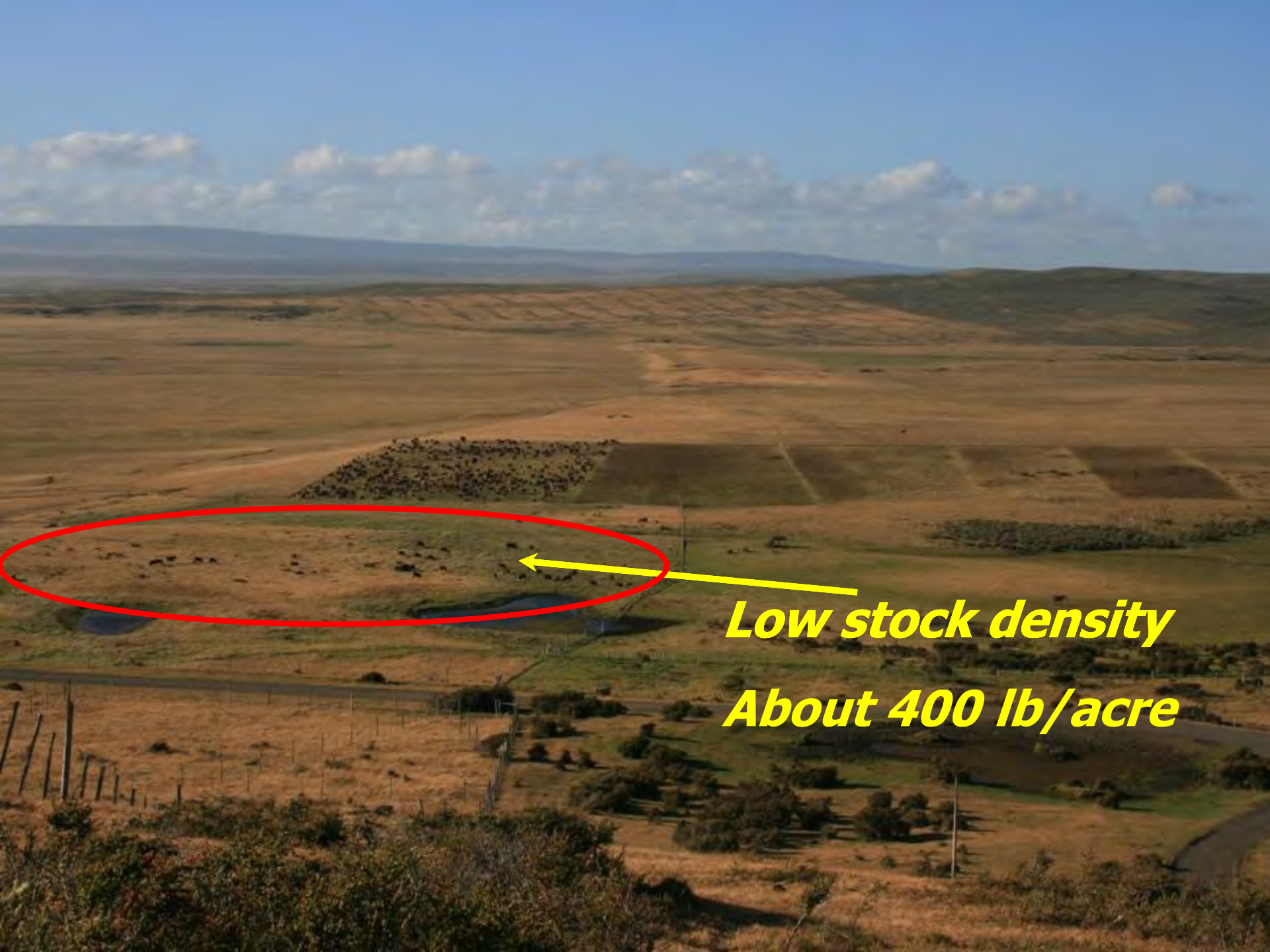
- Each level of subdivision results in higher stock density
- Stock density is now 12,000 lb/acre



Pasture subdivision and stock density

- Stock density is now 24,000 lb/acre
- You've got it, right?




Low stock density
About 400 lb/acre


High stock density
About 300,000 lb/A


This pasture is stocked beyond its carrying capacity !
This pasture situation was caused by low stock density !


This pasture is stocked near its carrying capacity !
This pasture situation was created by using high stock density !

So, what's the 'right' stock density?

It depends !

