

# Woody harvesting effects on productivity and biodiversity

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BUSH BIOMASS SYMPOSIUM

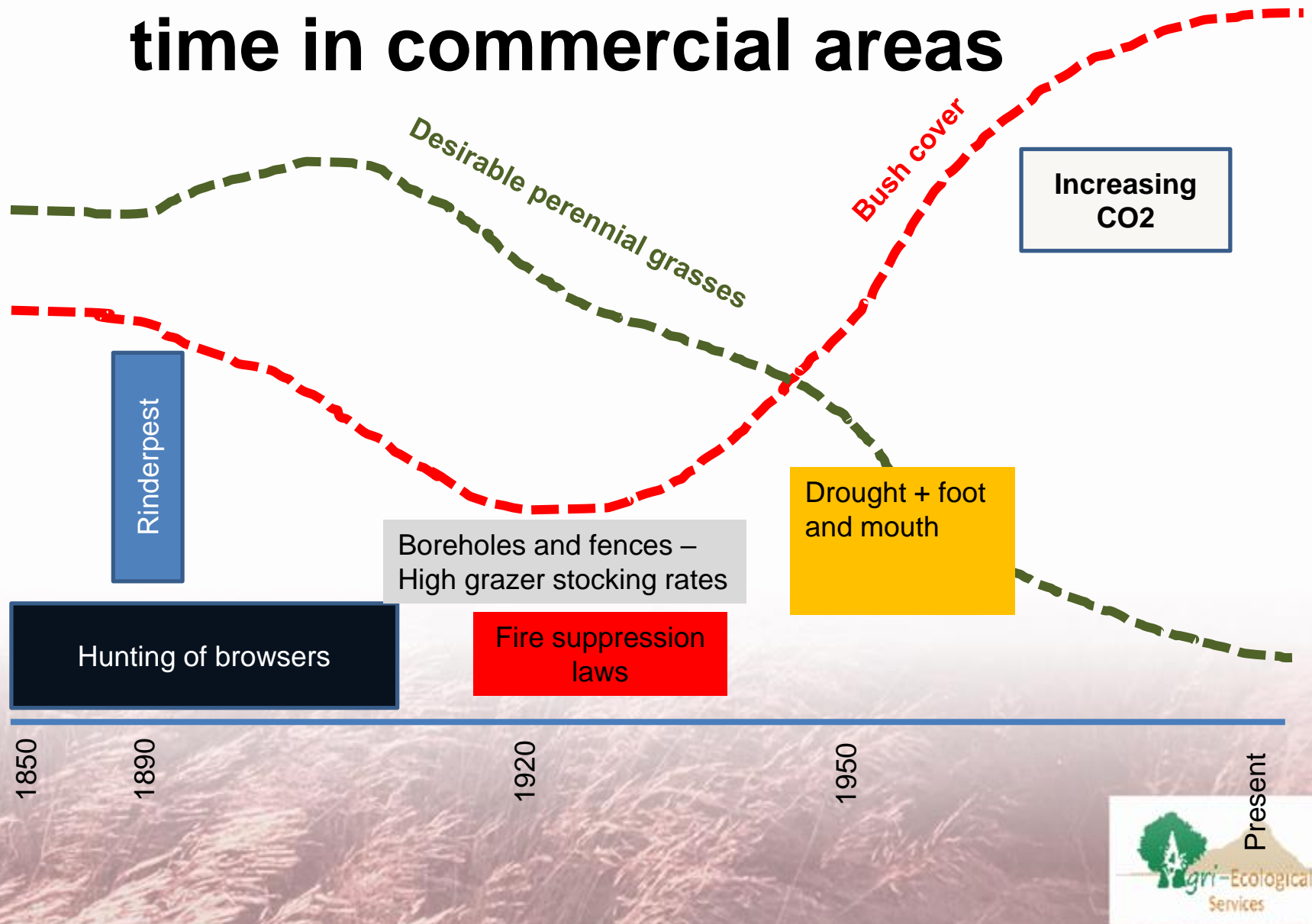
Theme: “The Role of Scientific Research in Growing Africa’s Bioeconomy”

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# Rangeland changes over time in commercial areas



