



OKAVANGO RESEARCH INSTITUTE (ORI)

A conceptual basis for rangeland management

Richard Fynn

Kevin Kirkman and Riaan Dames

Suggested reading for some key concepts

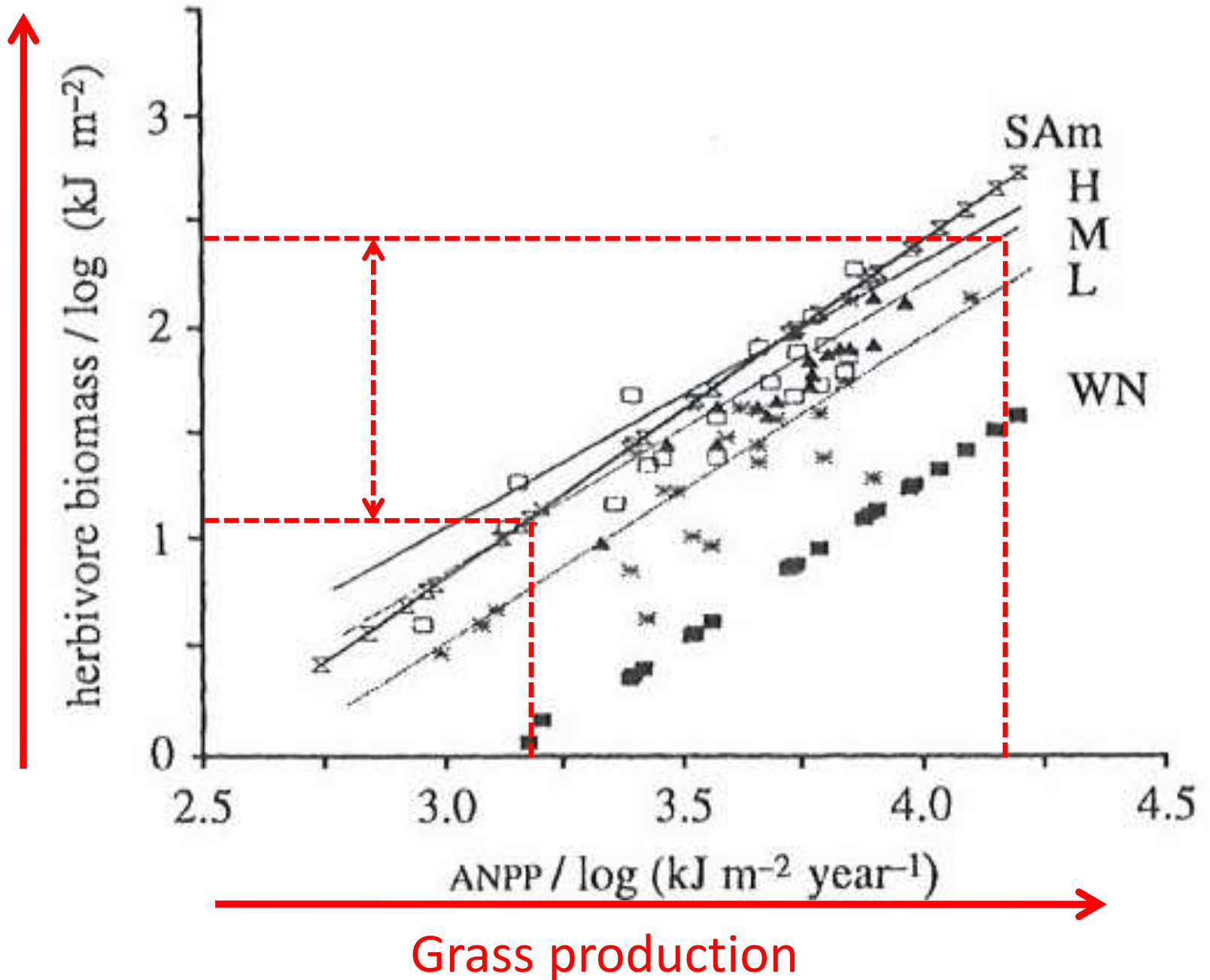
- ✓ **Kirkman, K. P., and A. Moore. 1995.** Perspective : Towards improved grazing management recommendations for sourveld. *African Journal of Range & Forage Science* 12:135–144.
- ✓ **Venter, A. D., and R. H. Drewes. 1969.** A flexible system of management for sourveld in Natal. *Proceedings of the Grassland Society of South Africa* 4:104–107.

