



PROMOTING EVIDENCE-BASED RESEARCH AND PUBLIC POLICY

# Drought and drought adaptations in the Karoo, 2012-2019

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Gqeberha

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# Funding: Karoo Management Panel

R144,252



R260,404



Progress 2012 –

- 112 farms
- Unbalanced panel of 428 observations
- 11 journal articles
- 12 reports in popular press
- **24** talks to industry stakeholders and farmers

# Expectations and Recommendations



Food and Agriculture Organization  
of the United Nations

# FAO's expectations

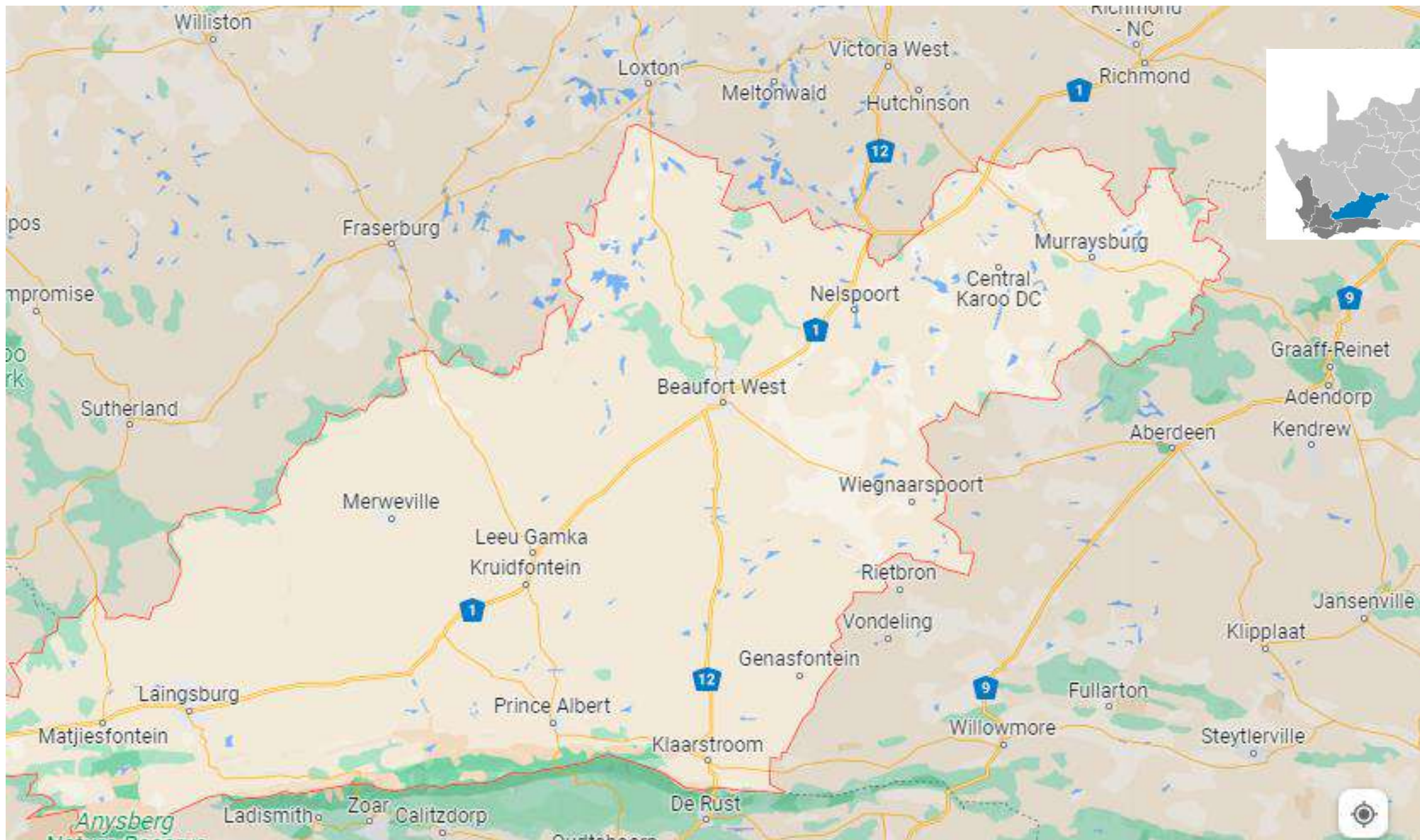
Agricultural system	Location	Climate change type	Sensitivity	Adaptive capacity	Options
<b>Highlands</b>	Himalayas, Central America, Rift Valley, Ethiopian plateau, <b>Southern Africa</b>	<u>Rainfall variability</u> , <u>droughts</u> , floods	<b>High</b> : mostly rainfed agriculture, poor soil moisture capacity	<b>Low</b> : limited options, knowledge and resources	Watershed management and on-farm water storage
<b>Semi-arid tropics</b>	Smallholder farming in West, East and <b>Southern Africa</b> , Sahal, Horn of Africa	High temperatures, variable rainfall, droughts	<b>High</b> : crop and animals at risk of high temperature and droughts	<b>Low</b> : limited options, knowledge	On-farm water storage, increased productivity
<b>Rangelands</b>	Pastoral and grazing lands on fragile soils, Eastern and <b>Southern Africa</b>	<u>High temperatures</u> , <u>variable rainfall</u> , <u>droughts</u>	<b>High</b> sensitivity due to reliance on <u>biomass</u> and water for livestock	<b>Low</b> : limited options, knowledge	Better integration of water supply and grazing <u>land management</u> , <u>reduction</u> of livestock density