# Introduction

- Bush thickening is a form of land degradation that is particularly prevalent in the semi-arid savannas of north-eastern and eastern Namibia.
- Perceived negative effects on ecosystem services such as:
  - **Productivity of herbaceous layer**
  - **Biodiversity**
- Increasing interest in woody resource utilization
- Lack of local data in Namibia

# Introduction (continue)

- NamPower's Encroacher Bush Biomass Power project – Biodiversity Impact Assessment
- Research to gain local information on productivity and biodiversity responses



# Methods

Three farms where harvesting took place in past:

- Gabus
- Tirol
- CCF



# Methods

- Field data collection took place from 2 to 10 July 2017
- Different treatments were in close proximity (i.e. 300-500m) of each other (2-3/farm).
- Treatments:
  - 1) woody harvesting where the wood has been removed,
  - 2) control areas where no harvesting took place and
  - 3) previously harvested areas that have been chemically or physically maintained in an open state.

# Methods

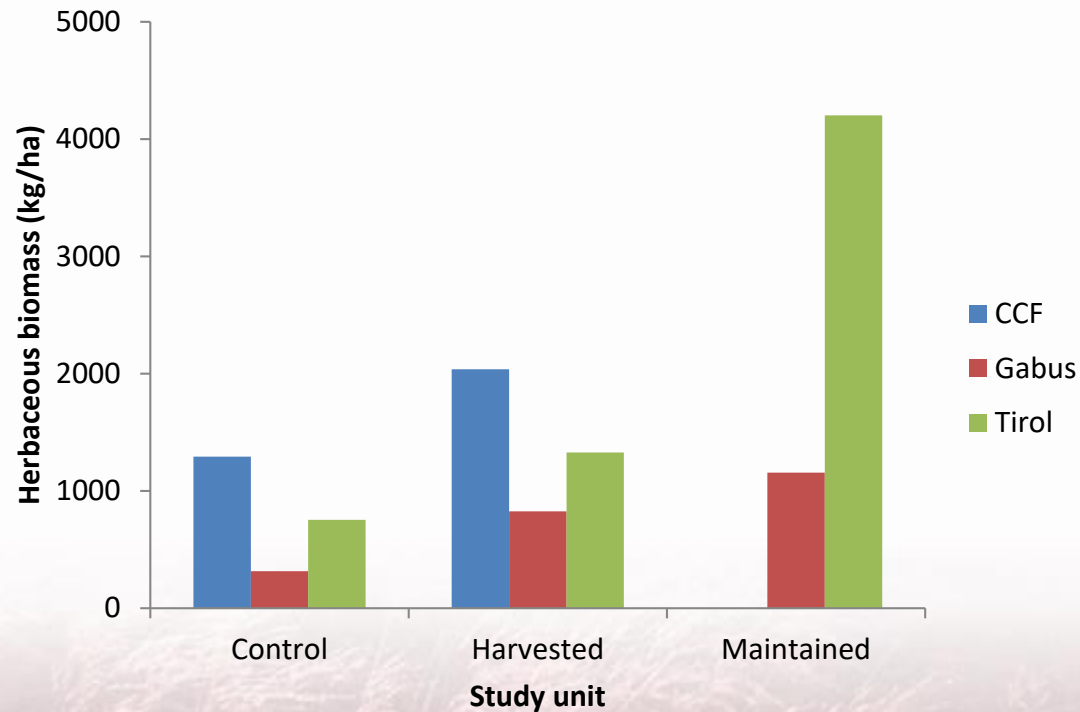
- Descending point surveys were conducted to determine the plant species composition at sites.
- Transects 100m long
- Projected plant canopies recorded per species at 1m intervals along transect
- Belt transects - woody species composition, density and height structure
- Woody plants  $> 4\text{m}$  height - wandering quarter method



