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How does ewe age affect reproductive performance relative to rainfall conditions?

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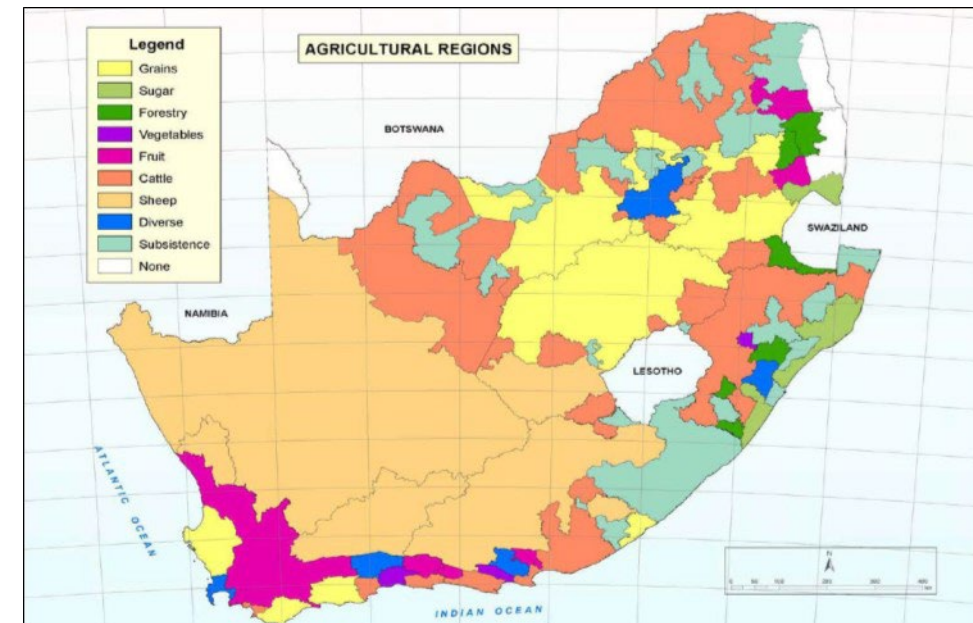
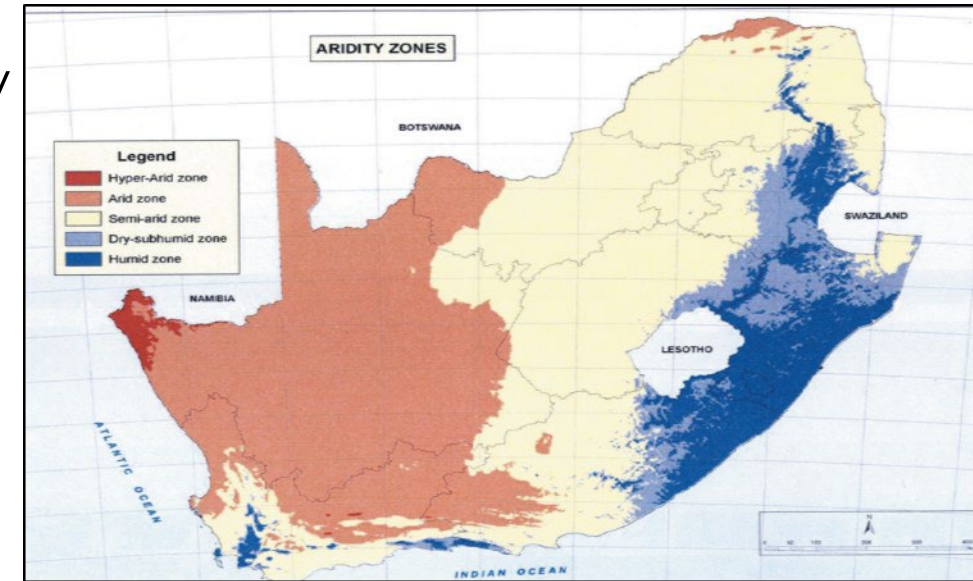
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Introduction

Introduction

- Climate change impacts projected to increase globally
- Increased aridity and droughts
- Extensive livestock production only viable form of agriculture in most arid regions
 - Majority of sheep in South Africa kept in arid regions
- Producers will have to explore management strategies to mitigate climate impacts
- Ewe age effects are well-documented
 - Significant effect on production
 - Potential interaction with environmental conditions?