# Specific recommendations

	Specific aspects	Data in Karoo Management Panel
<b>Diversify livelihoods</b>	Off-farm	Household income from off-farm jobs
	On-farm	Farm income from non-livestock enterprises
<b>Make up for failing biomass</b>	Raise feed cost	Feed cost in Rand / stock sheep
	Lower stocking rate	Stocking rate compared to norm of 36 ha/LSU
	Transhumance	Multiple non-adjacent cadastres
<b>Protect animal welfare</b>	Rotational grazing	
	Shade & cooling	
	Drinking water	
	Hardier flocks	% boer goats, Meat masters, Damaras in flock

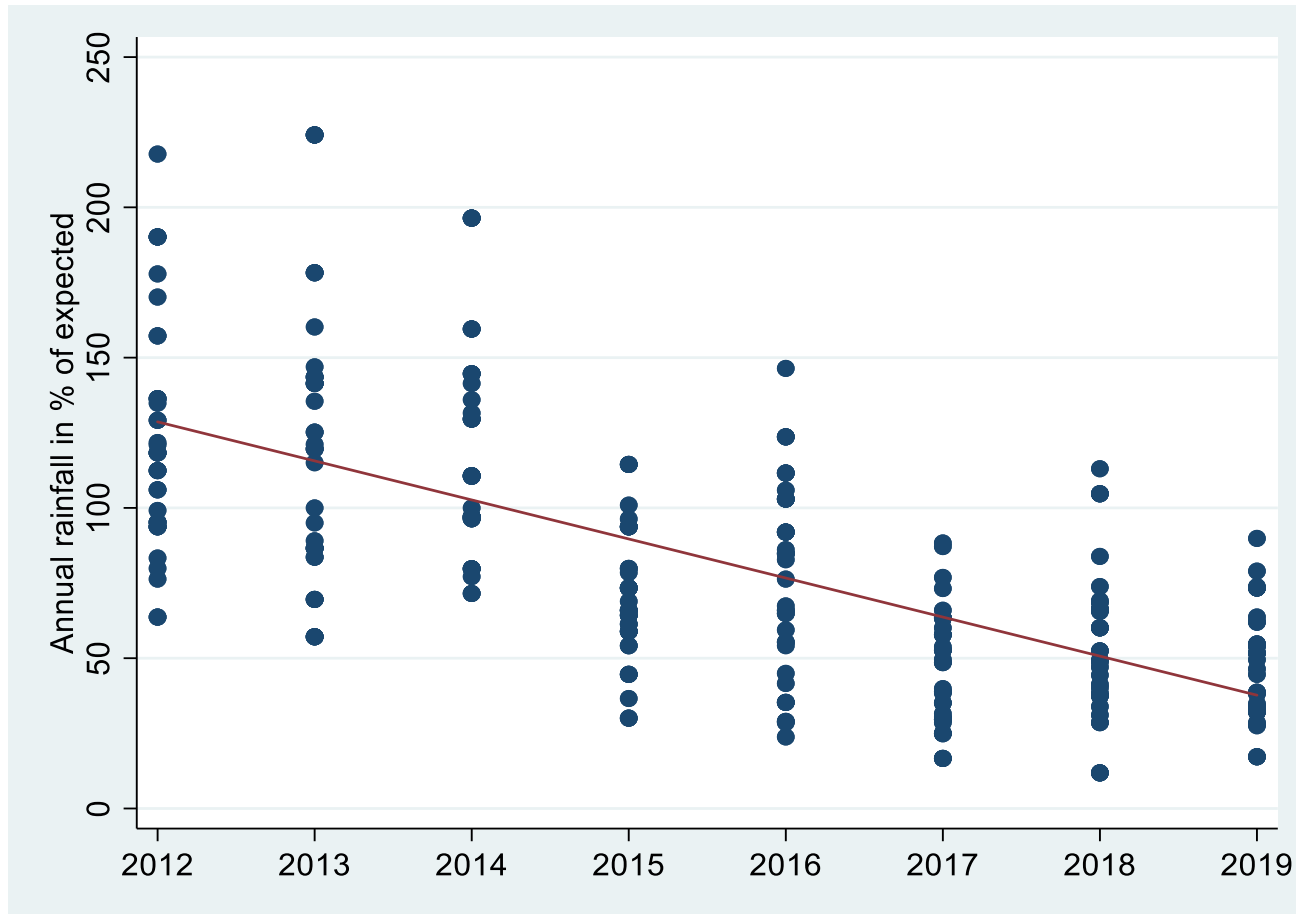
# Drought in the Central Karoo



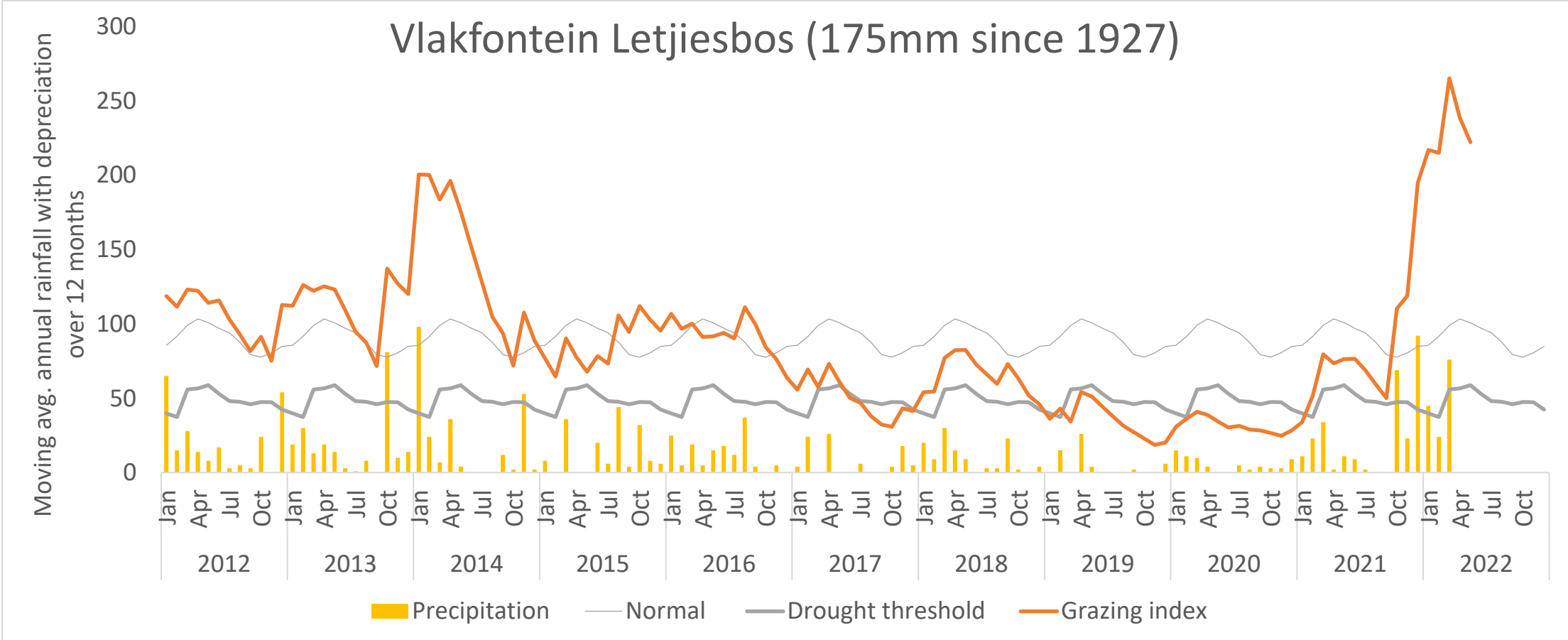


# Farm-level rainfall as % of expected

Laingsburg 112 mm  
Beaufort West 238 mm



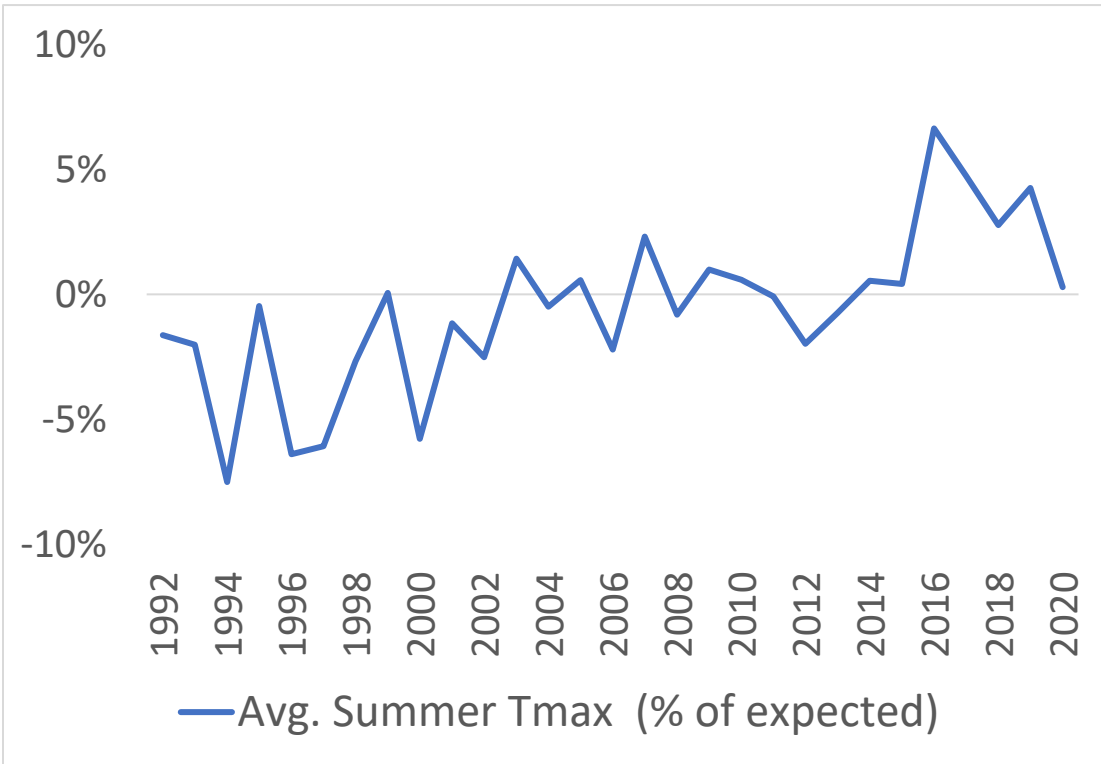
# Typical grazing conditions



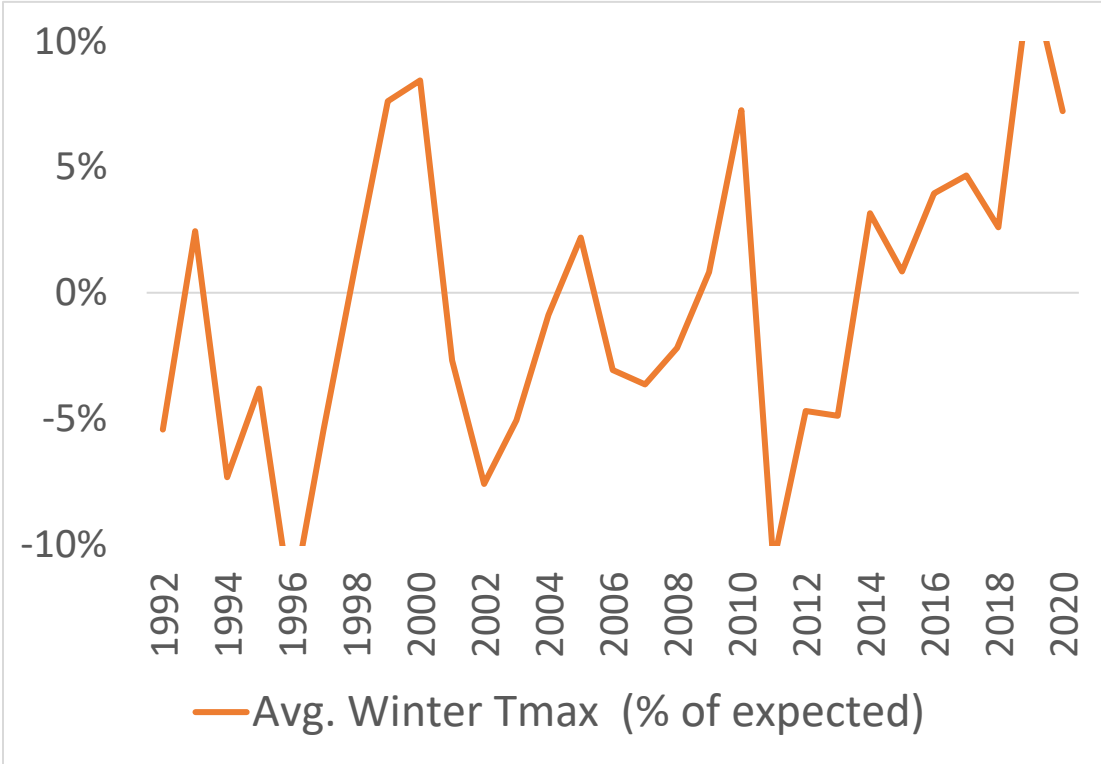
# Avg. daily Tmax



## Summer



## Winter





# Adapting to the Drought

40 farms x eight years

# Adapting at the extensive margin

Recommendation	Farms adapting (%)	
	2012 – 2015	2016 – 2020
Diversify into off-farm employment	35	32
Diversify on-farm income	<b>12</b>	<b>25</b>
Introduce hardiness	21	26
Transhumance is possible ( <i>trekboerdery</i> )	57	48
Buy feed	87	93
Stock below recommended rate	<b>86</b>	<b>93</b>

