UNIVERSITEIT
iYUNIVESITHI
STELLENBOSCH
UNIVERSITY

100
1918 · 2018

forward together · saam vorentoe · masiye phambili

The current status of sheep genetic resources in South Africa and future sustainable utilisation to improve livelihoods

Annelin Molotsi

Bekezela Dube

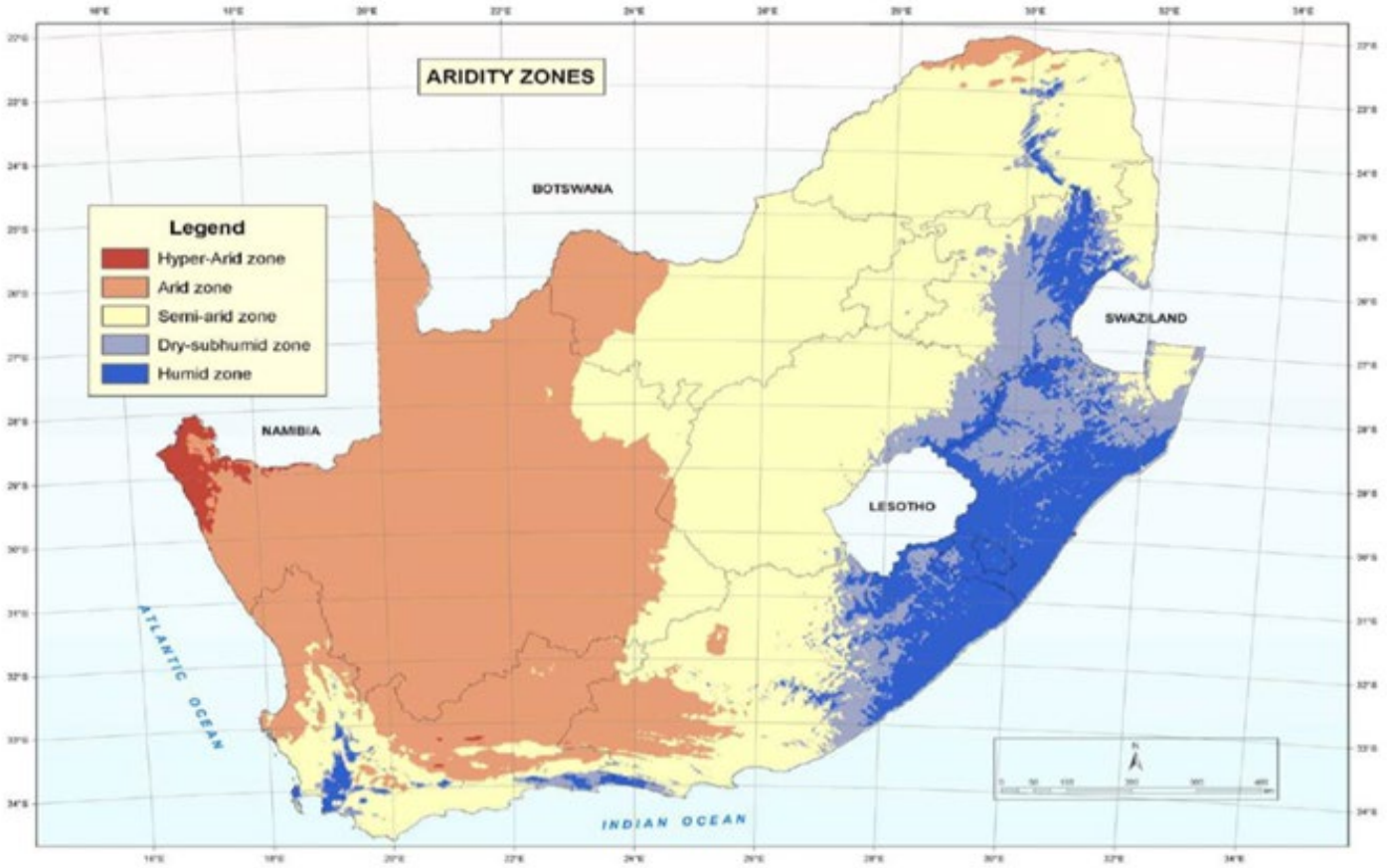
Schalk Cloete

18 July 2019

Outline

1. Introduction
2. Literature overview
    - Genetic diversity
    - Phenotypic characterisation
3. Create awareness
4. Primary approach
5. Limitations to address
6. Questions for discussion