AIM

Determine whether the effect of dam age on reproductive performance varied depending on the environmental conditions the flock was exposed to prior to mating

Methodology

Methodology

Location and environment

- Tygerhoek Research Farm, Western Cape, South Africa (34° 10' S 19° 54' E)
- Mediterranean climate
 - 480 mm winter rainfall annually
 - Mean maximum temperature of 23,6 °C
- Dryland pastures for grazing
 - Lucerne
 - Medics
 - Wheat stubble (summer)
 - Oat fodder (winter)
- Oat grains available as supplementation during summer



Methodology

Animals

- Tygerhoek Merino flock
- Hand-mating between October and December annually
 - Multiple mating opportunities
- Individual production records between 1976 and 2018
 - Conception (CON)
 - Number of lambs born (NLB)
 - Number of lambs weaned (NLW)
 - Average birthweight (ABW)
 - Average weaning weight (AWW)



Methodology

Weather data

- Weather station kept on farm by ARC
- Daily rainfall records
- Cumulative rainfall in 12 months prior to mating calculated
 - Two seasons discarded due to missing observations
- Seasons divided into 5 groups based on rainfall
 - Dry (<70% of mean rainfall)
 - Below average (70-90% of mean rainfall)
 - Average (90-110% of mean rainfall)
 - Above average (110-130% of mean rainfall)
 - Wet (>130% of mean rainfall)



Methodology

Data analysis

- Statistica 14
- Welch ANOVA performed
 - Effect of age on performance across all rainfall groups
 - Effect of age on performance within each rainfall group
- Games-Howell multiple comparisons at $P \leq 0,05$

Results and discussion

Results and discussion

Table 1 The effect of age on reproductive performance (means $\pm$ S.E.) in the Tygerhoek Merino flock

Age	n	CON	NLB	NLW	ABW (kg)	AWW (kg)
2	3596	0.68 $\pm$ 0.01 ^c	0.86 $\pm$ 0.01 ^c	0.60 $\pm$ 0.01 ^c	3.62 $\pm$ 0.02 ^c	25.37 $\pm$ 0.18 ^b
3	3388	0.75 $\pm$ 0.01 ^a	1.03 $\pm$ 0.01 ^a	0.75 $\pm$ 0.01 ^a	3.76 $\pm$ 0.02 ^b	26.73 $\pm$ 0.17 ^a
4	3292	0.72 $\pm$ 0.01 ^b	1.04 $\pm$ 0.01 ^a	0.77 $\pm$ 0.01 ^a	3.83 $\pm$ 0.02 ^a	26.37 $\pm$ 0.17 ^a
5	3062	0.66 $\pm$ 0.01 ^c	0.96 $\pm$ 0.01 ^b	0.69 $\pm$ 0.01 ^b	3.85 $\pm$ 0.02 ^a	26.40 $\pm$ 0.19 ^a
6	3044	0.65 $\pm$ 0.01 ^c	0.97 $\pm$ 0.02 ^b	0.68 $\pm$ 0.01 ^b	3.84 $\pm$ 0.02 ^a	25.48 $\pm$ 0.20 ^b
P-value		<0.001	<0.001	<0.001	<0.001	<0.001

- All traits affected by age
- Primiparous ewes displayed lowest performance levels in all traits
- Three- and four-year-old ewes had highest levels of reproductive performance