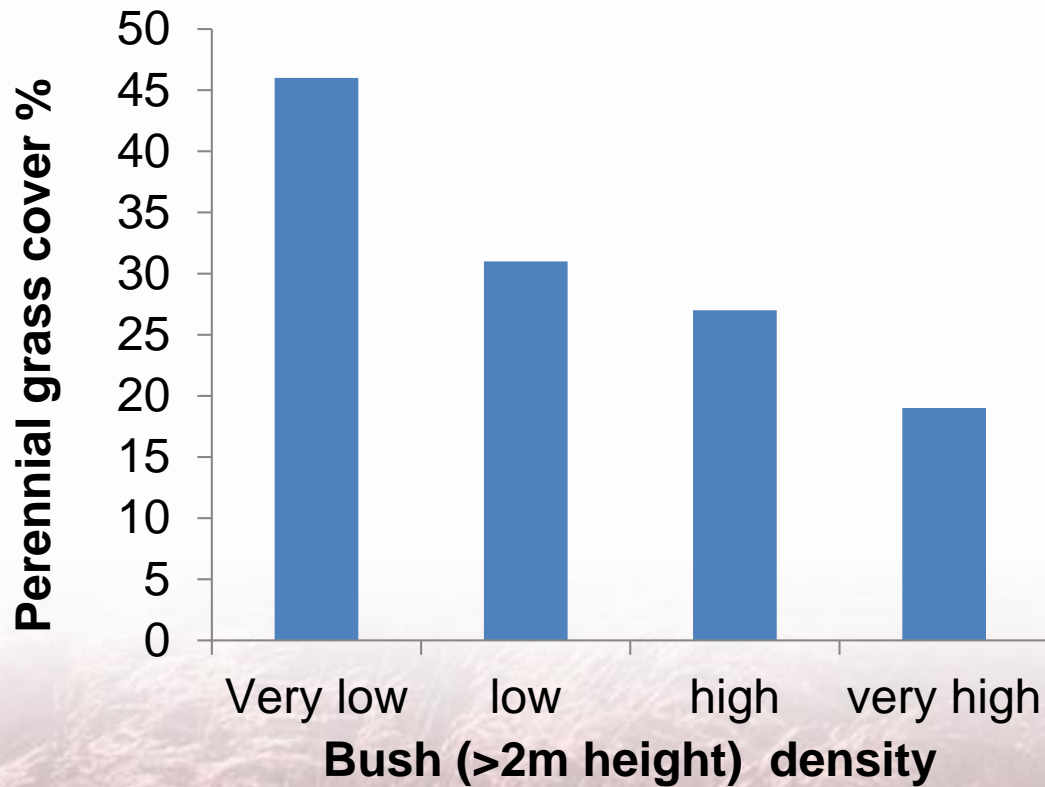
# Methods

- Standing herbaceous biomass was quantified per site using a double sampling technique
- Along transect 1 x 1 m quadrat is placed at 5 meter intervals and herbaceous biomass scored
- Calibration used 3 quadrates scored and biomass clipped, dried and weighed
- Mammal dung and burrow surveys in 4m x 100m transects