Introduction



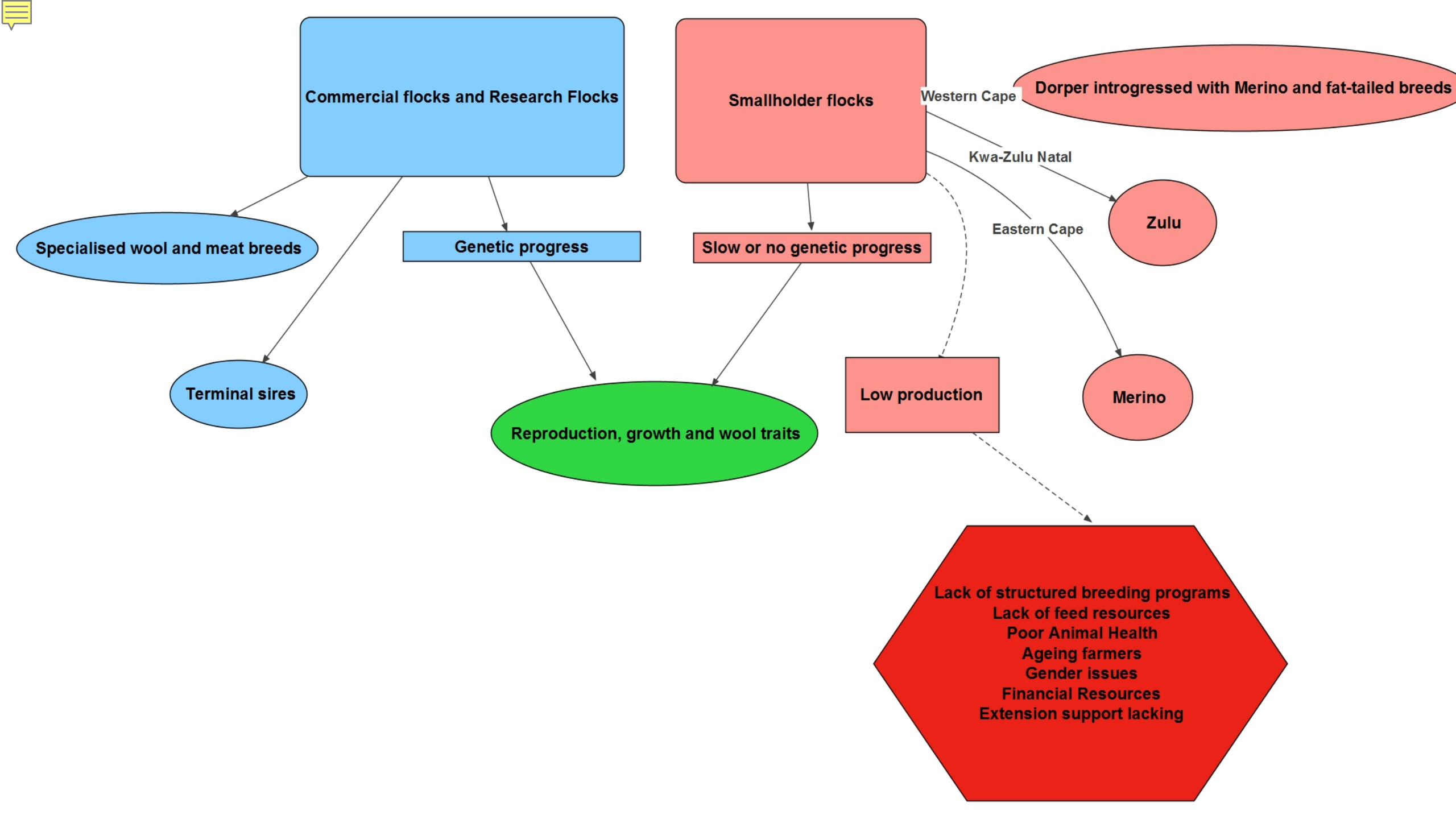
Introduction





Wool – R3,5 billion
Sheep and goat meat – R7,5 billion

cialist ool ds	Specialist meat breeds	Terminal sire breeds	Dual purpose breeds	Adapted indigenou s breeds


