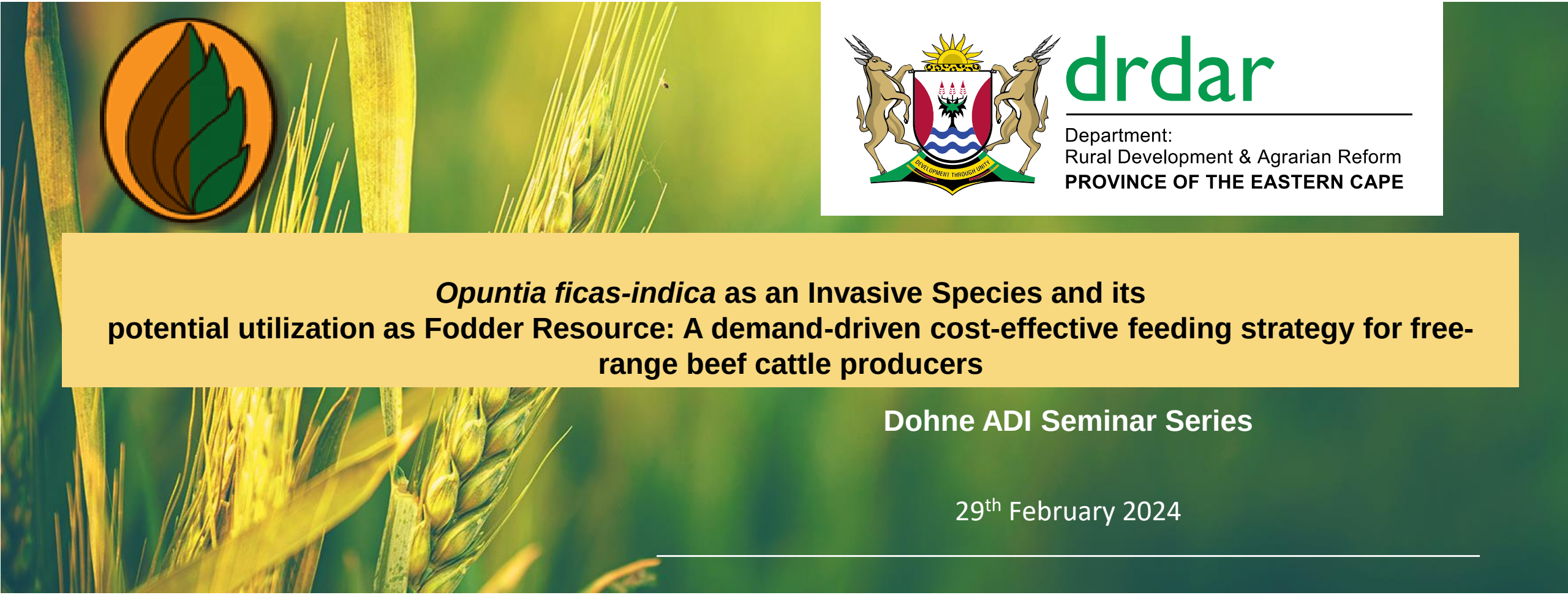

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Department:
Rural Development & Agrarian Reform
PROVINCE OF THE EASTERN CAPE

Opuntia ficas-indica as an Invasive Species and its potential utilization as Fodder Resource: A demand-driven cost-effective feeding strategy for free-range beef cattle producers

Dohne ADI Seminar Series

29th February 2024

By

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OUTLINE

- Introduction
- Problem Statement
- Justification
- Experimental study Objectives
- Experimental Study Area
- Materials & Methods
- Results & Discussion
- Conclusion & Recommendation

INTRODUCTION

- *Opuntia ficus-indica* commonly called Cactus Prickly pear, is one of the most agronomical important invasive species for the production of edible fruits and cladodes.
- In Southern Africa, the invasiveness of Cactus prickle pear and its impact on various ecosystems has been recognised
  - Especially in arid and semi-arid areas where rainfall is erratic.
  - With the Eastern Cape Province having the most visible clusters of Cactus PP invaded spaces

  i.e. Sarah Baartman and Chris Hani districts – with dry lands know as Karroo areas

PROBLEM STATEMENT

- Due to its adaptability to harsh environmental conditions, less fertile soils, high temperatures and low rainfall, Cactus PP species is regarded as drought tolerant plant.
- As a result, a high proportion of this invasive species is threatening growth and survival of most grass *spp*.
- Moreover, under the current global climate changes, most environments in SA are becoming more arid such that;
  - ➢ Cactus PP will inhabit more areas as conditions will suit its growing environment, which is a significant role player in its life cycle.
- This will result in the expansion of Cactus PP invading to more areas in the near future.
- Thus, a need arises therefore, to control the wide spread of this invasive species.