# Herbaceous biomass response



# Bush thickening vs. perennial grass cover

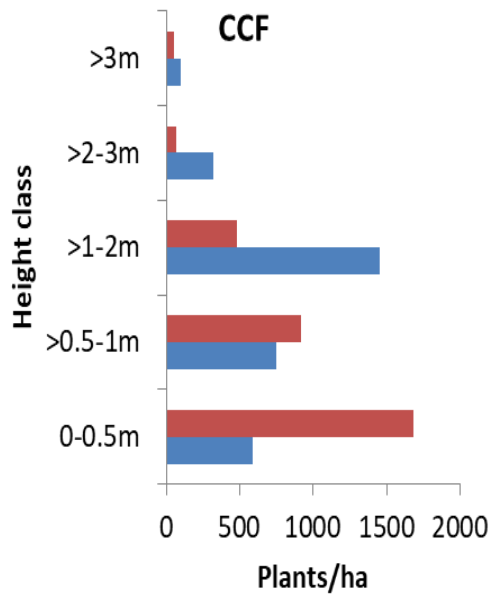


De Klerk 2004

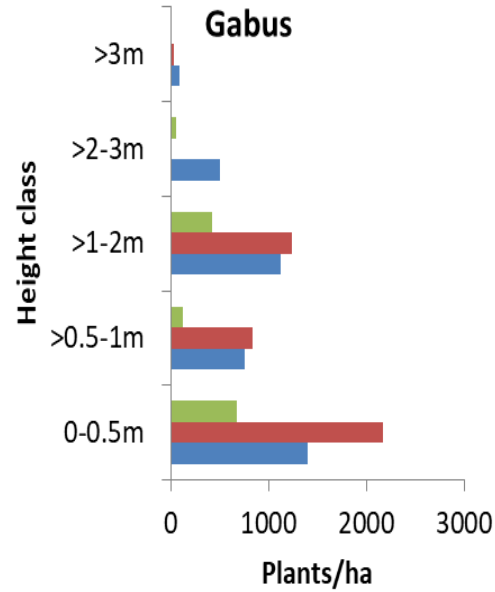
# Perennial grass mortality after 1960 drought (Northern Cape)

Grass species	Bush cleared	Bush encroached
<i>Stipagrostis uniplumis</i>	0%	68%
<i>Schmidtia pappophoroides</i>	26%	85% dead
<i>Eragrostis lehmaniana</i>	5%	93%
Donaldson (1967)		