Commercial flocks and Research Flocks
Smallholder flocks
Western Cape
Dorper introgressed with Merino and fat-tailed breeds
Kwa-Zulu Natal
Zulu
Eastern Cape
Merino
Specialised wool and meat breeds
Genetic progress
Slow or no genetic progress
Terminal sires
Reproduction, growth and wool traits
Low production
Lack of structured breeding programs
Lack of feed resources
Poor Animal Health
Ageing farmers
Gender issues
Financial Resources
Extension support lacking

Literature Review –Genetic Diversity

Small Ruminant Research 103 (2012) 112–119

Contents lists available at SciVerse ScienceDirect

Small Ruminant Research

journal homepage: www.elsevier.com/locate/smallrumres

South African sheep breeds: Population genetic structure and conservation implications

P. Soma[a,*], A. Kotze[b,c], J.P. Grobler[b], J.B. van Wyk[d]

[a] Agricultural Research Council, P/Bag X2, Irene 0062, South Africa

Breed	Unbiased heterozygosity
Fat Rumped	0.401-0.520
Fat Tailed	0.480-0.637
Wool-types	0.527-0.711

Poster presentations

GENETIC DIVERSITY AND POPULATION STRUCTURE OF FOUR SOUTH AFRICAN SHEEP BREEDS

L. Sandenbergh[1,2], S.W.P. Cloete[1,3], R. Roodt-Wilding[2], M.A. Snyman[4], and A.E. Van der Merwe[2]

[1]Directorate Animal Sciences: Elsenburg, Private Bag X1, Elsenburg, 7607, South Africa
[2]Department of Genetics, Stellenbosch University, Private Bag X1, Matieland, 7602, South Africa
[3]Department of Animal Sciences, Stellenbosch University, Private Bag X1, Matieland, 7602, South Africa
[4]Grootfontein Agricultural Development Institute, Private Bag X 529, Middelburg EC 5900, South Africa

SUMMARY

Prior knowledge of the genetic diversity, extent of linkage disequilibrium (LD) and population structure is necessary to determine the sample size and number of SNPs necessary to ensure sufficient power of detection in genome-wide association studies (GWAS) and genomic

Breed	Heterozygosity
Dorper	0.34
Namaqua Afrikaner	0.28
Merino	0.35

Genetic Diversity

Small Ruminant Research 90 (2010) 101–108

Contents lists available at ScienceDirect

Small Ruminant Research

journal homepage: www.elsevier.com/locate/smallrumres

Genetic profile of the locally developed Meatmaster sheep breed in South Africa based on microsatellite analysis

F.W. Peters[a], A. Kotze[b,c], F.H. van der Bank[a], P. Soma[d], J.P. Grobler[b,*]

[a] Department of Zoology, University of Johannesburg, P/Bag 524, Auckland Park, 2006, South Africa
[b] Department of Genetics, University of the Free State, PO Box 339, Nelson Mandela Ave, Bloemfontein, 9300, Free State, South Africa
[c] National Zoological Gardens of South Africa, PO Box 754, Tshwane, 0001, South Africa
[d] Agricultural Research Council, P/Bag X2, Irene, 0062, South Africa

Trop Anim Health Prod
DOI 10.1007/s11250-017-1392-7

REGULAR ARTICLES

Genetic diversity and population structure of South African smallholder farmer sheep breeds determined using the OvineSNP50 beadchip

Annelin H. Molotsi[1] · Jeremy F. Taylor[2] · Schalk W.P. Cloete[1,3] · Farai Muchadeyi[4] · Jared E. Decker[2,5] · Lynsey K. Whitacre[2,5] · Lise Sandenbergh[3] · Kennedy Dzama[1]

Received: 9 March 2017 / Accepted: 4 September 2017

RESEARCH ARTICLE

Genetic structure of South African Nguni (Zulu) sheep populations reveals admixture with exotic breeds

Mokhethi Matthews Selepe[1☯], Simone Ceccobelli[2☯], Emiliano Lasagna[2]*, Nokuthula Winfred Kunene[1]