JUSTIFICATION

- Many strategies have been employed in controlling the wide spread of cactus PP which include;
  - (i). Chemical, (ii). Mechanical, and iii) Biological
- These methods may not be sustainable, and seem to have disadvantages to the environment
- Therefore, the is a need to come up with other environmental friendly management methods to control expansion of Cactus PP.
- Recently, there has been an increasing interest in Cactus PP use as an alternative feed for ruminant animals in most parts of the world
  - As this enables livestock farmers to survive critical periods of feed shortages and still be able to produce good quality animal products.

Experimental study Objective/s

Preliminary assessments

Evaluate farmers' perceptions of the impacts of environmental changes to rangeland vegetation, as well identifying locally available forage resources (LAFRs) as potential energy and protein sources for use as cattle feed;

Assessment of nutritional composition and digestibility of selected locally available forage resources (LAFRs) as potential energy and protein sources in the Eastern Cape over 2 growing seasons

Specific objective for this Study

Determine Growth performance, Carcass characteristics and Economic viability of Nguni Cattle fed diets containing Graded levels of Cactus PP (*Opuntia ficus-indica*)

Experimental Study Area

Permission to conduct the study was applied for through the Agricultural Research Council – Animal Production (ARC - AP) Ethical Clearance Committees

To test the actual feeding value for diets formulated from rangeland-based LAFRs were fed to Nguni cattle breed under feedlot conditions.

All the data were analysed using General Linear Model (GLM) procedures of SAS (2009) with repeated measures.