Results and discussion

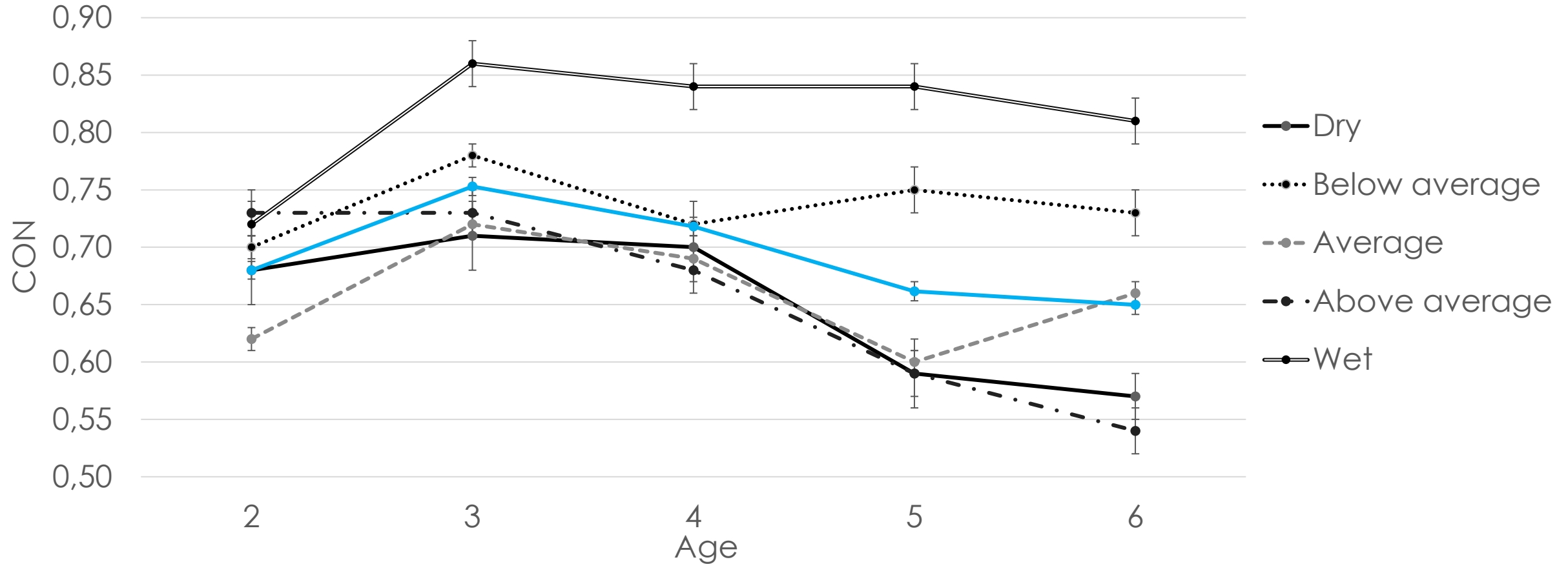


Figure 1 Graphical representation of the effect of ewe age on conception (CON $\pm$ S.E.) across different rainfall classes in the Tygerhoek Merino flock