1 Department of Agriculture, University of Zululand, Kwadlangezwa, South Africa, **2** Department of Agricultural, Food and Environmental Sciences, University of Perugia, Perugia, Italy

☯ These authors contributed equally to this work.
* emiliano.lasagna@unipg.it

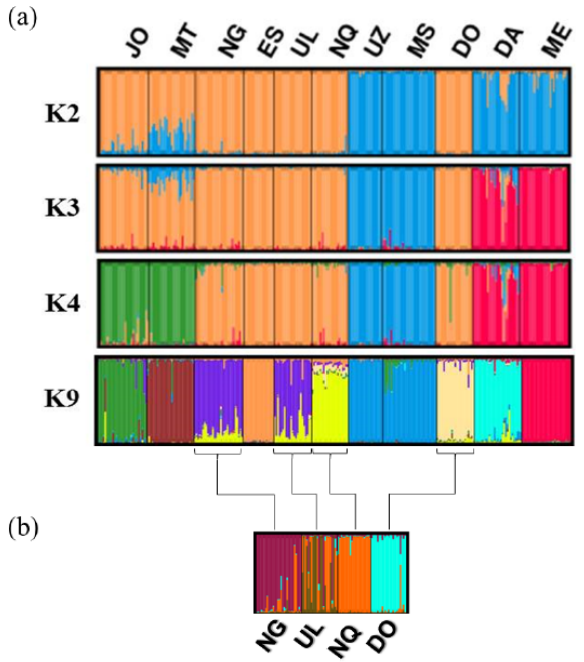
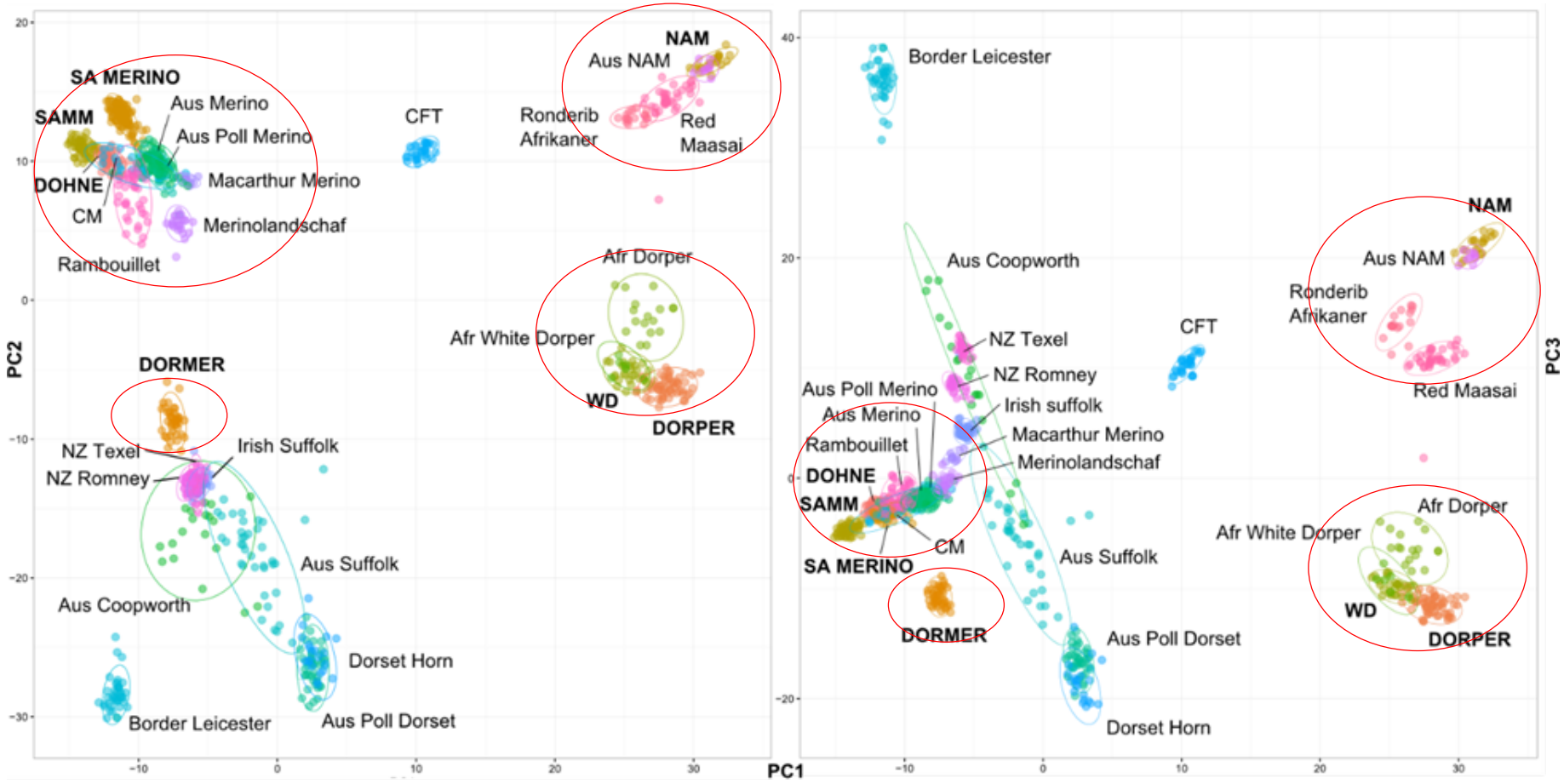