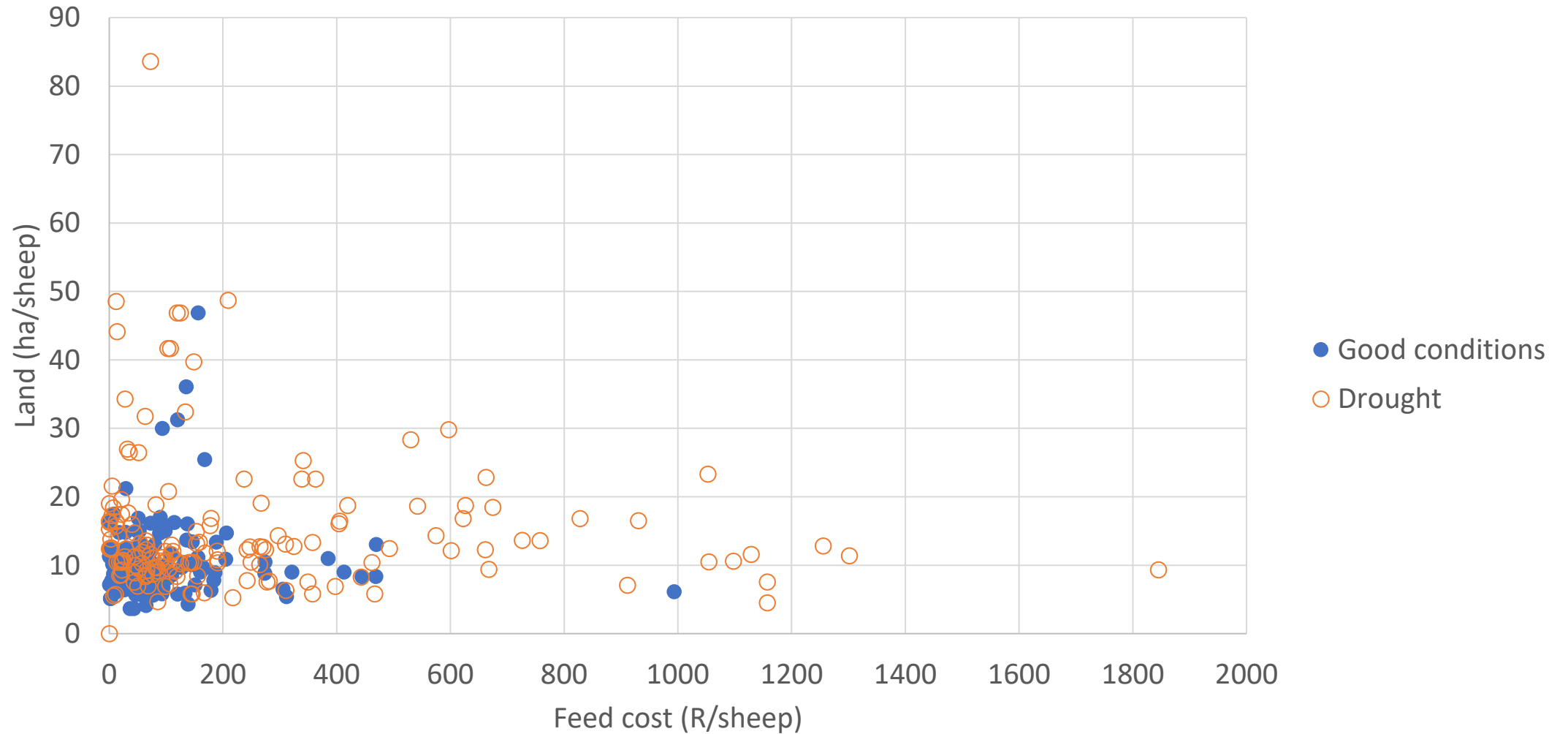
Statistically significant differences in red