KEY CONCEPTS

Concept 1:

**Carrying capacity is driven
by grassland productivity**

Fritz & Duncan 1994 – More grass equals more cattle



KEY CONCEPTS

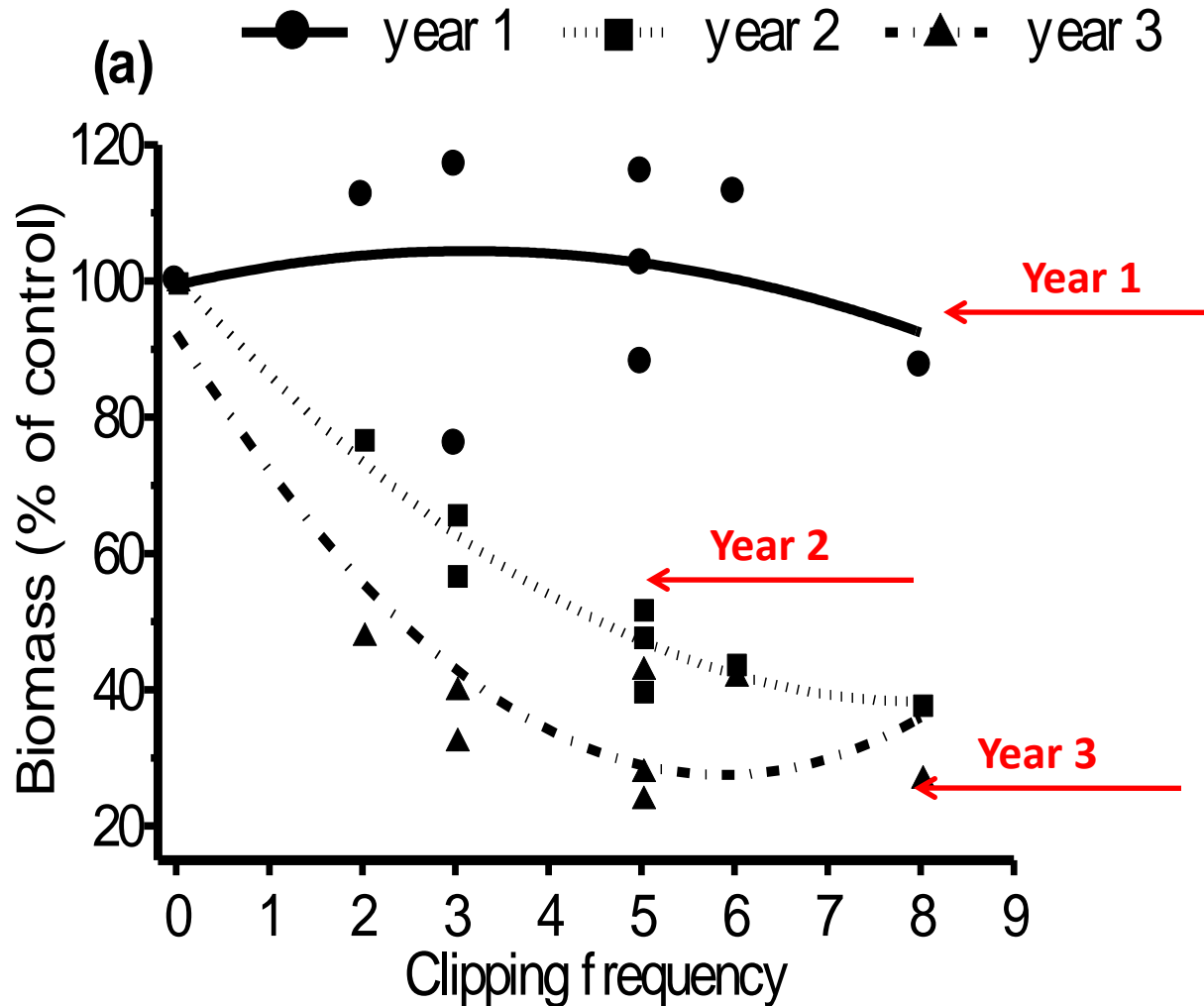
Concept 2:

Grassland productivity is determined by grazing history and its effects on nutrient economy and root biomass

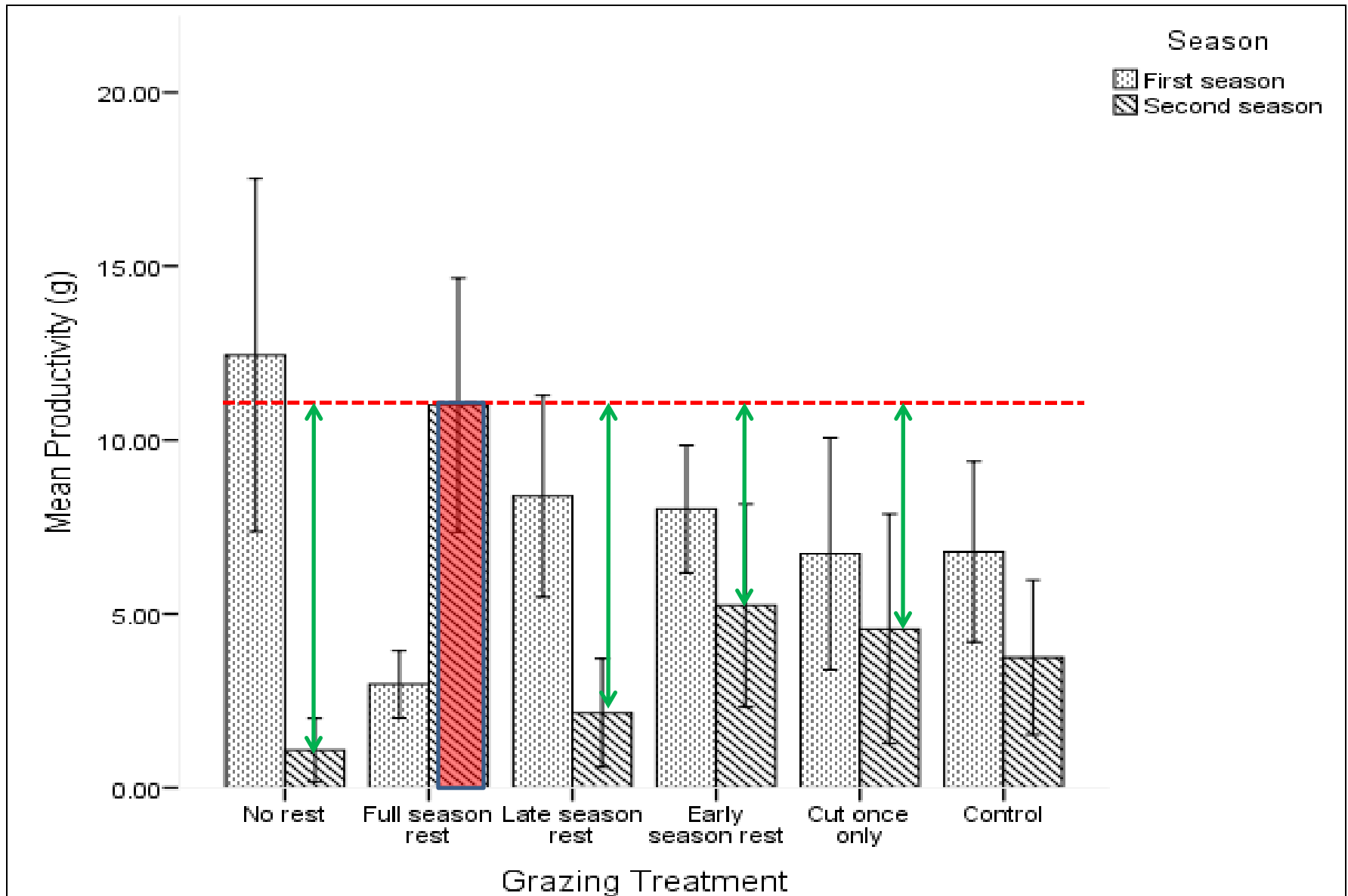
Determinants of grassland productivity

- Herbivory results in loss of growth-limiting nutrients
- Grazing reduces photosynthetic leaf area

Productive grasslands require long rest and recovery periods after grazing – Turner et al. 1993 USA



Productive grasslands require long rest and recovery periods after grazing – Edwin Mudongo 2014 Kgalagadi



Grass productivity responses to grazing history

- Identical responses have also been observed in grazing studies in KZN (Kirkman 2002)

Mechanism through which resting increases grass production

- It allows recovery of photosynthetic leaf area
- Most importantly it enables the grass plant to rebuild and increase its total pool of growth limiting nutrients, which can be re-allocated to growth in the next season
- Most mineralization of nutrients occurs after the spring rains – thus early wet season resting is critical as this is the time when grasses are able to recover and rebuild nutrient stores