Fig 2. Genetic clustering of 11 sheep population with STRUCTURE. (a) Analysis of the entire data set obtained from 10 runs for each number of assumed populations (*K*) value ranging from 2 to 9; (b) further analysis obtained from four populations (NG, UL, NQ and DO). JO, Jozini; MT, Mtubatuba; NG, Nongoma; ES, Eshowe; UL, Ulundi; NQ, Nquthu; UZ, UNIZULU research station; MS, Makhathini research station; DO, Dorper; DA, Damara; ME, South African Merino.

https://doi.org/10.1371/journal.pone.0196276.g002

Relatedness to international resources

- Analysed with SNP data of the International sheep genomics consortium (Kijas et al., 2019; 2012)



Present genotyped population

Breed	Description	n
Damara	Indigenous	30
Dohne Merino	Locally developed, commercial	73
Dormer	Locally developed, commercial	40
Dorper	Indigenous influence, locally developed, commercial	79
Meatmaster	Indigenous influence, locally developed, commercial	38
Namaqua Afrikaner	Indigenous	94
Pedi	Indigenous	30
Merino	Locally developed, commercial	588
South African Mutton Merino	Locally developed, commercial	74
Persian	Early import, adapted fat-rump	30
White Dorper	Indigenous influence, locally developed, commercial	27
	Total	1055

Details of South African resource flocks/herds involved in research on selection and the comparison of breeds or lines.

Flock	Breed	Location (province)	Time span	Selection objectives	Selection lines/types	Key references
Klerefontein Merino flock	Merino	Carnarvon (Northern Cape)	1962–1983	Increasing fleece weight and improving conformation	1. Control line 2. Fleece weight line 3. Visual appraisal line	Erasmus et al. (1990) Snyman et al. (1996b) Snyman et al. (1998a)
Koopmansfontein flock	Dorper	Jan Kempdorp (Northern Cape)	1966–1982	Selection for growth under different scenarios	1. Weaning weight 2. Weaning weight in ewes, post-weaning feedlot gain in rams 3. Subjective selection	Neser et al. (1995)
Tygerhoek flock	Merino	Riviersonderend (Western Cape)	1969–present	Increasing fleece weight without changing fibre diameter	1. Control line 2. Clean fleece weight line 3. S/P Line	Heydenrych et al. (1984) Cloete et al. (1998a)
Upington flock	Karakul	Upington (Northern Cape)	1970–present	Improving pelt quality	1. Control line 2. Hair length line 3. Pattern line 4. Hair quality line 5. Curl development line	Greeff et al. (1993a,b,c)
Klerefontein Namaqua flock	Namaqua Afrikaner	Carnarvon (Northern Cape)	1982–present	Conservation of indigenous fat-tailed breed	Live weight and reproduction traits recorded	Snyman et al. (1993)
Elsenburg flock	Merino	Stellenbosch (Western Cape)	1986–present	Divergent selection for reproduction (number of lambs weaned)	1. H line (selected for) 2. L line (selected against)	Cloete et al. (2004b)
Jansenville fine-mohair herd	Angora	Jansenville (Eastern Cape)	1988–present	Selection for a reduced fibre diameter	1. Control line 2. Fine-mohair line	Snyman (2002)
Tygerhoek fine-wool flock	Merino	Riviersonderend (Western Cape)	1998–present	A reduced fibre diameter	3. Control line 4. Fine-wool line	Cloete et al. (2001a)
Klerefontein Dorper flock	Dorper	Carnarvon (Northern Cape)	1993–2000	Comparison of lines within the Dorper breed	1. Hairy type 2. Woolly type	Snyman and Olivier (2002b)