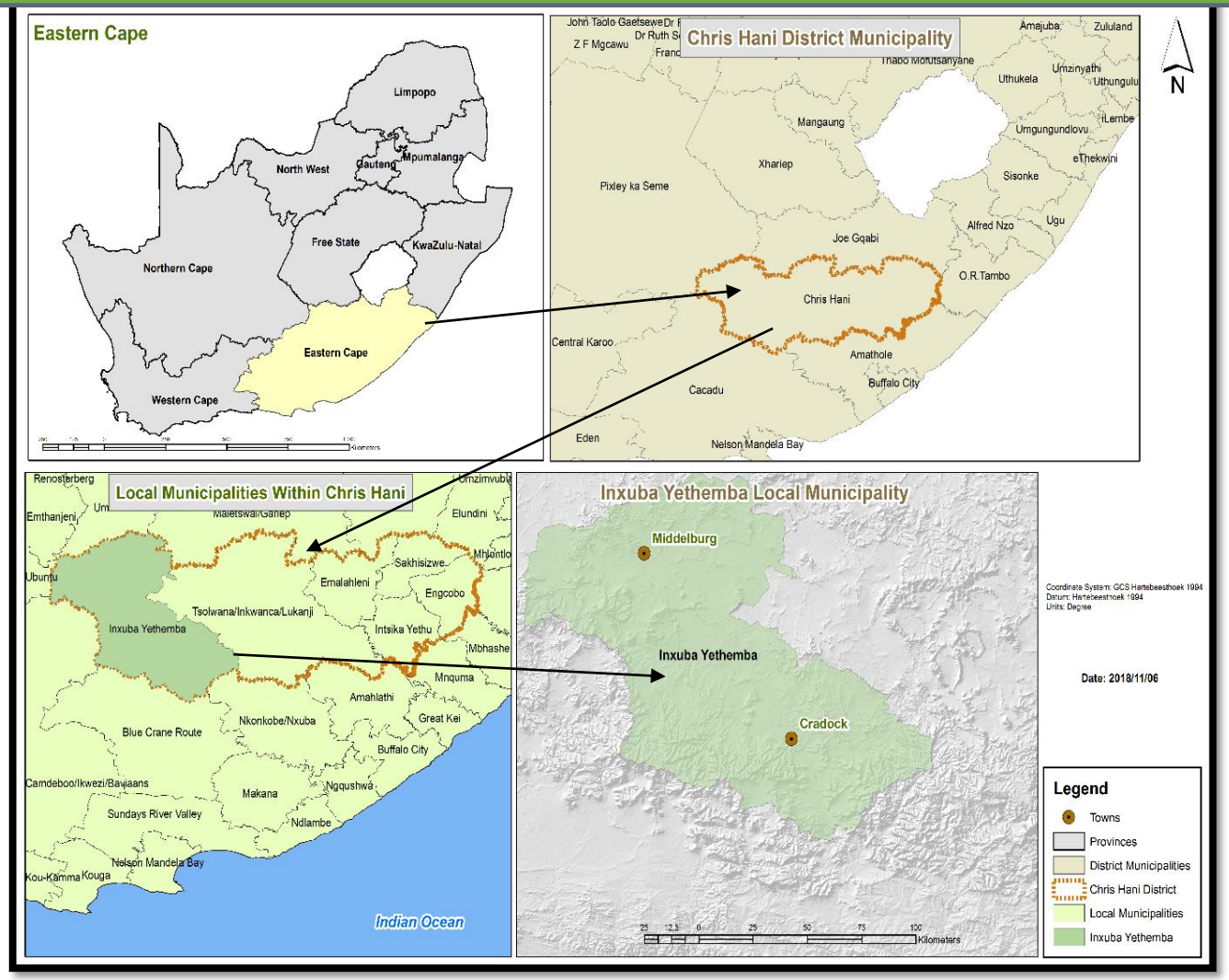

***Figure 1**: Location of the study areas in the Eastern Cape Province, South Africa (Akela South Africa website)*

MATERIALS & METHODS

Harvesting, transporting and processing of cactus cladodes

<u>Diets formulation:</u>

T1 & T4 = crop-based energy and commercial protein source;