Mechanism through which resting increases grass production

- It allows roots to rebuild in depth and total mass and root area, which improves moisture and nutrient uptake efficiency and provides a below ground store of growth limiting nutrients for regrowth in the next season
- Much root growth occurs late in the growing season (Snyman 2005 - *Journal of Arid Environments* 60:457–481; McNaughton et al. 1998 - *Ecology* 79:587–592)

Mechanism through which resting increases grass production

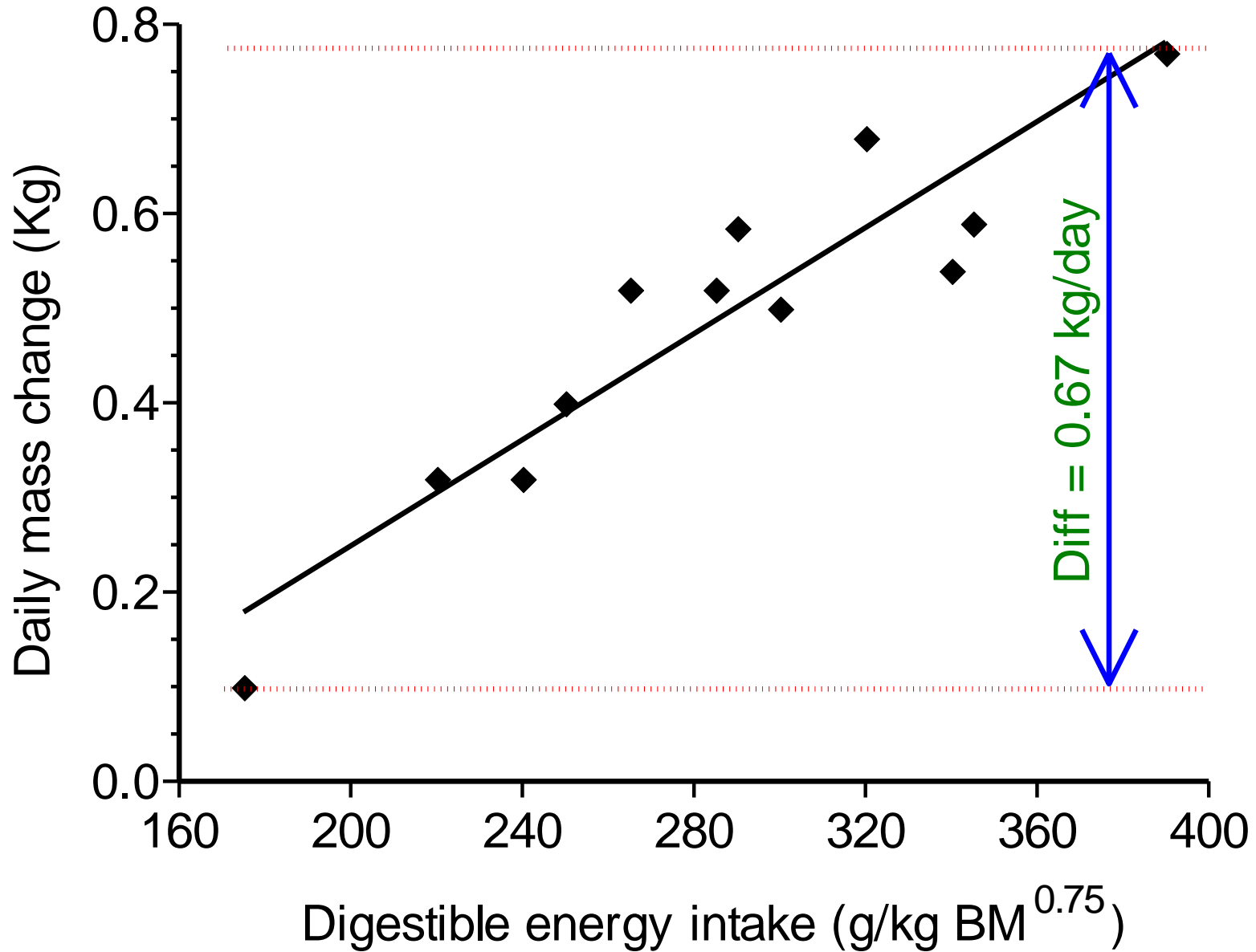
- Consequently, effective resting of grasses requires that
 - Grasses are rested in the early wet season (November, December and January) to maximize uptake and storage of nutrients
 - Grasses are also rested over the late wet season (February, March and April) to enable maximum building of root biomass
 - **Thus a full wet seasons recovery period is essential to maximize grassland productivity**