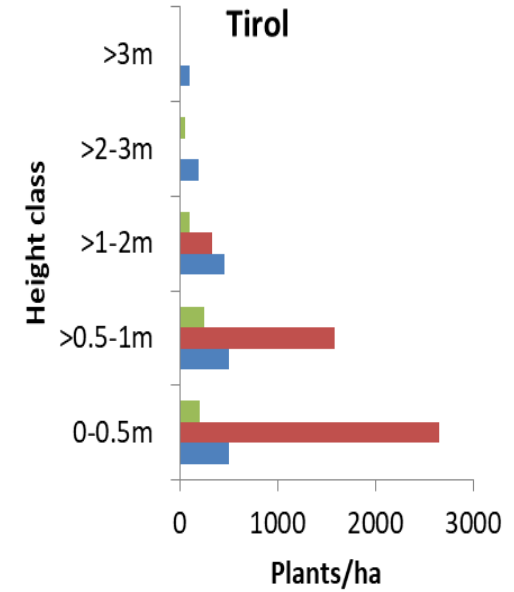
# Woody structural response



■ Harvested ■ Control

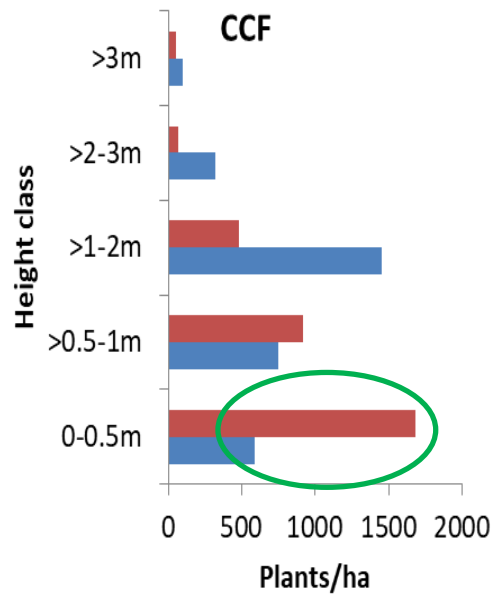


■ Maintained ■ Harvested ■ Control

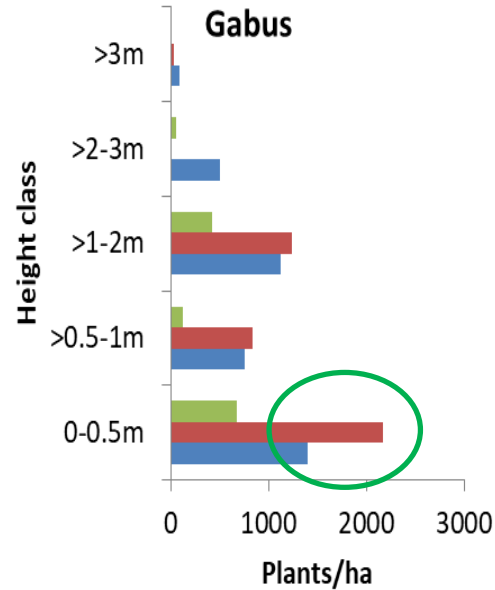


■ Maintained ■ Harvested ■ Control

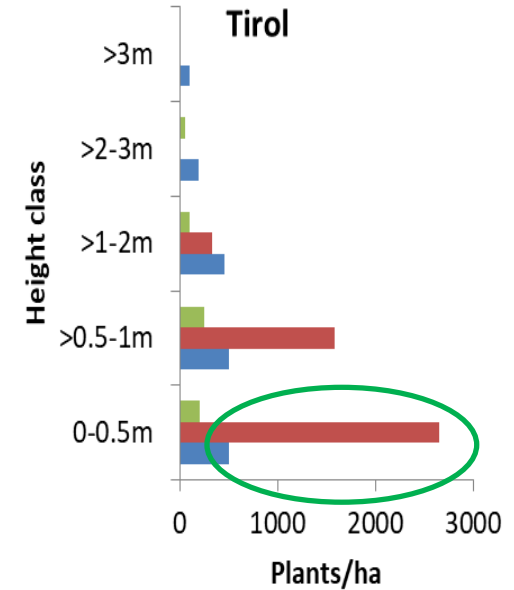
# Woody structural response



■ Harvested ■ Control



■ Maintained ■ Harvested ■ Control