T2 & T3 = with pasture-based energy + protein sources

MATERIALS & METHODS CONT……

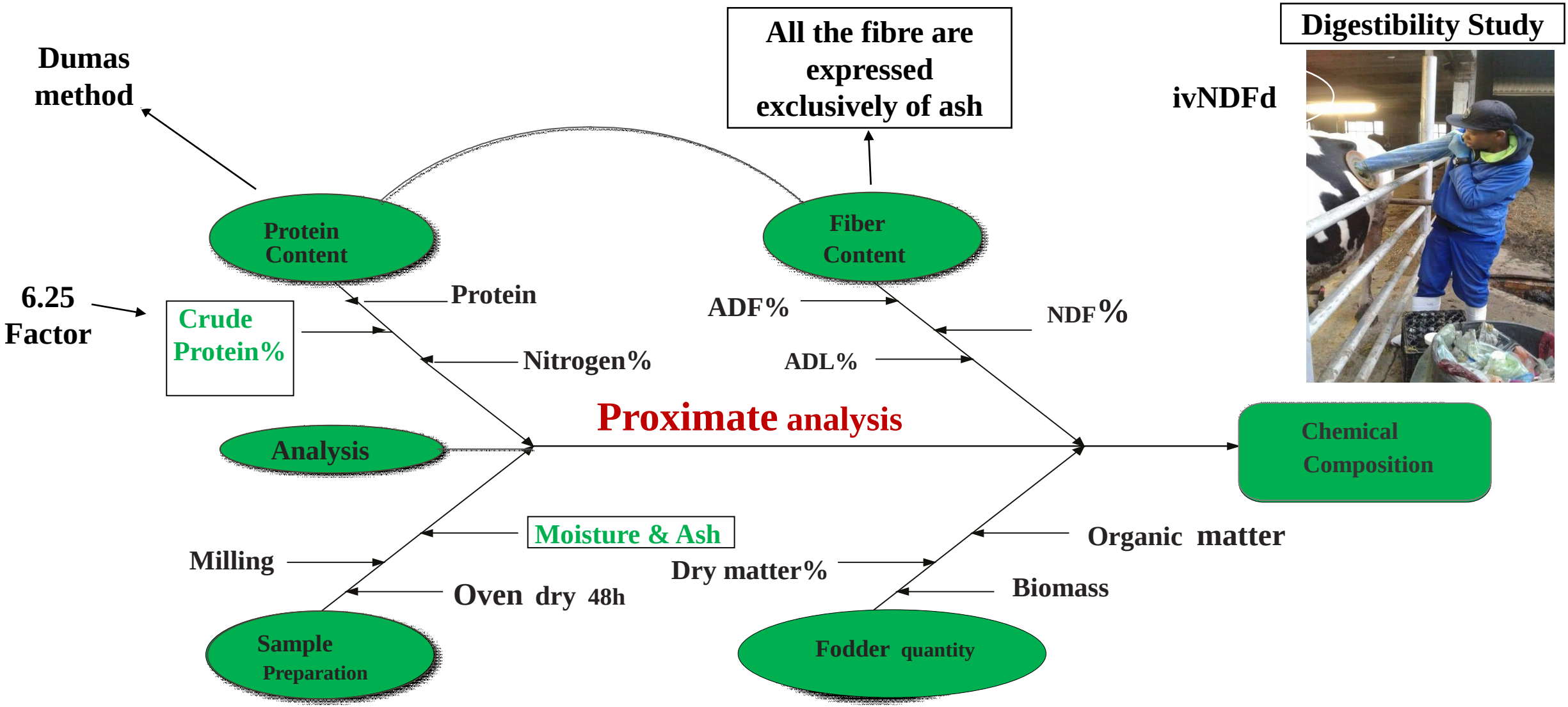

Figure 2: Methods for determination of nutritional composition

Feeding Trial Management

- A total number of 32 Nguni Heifers of the same age group (171 ± 21.4 kg and 22 months), put into individual pens (2×4 m), were randomly assigned to four treatment diets (8 heifers/treatment)
- The animals were allowed 21 days to adapt to their respective treatment diets prior to the 90-day feeding trial.