# Degree of adoption amongst adopters

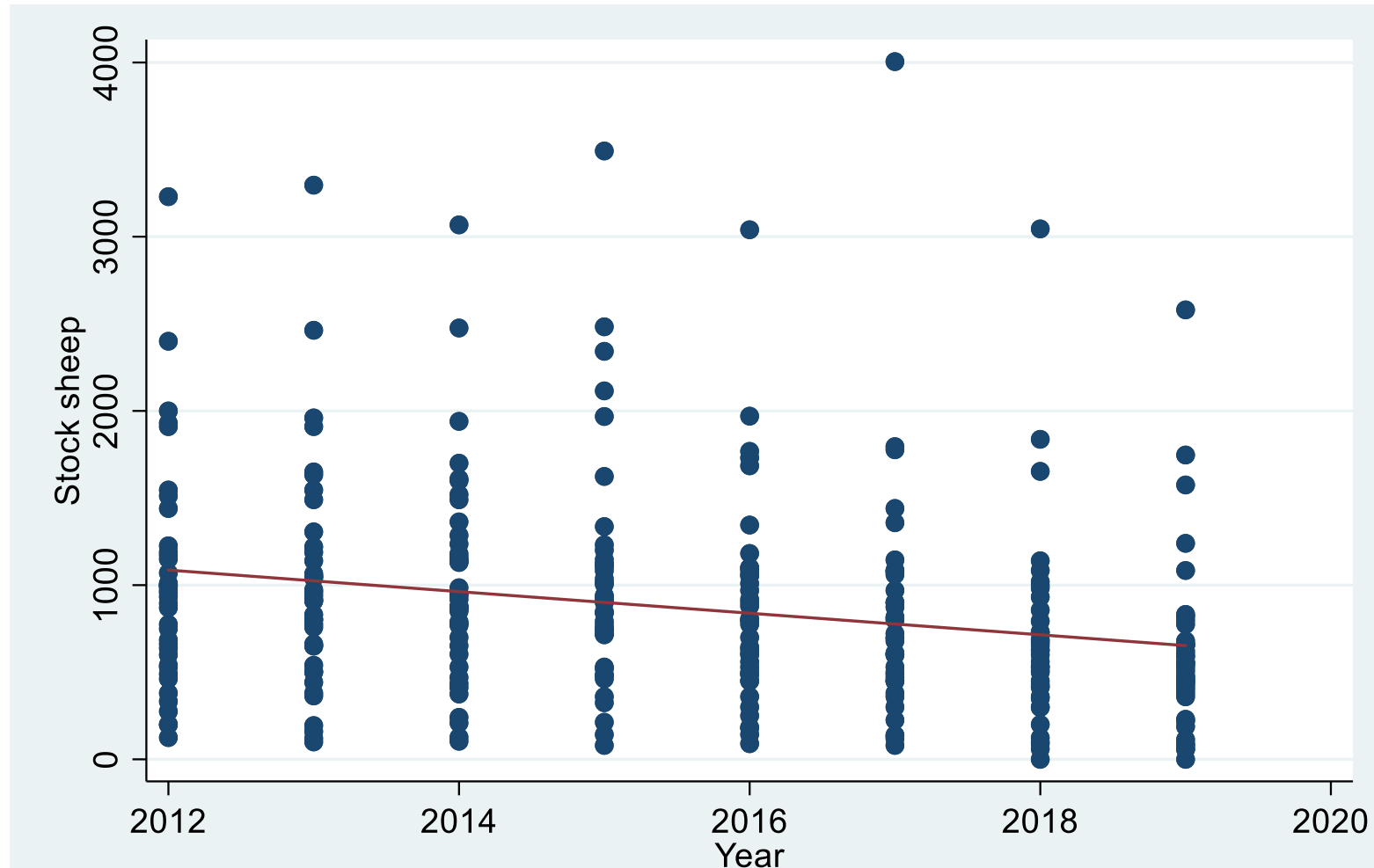
	Adopters only	
Measure of adoption	2012 – 2015	2016 – 2020
% household income from off-farm wages	<b>49</b>	<b>68</b>
% farm income from seed, hunting, wind energy	18	18
% hardy breeds in flock	<b>23</b>	<b>38</b>
Feed cost R/stock sheep	<b>122</b>	<b>310</b>
Stocking rate - % below official norm	<b>37</b>	<b>52</b>

Statistically significant differences in red

# Trade-offs along veld-feed axis



# Stock sheep



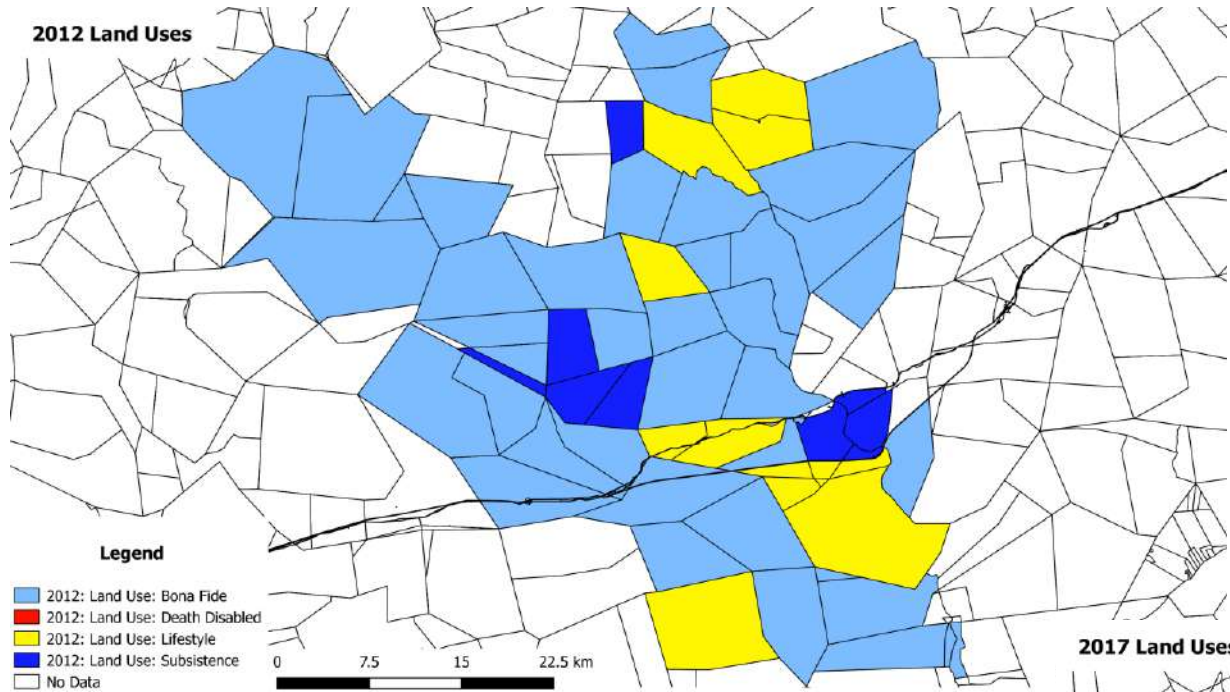
# Evolving feed strategies of the big spenders