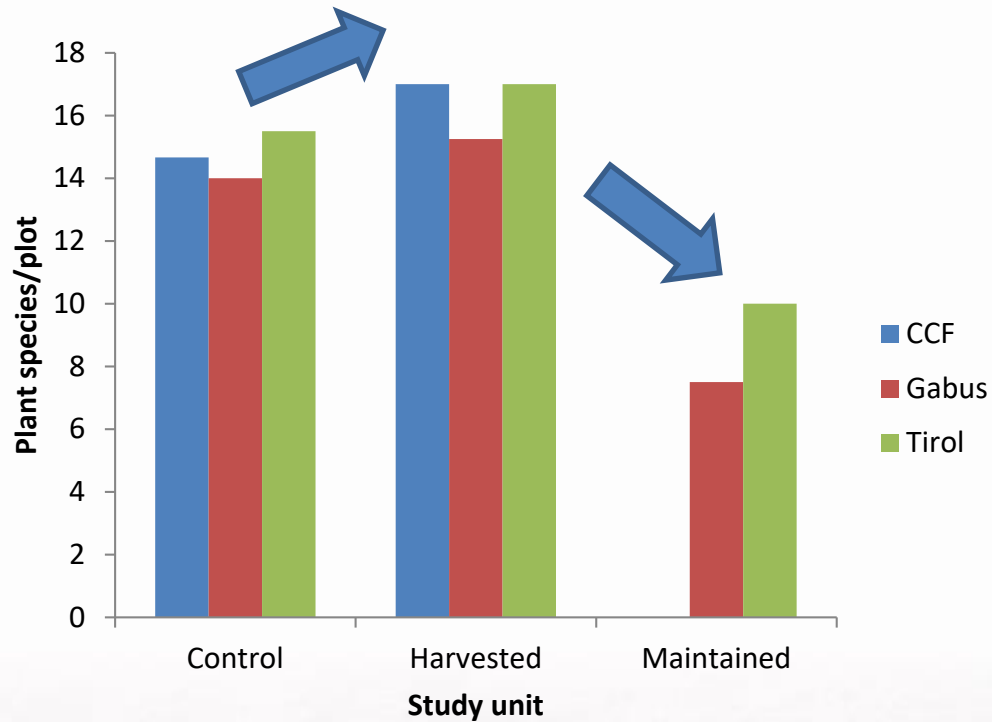


■ Maintained ■ Harvested ■ Control

# Over clearing without aftercare



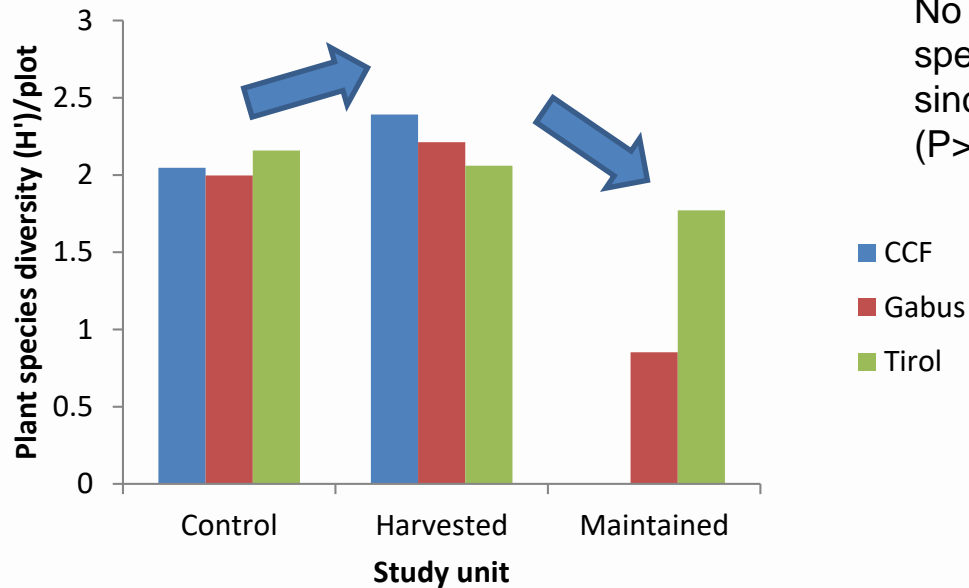
# Plant species richness



No correlation between species richness and time since harvest ( $P > 0.10$ ).

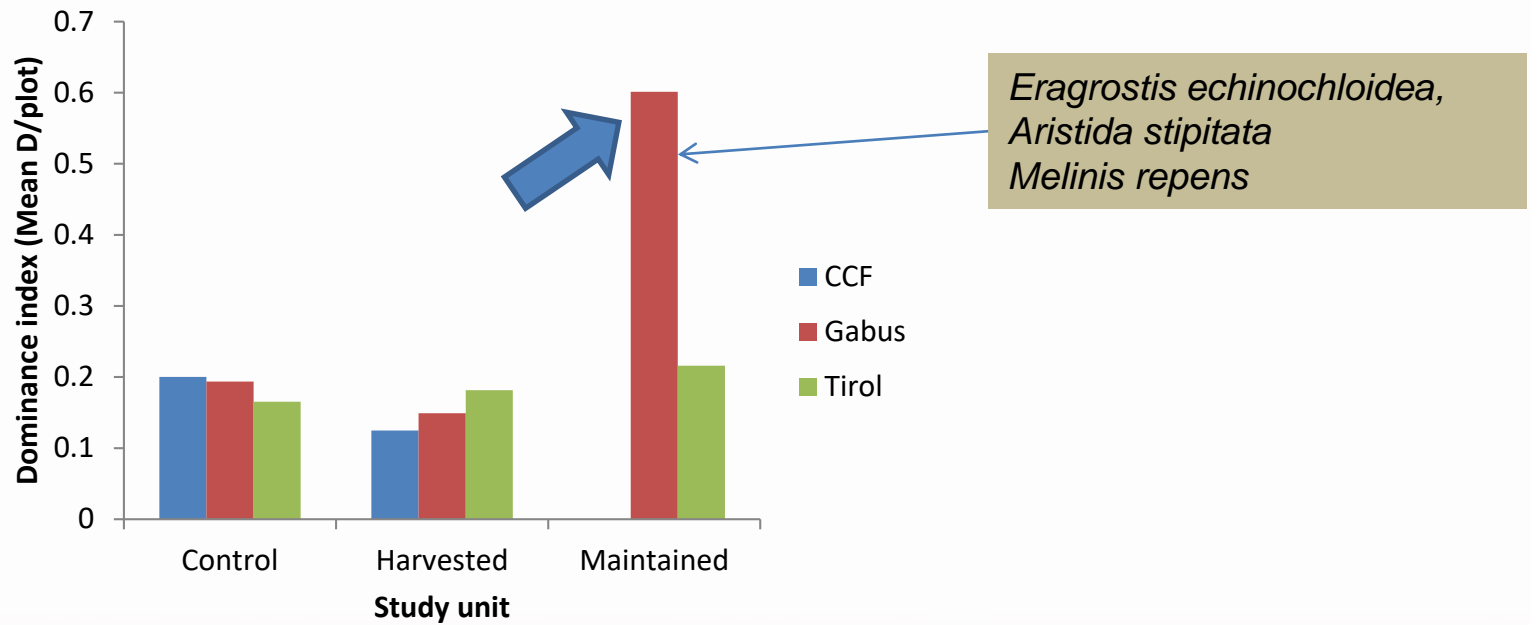


# Plant species diversity



No correlation between species diversity and time since harvest were found ( $P > 0.10$ ).