KEY CONCEPTS

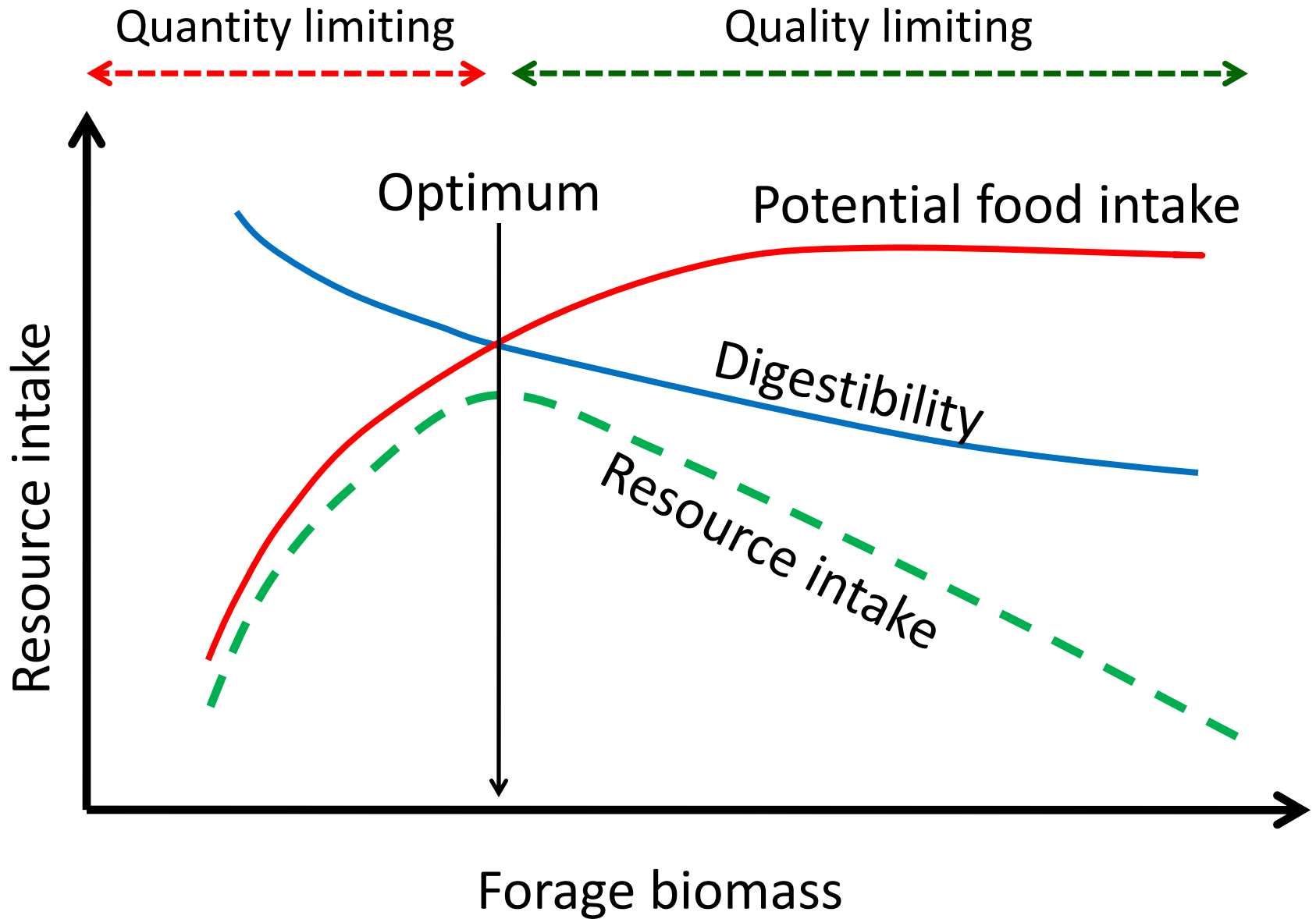
Concept 3:

Maximum cattle production is also dependent on forage quality –facilitation of grazing

Growth rate of elk calves: Cook et al. 1996 - *The Journal of Wildlife Management* **60**, 528-541.



Determinants of resource intake



Abundant digestible green leaf – Strathearn ranch



Additional problems with allowing grassland to grow too tall and old

- Allowing grassland to get old and tall **also reduces grass production!**

Optimal ranch management

Thus we can conclude that we need to concentrate the cattle on half the ranch during the wet season to create sufficient grazing pressure to maintain the grassland in:

(1) A short high-quality state

(2) An immature, rapidly growing state (maximum grass production)

KEY CONCEPTS

Concept 4:

Maximum stability and productivity of cattle populations is determined by adaptive foraging between a shorter, high-quality wet season resource and a taller more reliable dry season resource

KEY CONCEPTS

Across Africa many large herbivore populations migrate between a less productive, high-quality wet-season resource and a more productive and reliable, but lower quality dry-season resource:

- Serengeti-Mara (Maddock 1979)
- Loita plains-Mara (Serneels & Lambin 2001)
- Athi-Kapiti-Nairobi (Hillman & Hillman 1977)
- Sahel-West Africa (Breman & DeWit 1983)
- Makgadikgadi-Okavango Delta (Bartlam-Brooks et al. 2011)
- Mababi-Linyanti (Fynn et al. 2014)

Effect of adaptive foraging between short and tall grass patches on annual grazer intake

(Owen-Smith 2002 – Adaptive Herbivore Ecology P175)

	Grazing evenly distributed	Grazing seasonally distributed
Combined annual consumption	756 g m ⁻²	1075 g m ⁻²