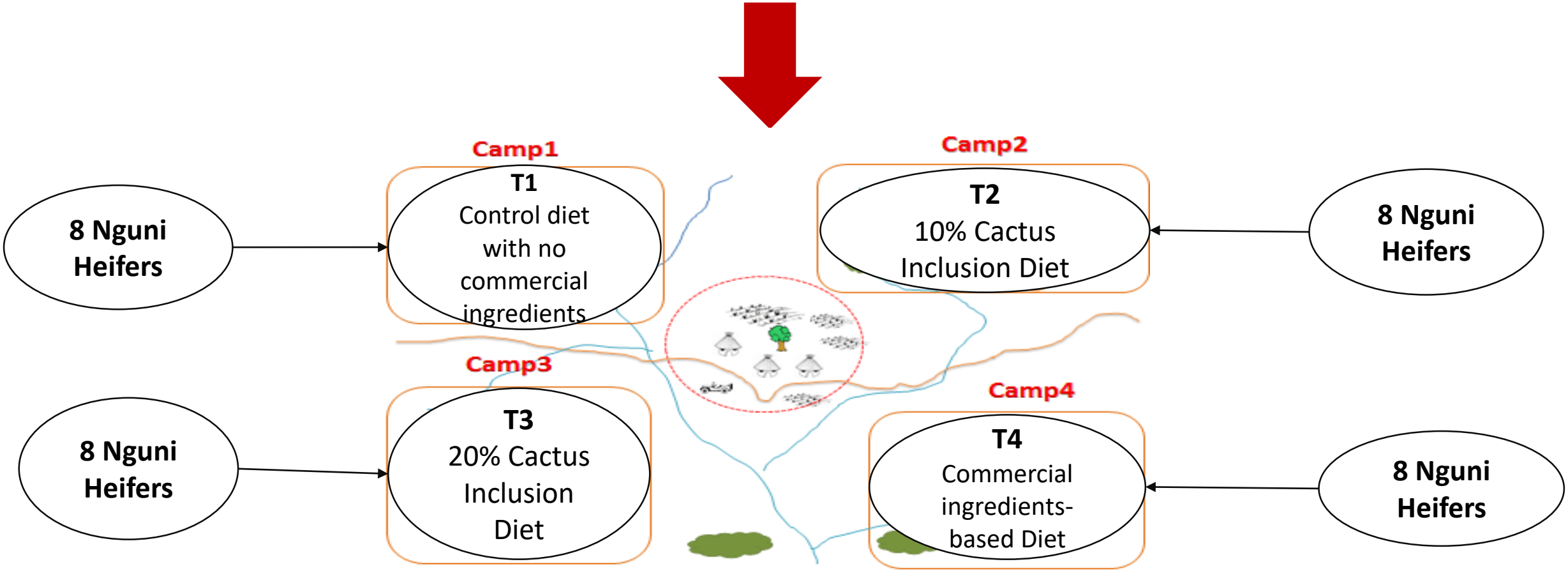

Figure 3: Distribution of animals and treatments

Measuring Animal Performance

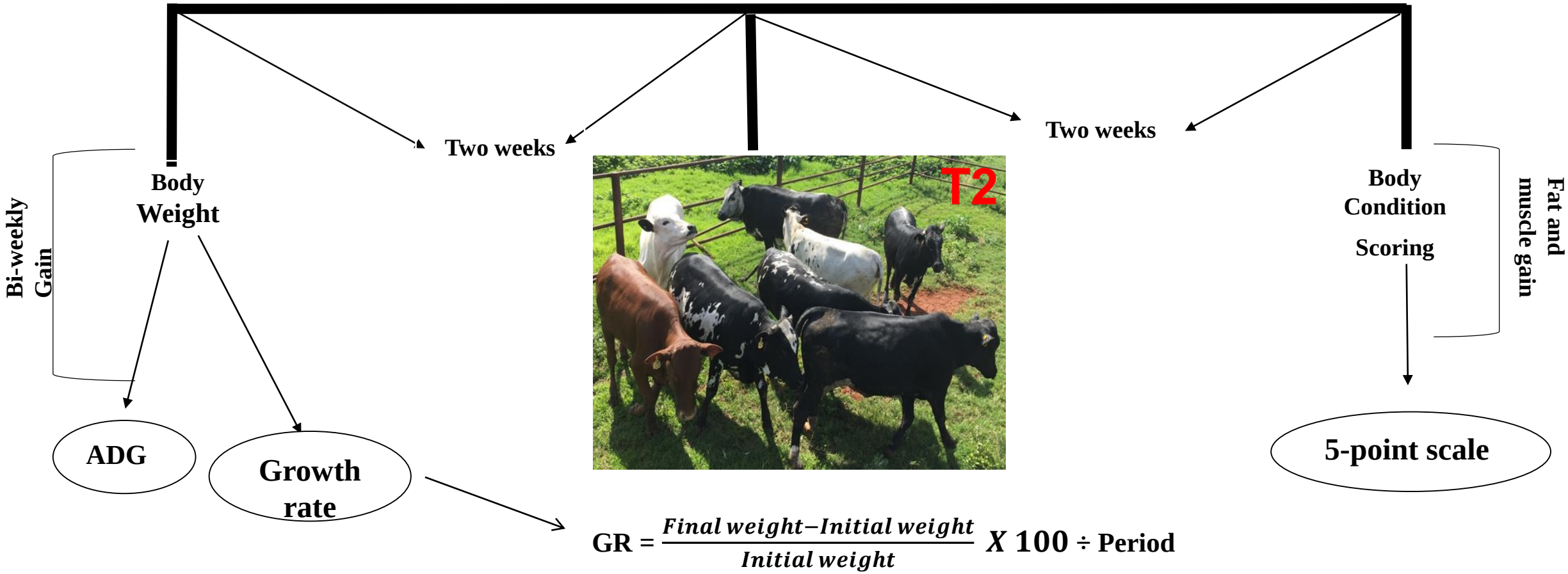

Figure 4: Diet influence on productive performance of Nguni heifers

RESULTS & DISCUSSION