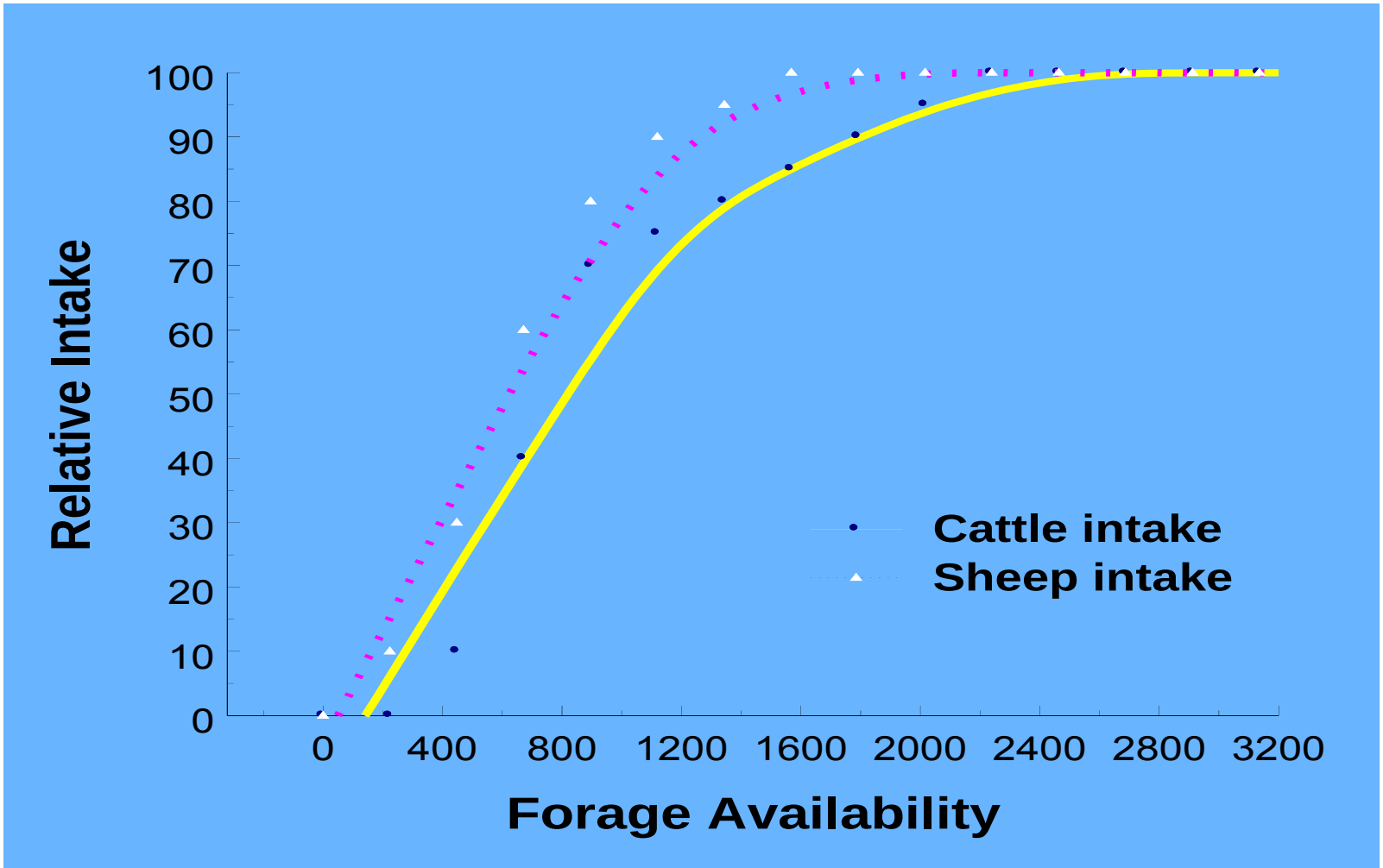
Grazier's Arithmetic

$$\text{Stock Density} = \frac{\text{Forage Availability} \times \text{Temporal Utilization Rate}}{\text{Daily Intake} \times \text{Length of the Grazing Period}}$$