Phenotypic characterisation

SA Indigenous flocks

South African Journal of Animal Science 2007, 37 (1) 11
© South African Society for Animal Science

Characterisation of Zulu (Nguni) sheep using linear body measurements and some environmental factors affecting these measurements

N. Kunene[1#], E.A. Nesamvuni[1] and A. Fossey[2]
[1] Department of Agriculture, University of Zululand, Private bag X1001, Kwadlangezwa 3886, South Africa
[2] Limpopo Department of Agriculture, Research & Training Services Branch, Private Bag X 9487, Polokwane 0700, South Africa
[3] Forestry, Natural Resources and the Environment, CSIR, P.O. Box 17001, Congella, Durban 4013, South Africa

- Mature live weight for Zulu ewes (32 kg) and rams (38 kg
- Contended that Zulu breed is adapted to hot and humid climates, good disease resistance
- No information regarding reproductive ability of Zulu breed

- Namaqua Afrikaner high survival from birth to weaning (91%) vs Dorper (88%) (Snyman et al., 2005)
- NA outperformed Dorpers and SAMM for number of lambs weaned per ewe lambed (Cloete et al., 2016)
- Commercial breeds outperformed indigenous breeds for carcass yield and composition (Burger et al., 2013)

Create awareness

Value of indigenous breeds in adaptability and robustness

Identify relevant stakeholders

Campaigns to promote indigenous breeds

Young men and women

THE CONVERSATION

Academic rigour, journalistic flair

Arts + Culture | Business + Economy | Education | Environment + Energy | Health + Medicine | Politics + Society | Scier

Young South Africans want to farm. But the system isn't ready for them

July 15, 2019 10.47am SAST

Possible platforms to create awareness

- Stakeholder meetings and workshops
- Use of the media – print, radio, TV
- Social media platforms
- Inclusion in university curriculum

Primary approach

- Formation of farmer cooperatives
- Efficient utilization of resources
- Sharing of knowledge, ideas genetic material
- Ease of provision of services
- Ease of market access

Limitations that should be addressed

Implementation of structured breeding programs	• Recording phenotypic information • Community-based breeding programs • Field agents to assist farmers design tailored breeding programs • Develop recordkeeping application • Workshops and trainings
Conservation of genetic resources	• Identify flocks that contribute to genetic diversity • Genetic material from research flocks should flow to smallholder farmers • Use indigenous rams instead of exotic breeds
Marketing	• Low-input farming systems – market products as free range or organic • Fetch a higher price for their product and supply to niche markets • Pool stocks and guarantee long-term supply • Selling of semen

Limitations that should be addressed

Feed resources	• Indigenous breeds, small-framed- low maintenance requirements • Fattening programmes using locally available feedstuffs
Health and diseases	• Result in loss in body weight, reduced milk production and quality product • Cooperatives - access to veterinary services; hence reduce costs • Training on different diseases
Gender and age issues	• Most smallholder farmers are old males • Females and youth not actively involved • Farming is thought of to be for the poor and elderly • Raising of young entrepreneurs in agribusiness as leaders

Questions for discussion

- Is adaptability a good or the only motivation for promoting use of indigenous genetic resources? How do we sell it?
- What are we prepared to forego if we advocate for the use of indigenous breeds in Southern Africa?
- What is the best starting point when developing such a campaign?
- What exactly is the target outcome, which we will be content with if we achieve?
- What are the possible stumbling blocks and how can we overcome them?


THANK YOU