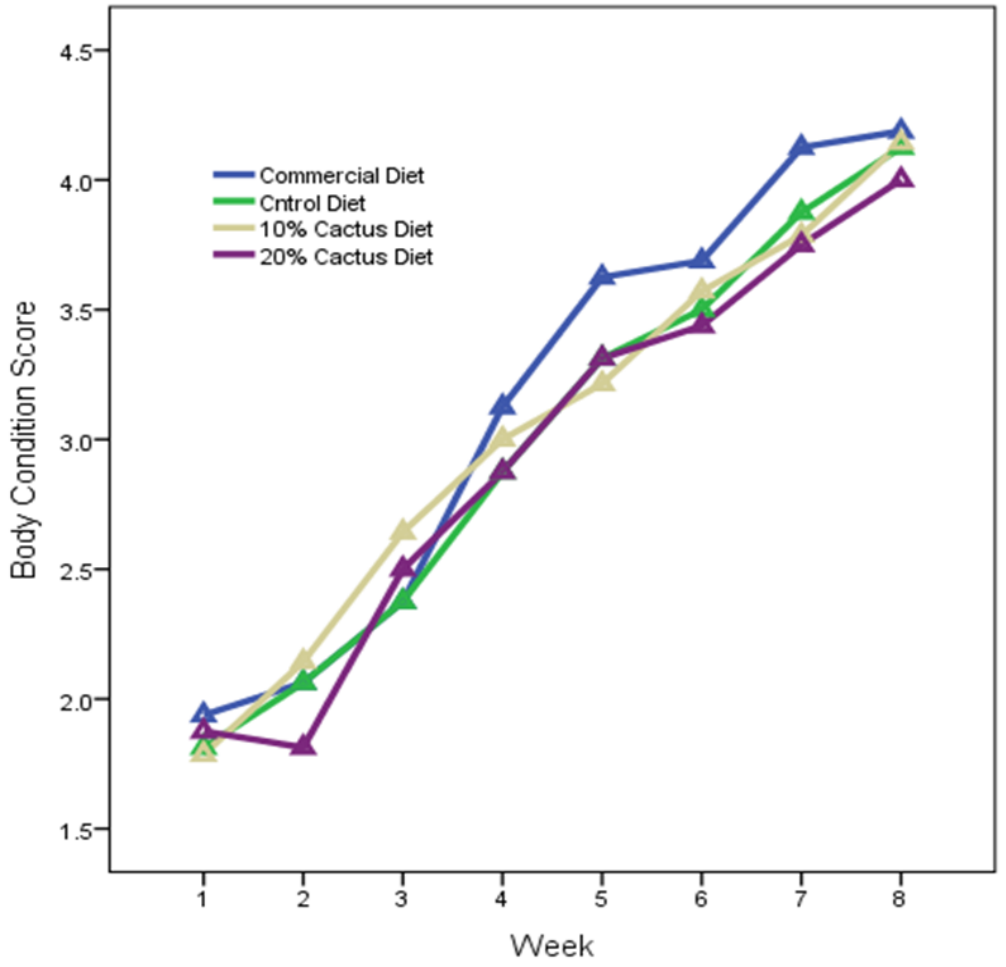

Figure 5: Diet influence on Body Condition Scoring (BCS) of Nguni heifers

RESULTS & DISCUSSION CONT…..

Table 1: Slaughter and carcass characteristics of Nguni Heifers fed diets containing two different levels of Cactus PP cladodes