	12	13	14	21	27	32	47	48	56	69	86
2012											
2013		F		F							
2014		F									
2015		F		F		F					
2016		F		F		F		F			
2017		F	F	F			F	F	F	F	
2018	F	F	F	F	F	F				F	
2019	F	F	F	F	F	F	F	F		F	F

- R450 – R2000 per stock sheep per year  
(avg. value = R782; median value = R618 per sheep / year)
- In Williston feeders produce and raise slaughter lambs R755 per stock sheep per year



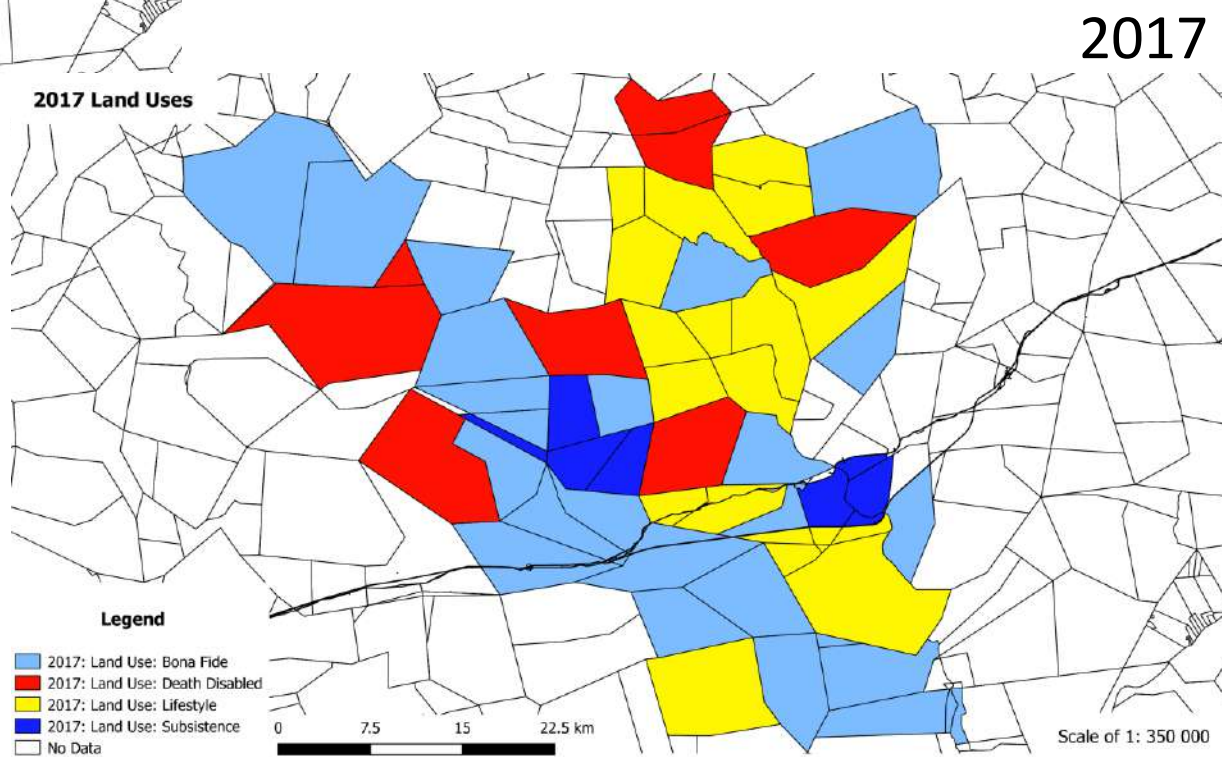
# To survive is to feed



2012

Legend

- 2017: Land Use: Bona Fide
- 2017: Land Use: Death Disabled
- 2017: Land Use: Lifestyle
- 2017: Land Use: Subsistence
- No Data



# Financial implications of feeding

R/stock sheep	Drought		Normal conditions	
	Control	Feeders	Control	Feeders
Gross revenue	719	1147	693	818
Feed	116	608	<b>73</b>	<b>194</b>
Other direct cost	297	568	<b>309</b>	<b>444</b>
Foreign factor cost (interest)	52	124	50	52
Total unit cost	465	1316	<b>432</b>	<b>690</b>
Net farm income	254	-142	261	128