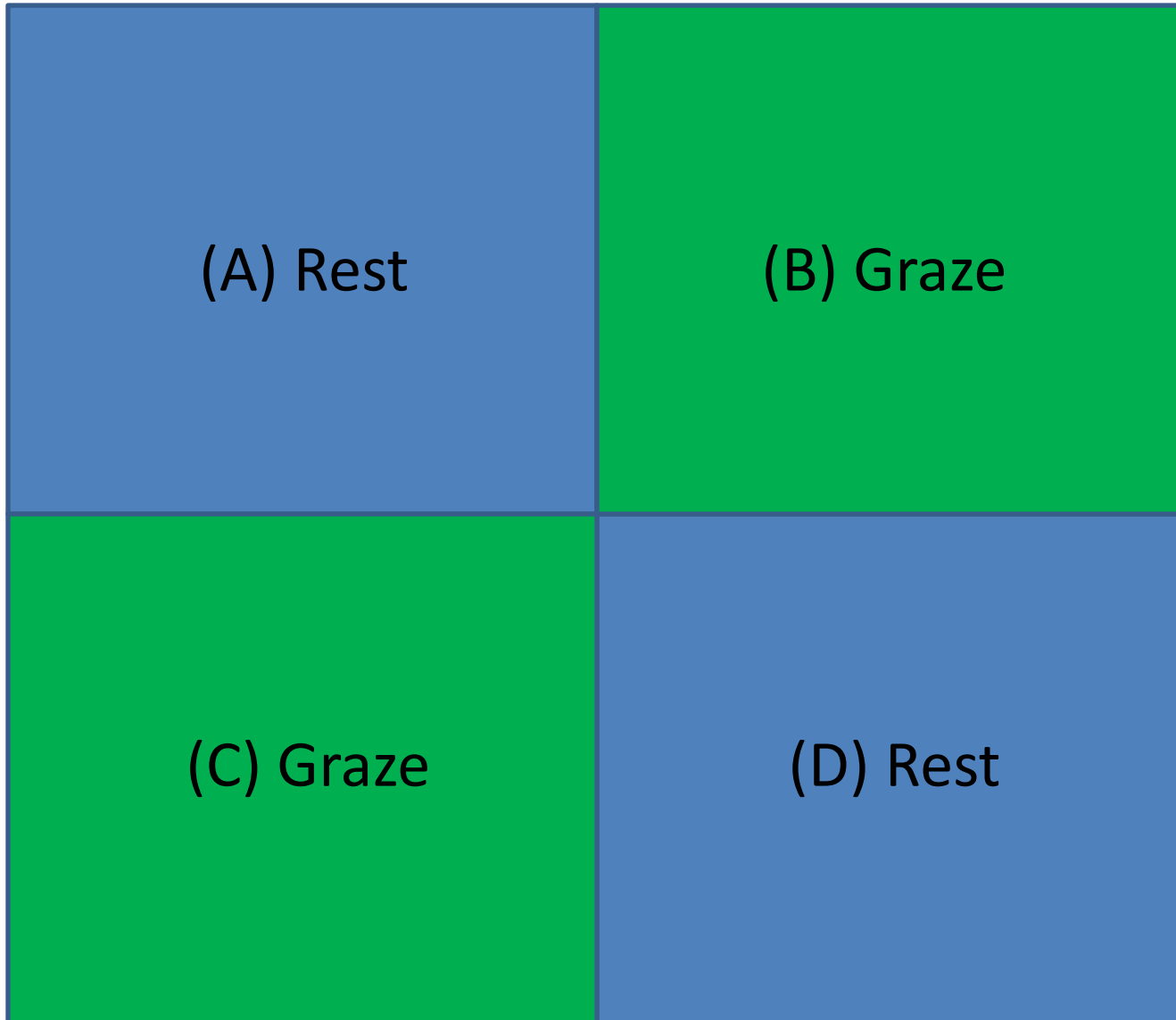
Optimal ranch management

Thus for maximum cattle production the ranch should be divided into two key areas:

- A short-grazed, high-quality grassland to provide maximum intake rates of energy and protein for optimal wet-season grazing
- An ungrazed reserve of taller grassland to:
 - (1) provide a year-long recovery period for perennial grasses
 - (2) provide a reserve of forage for the dry season and during droughts

How do we apply these key
concepts to our ranches?

Optimal ranch management



Fourie Vennootskap, Danielskuil ranch in the Northern Cape Province



Tiisa Kalahari Ranch - Ghanzi



Tiisa Kalahari Ranch - Ghanzi



Best basal cover and composition in KZN – Strathearn ranch





Ke a leboga
ditsala tsa me!