Variable	Diets				
	Control Diet	10% Cactus Diet	20% Cactus Diet	Commercial Diet	Sign
Live weight (Final BW, Kg)	269.30 ± 37.56	253.38 ± 37.55	249.00 ± 30.33	270.80 ± 32.89	NS
Warm carcass weight (Kg)	135.10 ± 22.87^{a}	145.40 ± 24.68^{ab}	126.80 ± 20.24^{b}	147.80 ± 20.71^{a}	*
Cold carcass weight (Kg)	132.60 ± 22.33^{a}	142.70 ± 24.45^{ab}	124.30 ± 20.06^{b}	145.30 ± 20.36^{a}	*
Warm dressing %	53.80 ± 1.38 ^{ab}	55.40 ± 1.88 ^{a}	52.90 ± 2.14 ^{b}	54.50 ± 1.61 ^{ab}	*
Cold dressing %	52.90 ± 1.36 ^{ab}	54.30 ± 1.83 ^{a}	51.80 ± 2.16 ^{b}	53.60 ± 1.583 ^{ab}	*
$pH_{initial}$ 45 min	6.07 ± 0.07	6.06 ± 0.10	6.10 ± 0.11	6.05 ± 0.34	NS
$pH_{ultimate}$ 24 h	5.40 ± 0.07	5.53 ± 0.17	5.51 ± 0.08	5.48 ± 0.12	NS
Fat thickness (mm)	2.30 ± 0.53 ^{a}	2.10± 0.35 ^{b}	2.10 ± 0.32 ^{b}	2.40 ± 0.46 ^{a}	*
Conformation	2.90 ± 0.35 ^{a}	2.60 ± 0.52 ^{ab}	2.30 ± 0.46 ^{b}	3.00 ± 0.00 ^{a}	*
Rib-eye muscle Area (mm^2)	4119.30 ± 560.50	4412.30 ± 978.89	4140.60 ± 691.60	5069.50 ± 749.92	NS
Starting weight (Kg)	173.50 ± 24.27	169.60 ± 28.72	173.60 ± 26.99	171.80 ± 28.41	NS
DMI (Kg DM/day)	7.30 ± 1.22 ^{a}	6.50 ± 1.73 ^{b}	6.00 ± 0.93 ^{b}	7.50 ± 1.22 ^{a}	*
ADG (Kg/day/animal)	1.10 ± 0.19 ^{a}	0.80 ± 0.16 ^{b}	0.73 ± 0.08 ^{b}	1.10 ± 0.17 ^{a}	***
FCR	6.64 ± 0.42 ^{b}	8.13 ± 1.02 ^{a}	8.22 ± 1.51 ^{a}	6.82 ± 0.92 ^{b}	**

^{ab} Means within a row with different superscript letters differ at $^{*}p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$.

RESULTS & DISCUSSION CONT…..

Table 2: Gross margins (R) of diets containing Cactus PP (*Opuntia ficus-indica*) cladodes

Parameter	Diets				Sign
	Control Diet	10% Cactus Diet	20% Cactus Diet	Commercial Diet	
Animal purchasing cost	11.86 ± 0.68	11.84 ± 0.69	11.89 ± 0.70	11.89 ± 0.69	ns
Feeding costs					
PPC cladode harvesting	---	2.03 ± 0.0	4.06 ± 0.13 ^{a}	---	**
Grass hay (*E. tef*)	2.20 ± 0.06 ^{ab}	0.63 ± 0.03 ^{b}	0.31 ± 0.01 ^{c}	4.08 ± 0.07 ^{a}	**
Lucerne	2.5 ± 0.04 ^{a}	2.36 ± 0.04 ^{b}	2.51 ± 0.05 ^{a}	---	**
Maize (milled)	23.56 ± 3.85 ^{a}	20.89 ± 2.61	18.75 ± 3.20 ^{c}	24.35 ± 1.42 ^{a}	**
Soybean OCM (40% CP)	---	0.63 ± 0.0.03 ^{b}	1.26 ± 0.03 ^{a}	0.63 ± 0.03 ^{b}	**
Molatek SB 100	3.14 ± 0.0	3.14 ± 0.0	3.14 ± 0.0	3.14 ± 0.0	ns
Management cost	0.71 ± 0.02	0.70 ± 0.02	0.71 ± 0.02	0.71 ± 0.02	ns
Total variable costs	20.73 ± 3.87 ^{b}	20.80 ± 3.07 ^{ab}	19.63 ± 2.82 ^{c}	22.40 ± 4.27 ^{a}	**
Total revenue	37.55 ± 5.66 ^{c}	38.31 ± 10.07 ^{b}	38.28 ± 12.03 ^{b}	38.74 ± 9.45 ^{a}	*
Gross margins	**15.56 ± 1.32 ^{c}**	**17.60 ± 1.33 ^{a}**	**18.64 ± 1.33 ^{a}**	**16.34 ± 1.27 ^{b}**	*

^{abc}Means with different superscripts within a row are different (P<0.05)
ns-not significant;

Conclusion and Recommendations

- The comparability of carcass traits of Nguni cattle fed Cactus PP diets and those fed other diets as well as higher economic returns from Cactus PP inclusion warrants the substitution of expensive conventional feeds with less costly alternative feeds.
- Moreover, Cactus PP could be used as cheapest source of feed for limited resource farmers.
- Further studies need to be conducted on the use of livestock in controlling the spread of Cactus PP in rangelands, its abundance and invasiveness.

THE END

Acknowledgements

Acknowledgements

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