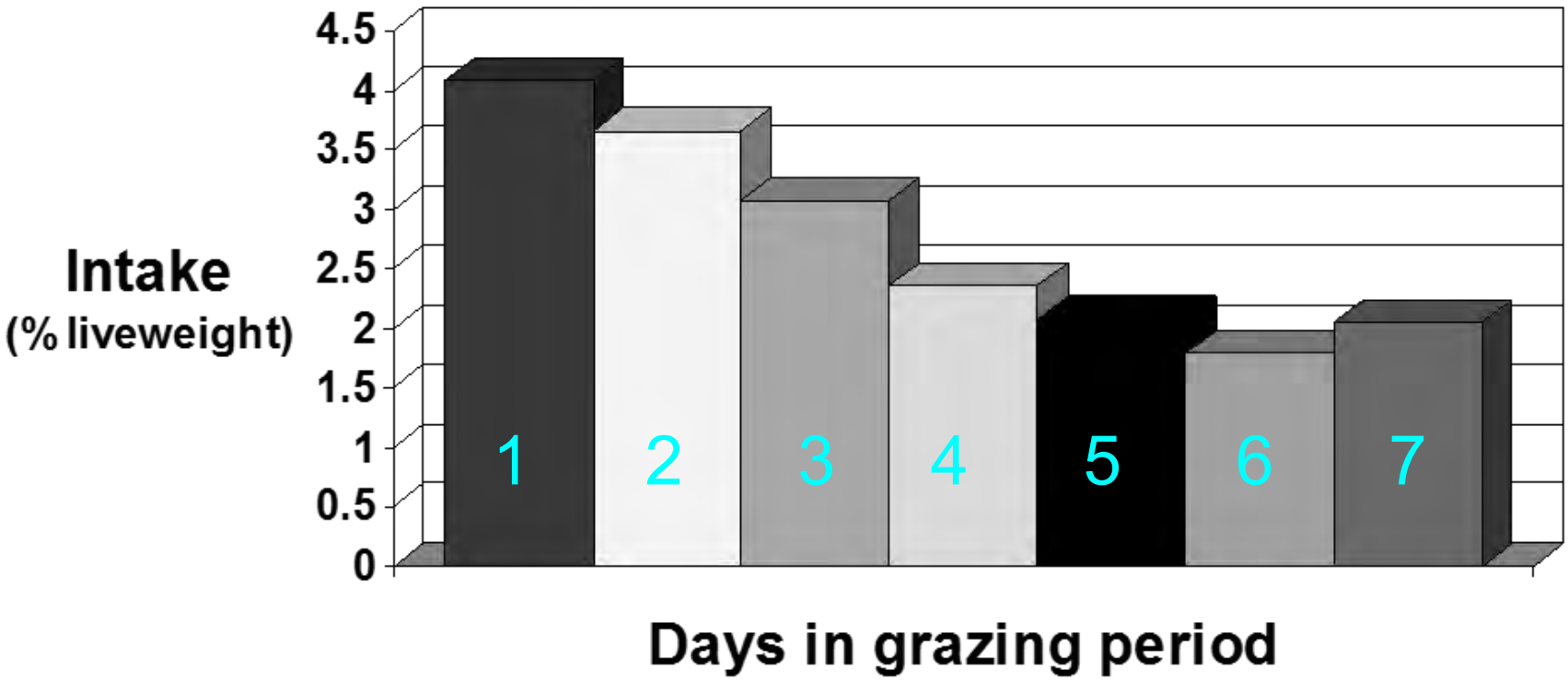
This is a biological relationship….

… not just a mathematical formula

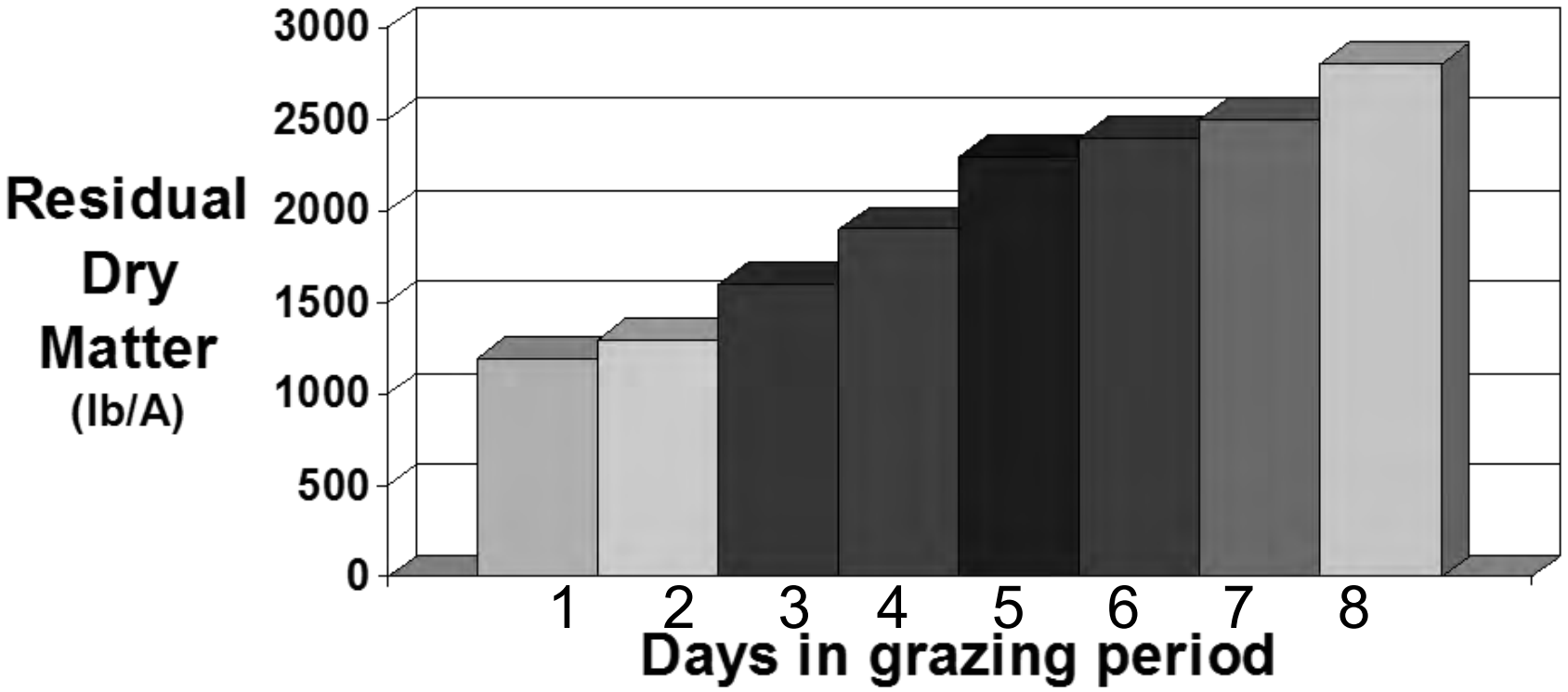
Effect of forage availability on the relative dry matter intake of cattle and sheep