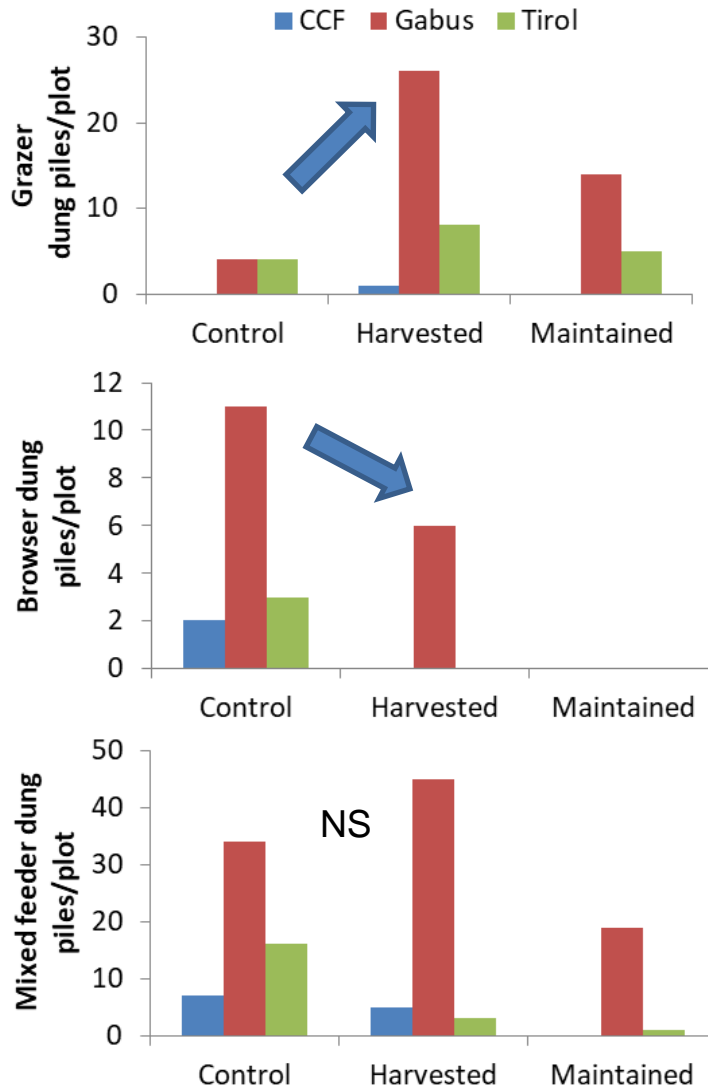
# Plant species dominance



# Plant species evenness

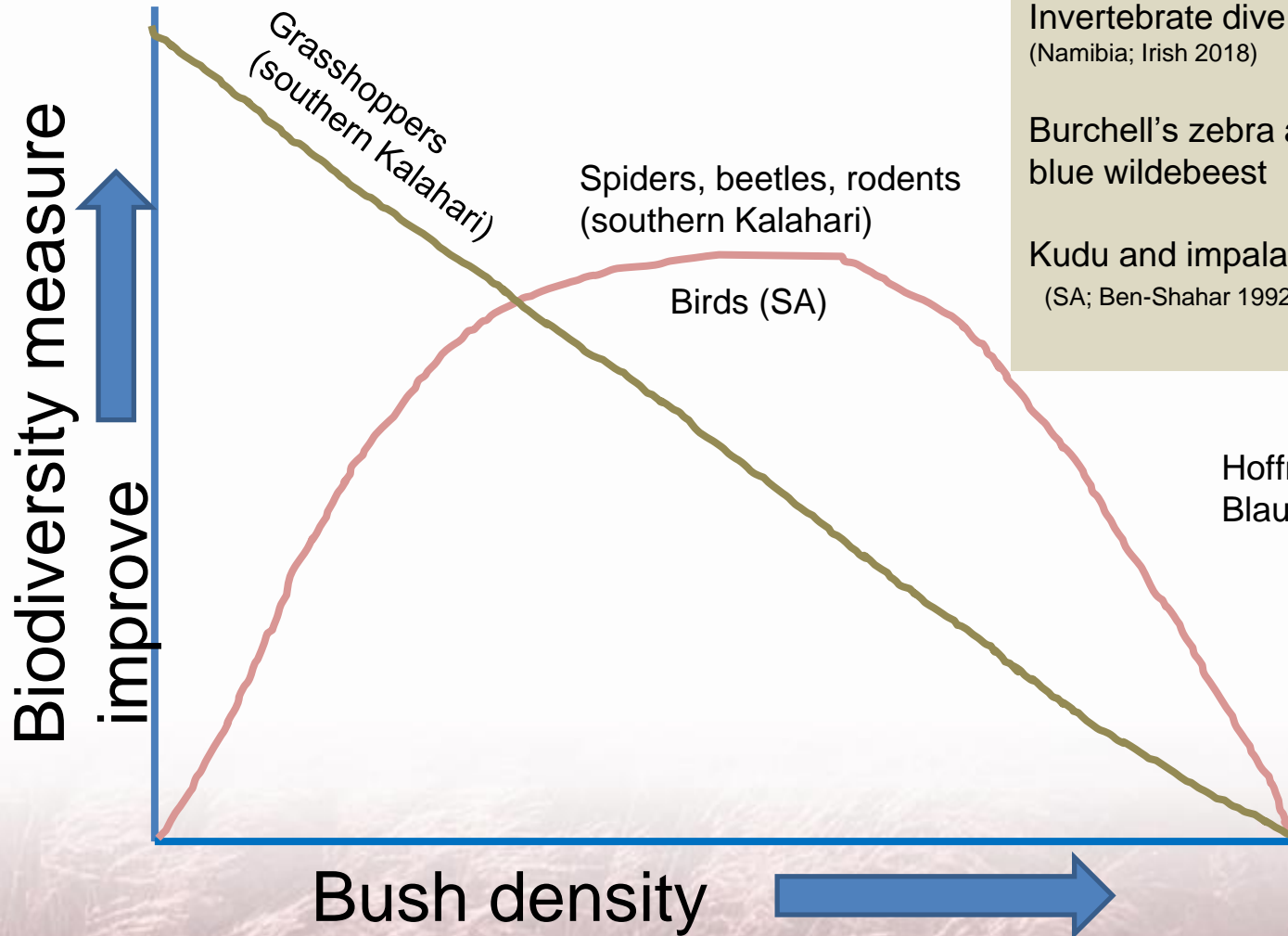
- How even species are distributed in terms of numbers - not differ between treatments (GLM,  $F_{2,18}=1.4974$ ,  $P>0.05$ ).
- In harvested areas - Tendency for plant species evenness to increase since time of harvest (Pearson's,  $r=.58$ ,  $n=10$ ,  $P=0.08$ ).

# Large mammal response



Neither the burrow density of aardvark nor small mammals differed between harvested and controls

# Other studies



## Woody plants cleared:

Invertebrate diversity  
(Namibia; Irish 2018)



Burchell's zebra and  
blue wildebeest



Kudu and impala  
(SA; Ben-Shahar 1992)

NS

Hoffmann et al. 2010  
Blaum et al. 2007a&b

# Conclusions – harvesting

- Herbaceous productivity increased
- Plant biodiversity increased and species dominance decreased
- Woody plant density increase in the seedling-sapling size class. **Aftercare important!**
- Continued control of woody plants mixed responses:
  - \* Herbaceous biomass highest.
  - \* But, plant species diversity decreased and dominance increased - undesirable.
- Clearly how aftercare of woody plants is performed is of great importance.

# Conclusions

- Browsers preferred bush encroached areas and grazers preferred the harvested areas.
- Biodiversity responses context specific:
  - Where on woody density gradient
  - Taxon studied
  - Spatial scale



# Acknowledgements

- NamPower for opportunity to do research and share information
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**Thank you!**