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Net farm income	<b>254</b>	<b>-142</b>	261	128
Stocking rate (ha/sheep)	15.7	13.3	10.6	9.2
NFI /ha	<b>16.12</b>	<b>-10.30</b>	27.70	18.88
% profitable firms	75%	45%	75%	75%

Statistically significant differences in red

# Arguments in favour of feeding

- Larger flocks recover more easily
- Good nutrition for young ewes ensures better lifetime performance
- Feeding limits time to market
- Larger flocks and shorter period to market maintain cashflow, which keeps the banker happy

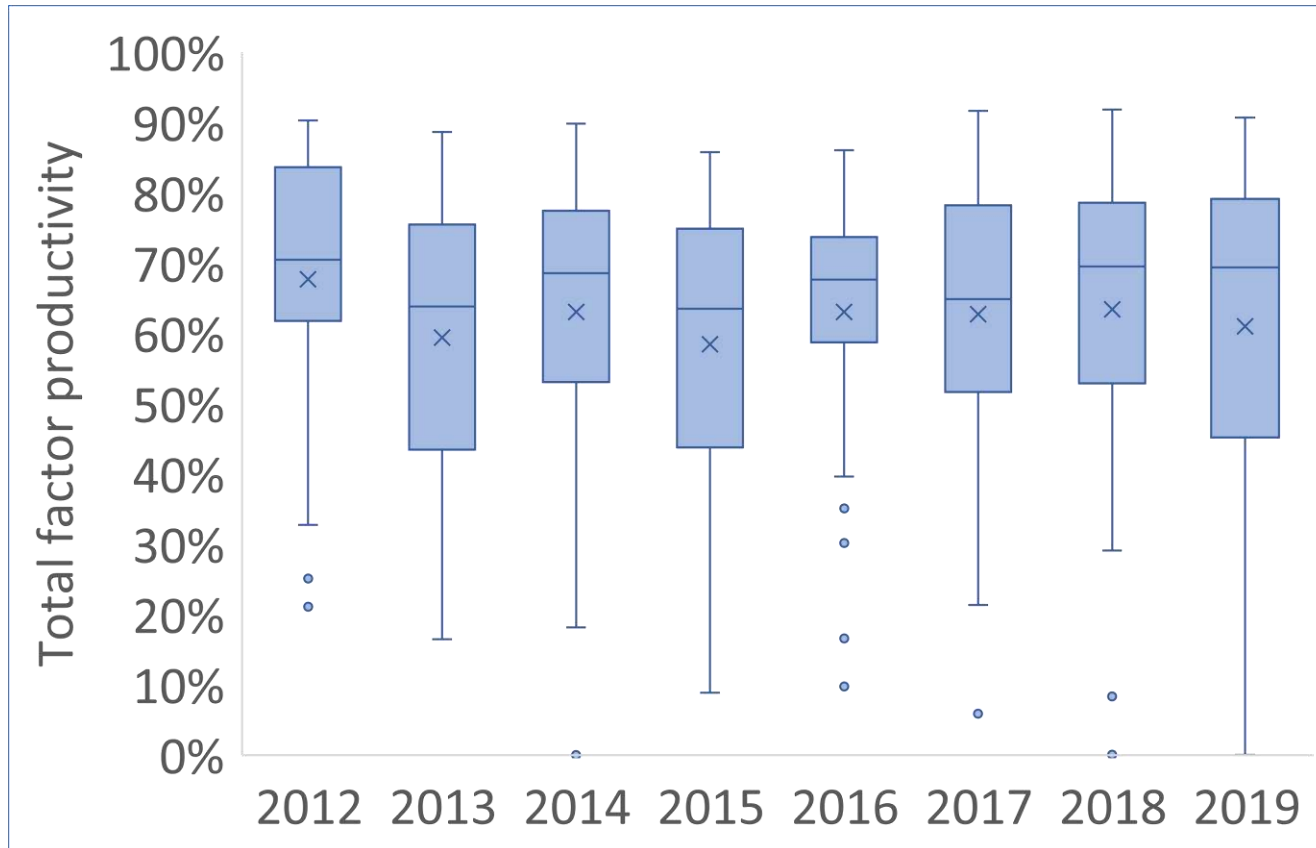




# Total factor productivity

Efficiency with which inputs are converted into outputs

# Adaptations on productivity



	Average %	CV
2012	68	0.28
2013	59	0.34
2014	63	0.31
2015	58	0.37
2016	63	0.28
2017	63	0.30
2018	63	0.35
2019	61	0.42

Summary and conclusion

# Conclusions

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- Just a first cut into adaptation
  - Pay more attention to **temperature**, primary and secondary effects
  - Need field experiments to work out how & when to feed
  - Close partnerships with rangeland scientists on recovery & carrying capacity
- 
- Are you still feeding passengers?
  - Is your local cooperative prepared for logistics & procurement?
  - Is your road network adequate?
  - Does your value chain justify the extra investment?
  - Are you ready for the next drought?