Results and discussion

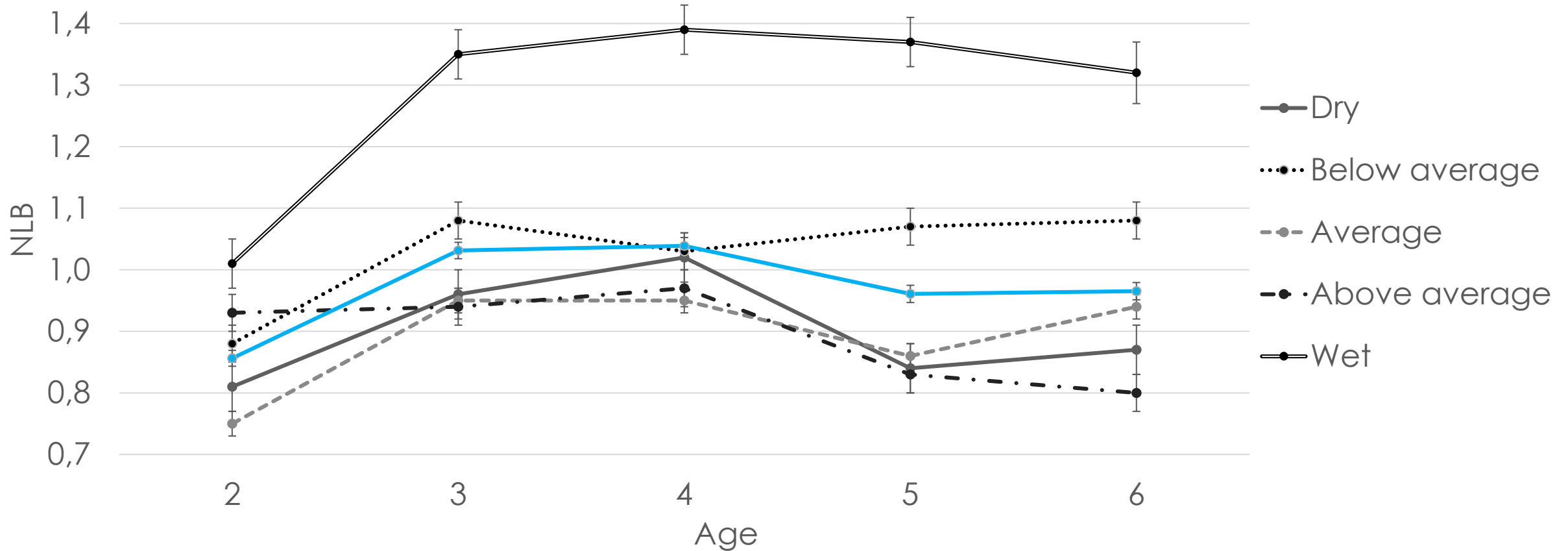


Figure 2 Graphical representation of the effect of ewe age on number of lambs born (NLB $\pm$ S.E.) across different rainfall classes in the Tygerhoek Merino flock