Change in daily intake from day 1 to day 7 of week grazing period



Residual forage required to maintain 2.5% intake for different grazing periods



Grazier's Arithmetic

$$\text{Stock Density} = \frac{\text{Forage Availability} \times \text{Grazing period Utilization Rate}}{\text{Daily Intake} \times \text{Length of the Grazing Period}}$$

If: Available forage = 3000 lb/acre

Temporal utilization = 50 %

Daily intake = 2.6% (.0,026 lb forage/lb liveweight)

Length of grazing period = 1 days ……

Grazier's Arithmetic

Then ….

$$\text{Stock Density} = \frac{3000 \text{ lb/acre} \times .50}{.026 \text{ lb forage/lb liveweight} \times 1 \text{ days}}$$

$$= 57{,}692 \text{ lb liveweight / acre}$$

Grazier's Arithmetic

Then ….

$$\text{Stock Density} = \frac{3000 \text{ lb/acre} \times .50}{.026 \text{ lb forage/lb liveweight} \times 1 \text{ days}}$$

$$= 57{,}692 \text{ lb liveweight / acre}$$

Or about 44 1300-lb cows/acre/day

Grazier's Arithmetic

Then ….

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$$= 57{,}692 \text{ lb liveweight / acre}$$

Or about 44 1300 lb cows/acre/day

Or about 82 700 lb steers/acre/day

What is the appropriate stock density?

	Intake target	2.5%
	Utilization target	50%
	Length of grazing period	1.00
Available Forage	**Potential Stock Density**	
forage/acre)	*(lb liveweight/acre*	
1000	**20000**	
1500	**30000**	
2000	**40000**	
2500	**50000**	
3000	**60000**	
3500	**70000**	
4000	**80000**	
4500	**90000**	
5000	**100000**	
5500	**110000**	
6000	**120000**	

What is the appropriate stock density?

	Intake target	2.5%
	Utilization target	80%
	Length of grazing period	1.00
Available Forage	**Potential Stock Density**	
forage/acre)	*(lb liveweight/acre*	
1000	**32000**	
1500	**48000**	
2000	**64000**	
2500	**80000**	
3000	**96000**	
3500	**112000**	
4000	**128000**	
4500	**144000**	
5000	**160000**	
5500	**176000**	
6000	**192000**	

What is the appropriate stock density?

	Intake target	2.2%
	Utilization target	80%
	Length of grazing period	1.00
Available Forage	**Potential Stock Density**	
forage/acre)	*(lb liveweight/acre*	
1000	**36364**	
1500	**54545**	
2000	**72727**	
2500	**90909**	
3000	**109091**	
3500	**127273**	
4000	**145455**	
4500	**163636**	
5000	**181818**	
5500	**200000**	
6000	**218182**	

Summary

- Stocking rate is the big picture of how many animals we put out there for the entire grazing season
- Carrying capacity is the appropriate number of animals we put out for the grazing season with consideration of our resources and weather
- Stock density is the number of animals we put out each day to help achieve our goals