Results and discussion

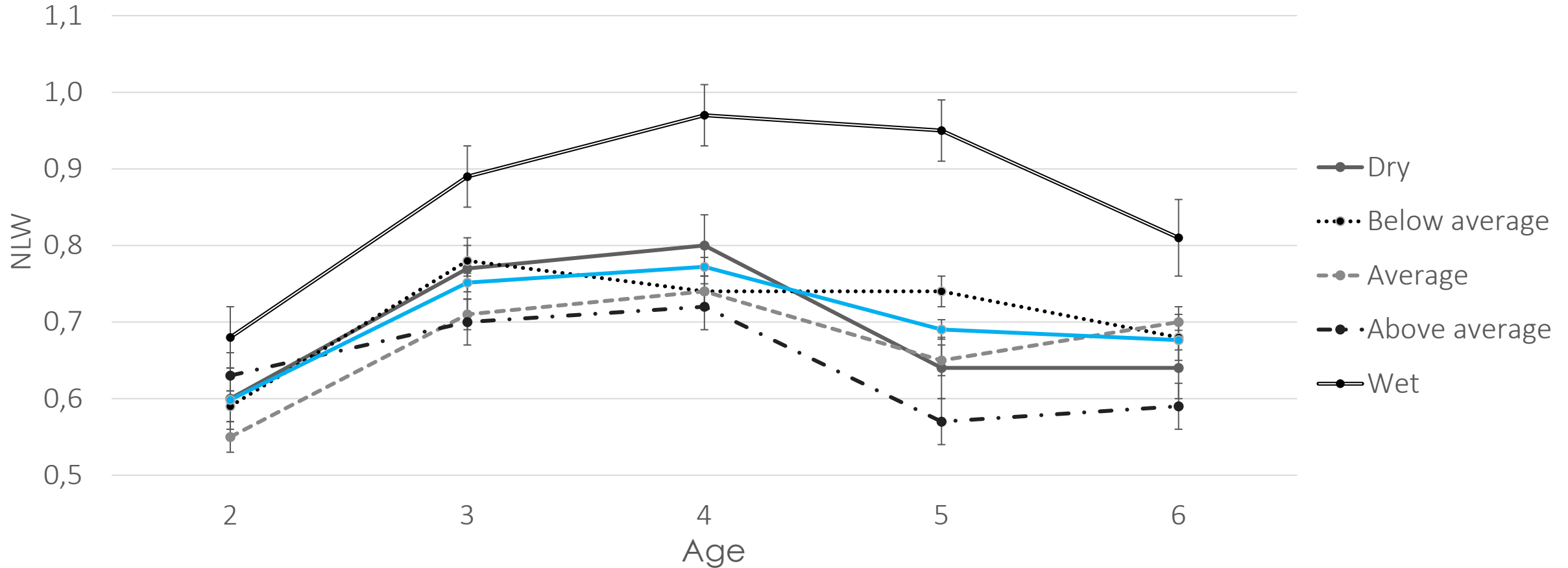


Figure 3 Graphical representation of the effect of ewe age on number of lambs weaned (NLW $\pm$ S.E.) across different rainfall classes in the Tygerhoek Merino flock

Results and discussion

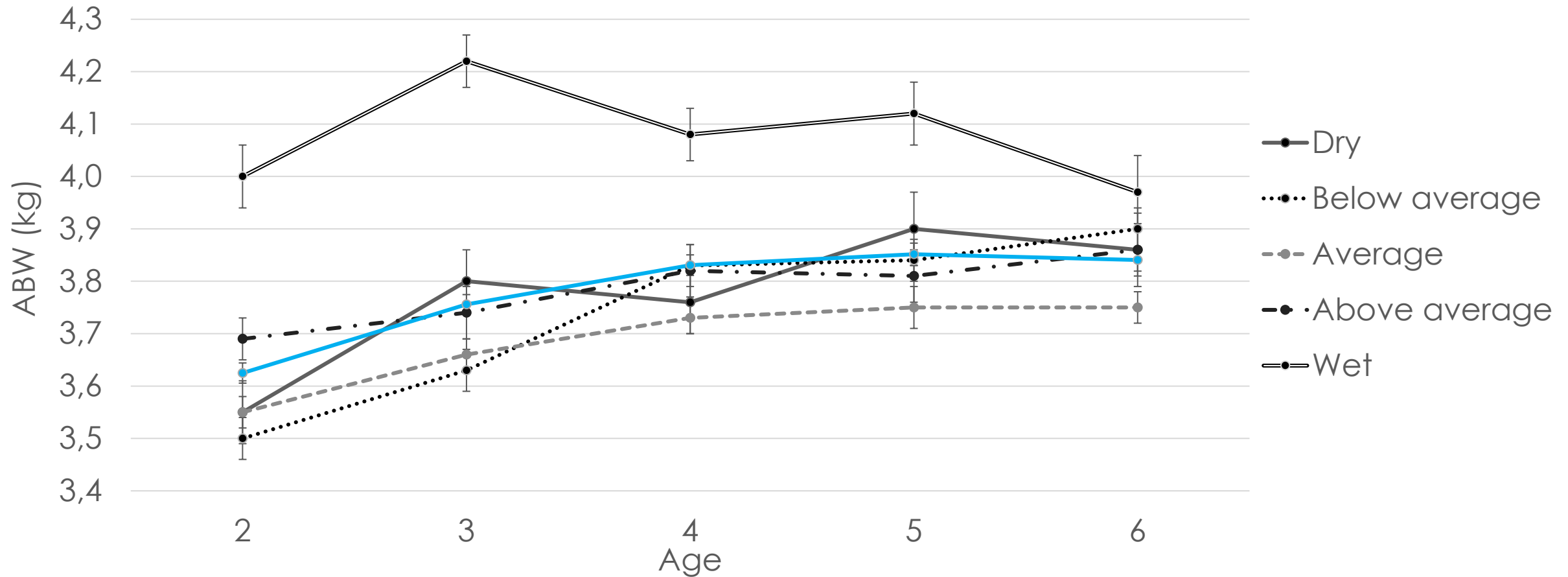


Figure 4 Graphical representation of the effect of ewe age on average birthweight (ABW $\pm$ S.E.) across different rainfall classes in the Tygerhoek Merino flock

Results and discussion

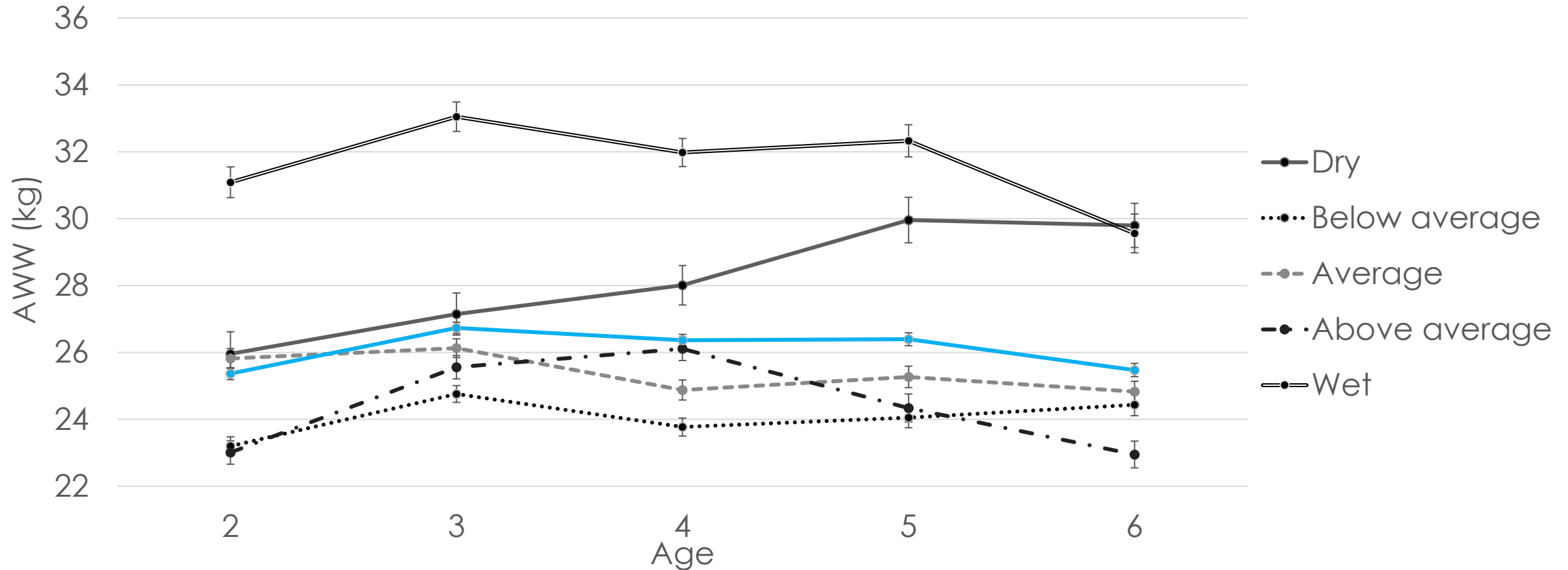


Figure 5 Graphical representation of the effect of ewe age on average weaning weight (AWW $\pm$ S.E.) across different rainfall classes in the Tygerhoek Merino flock

Results and discussion

- Overall wet years resulted in the best performance
 - Improved fodder availability
 - Higher nutritional plane
- Supplementation in drier years ameliorated impact of lower rainfall
- Age effects largely remained constant across all rainfall groups
 - Weaning weight increased with age in dry years
 - Potentially better fodder selection or more dominant feeders

Conclusions

Conclusions

- Optimal age for reproduction is 3-4 years when all traits are considered together
- Age profile for optimal reproduction remains constant regardless of rainfall
 - Improvement in weaning weight cannot be utilised by producers
- Manipulation of flock age structure offers no potential as drought mitigation strategy



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