

Effective use of Fertilizer in Rain Fed Maize Production: Case studies



FERTASA

Discussion

Hendrik J C Smith

Soil Scientist (Pr.Sci.Nat.)

22 August 2018

hendriksmith@faktor2.co.za

[www//faktor2.co.za](http://www/faktor2.co.za)

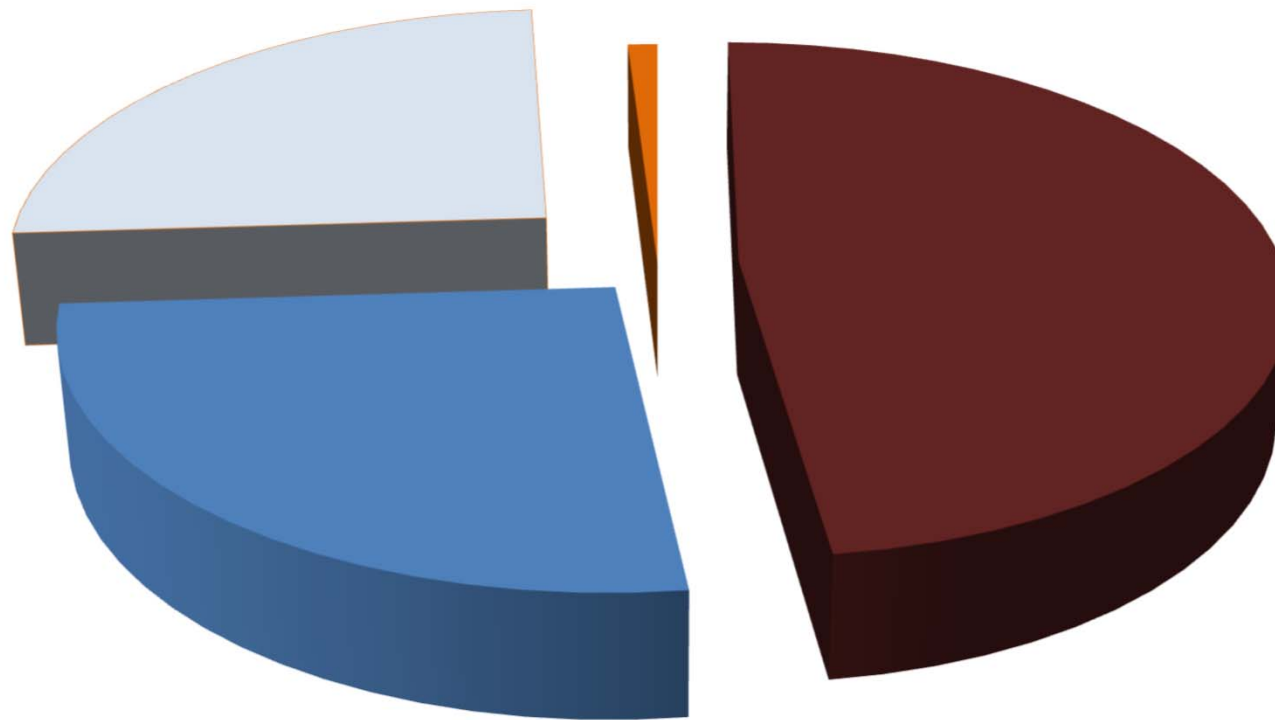
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Soil: Three phase system



■ Minerale deeltjes

■ Water

■ Lug

■ Organiese materiaal

Soil variation

$$S = f(\text{cl, o, r, p, t}) \text{ (Jenny)}$$

Where: S = a soil property

cl = climate

o = organisms

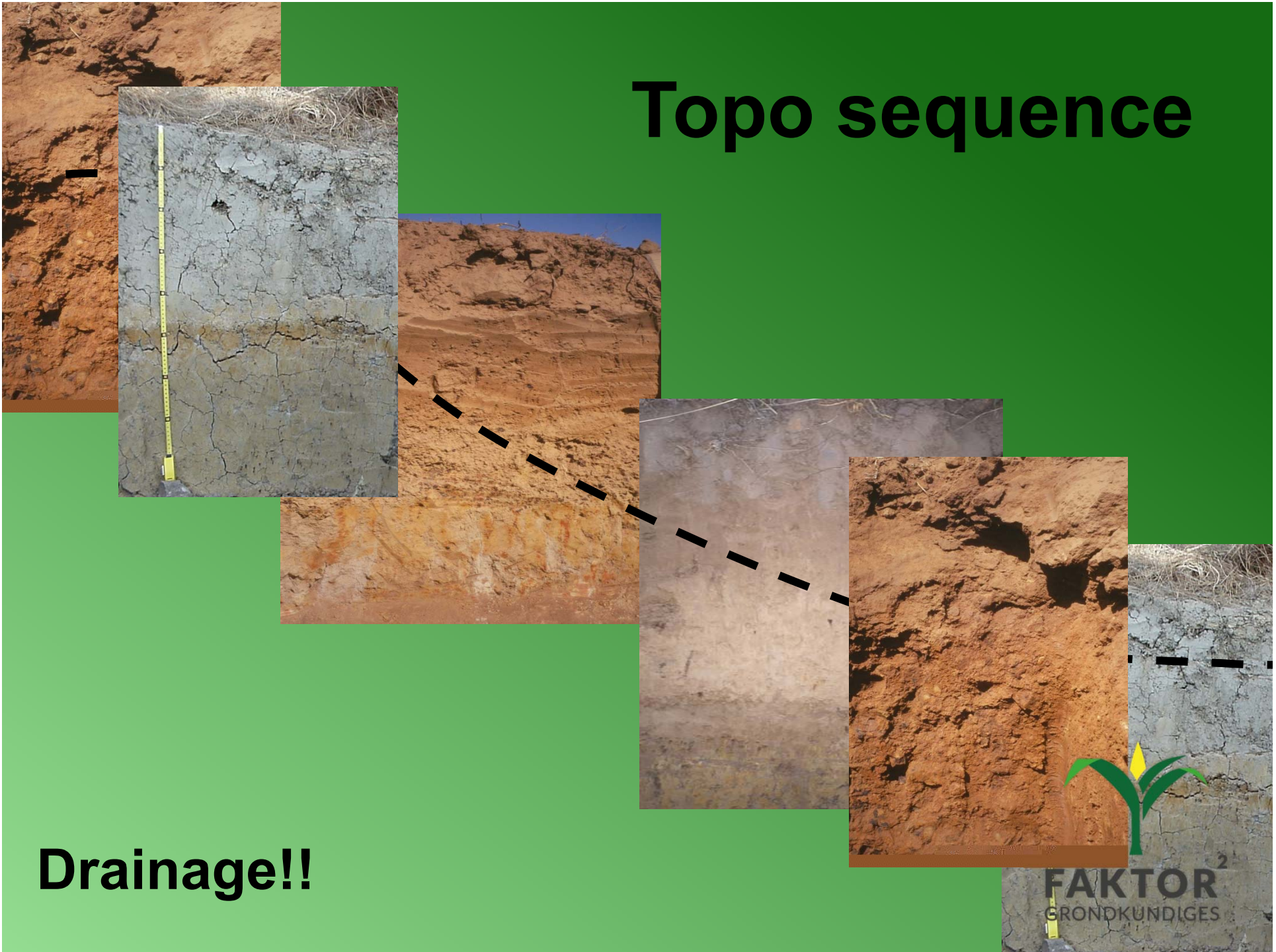
r = topography

p = parent material (geology)

t = time



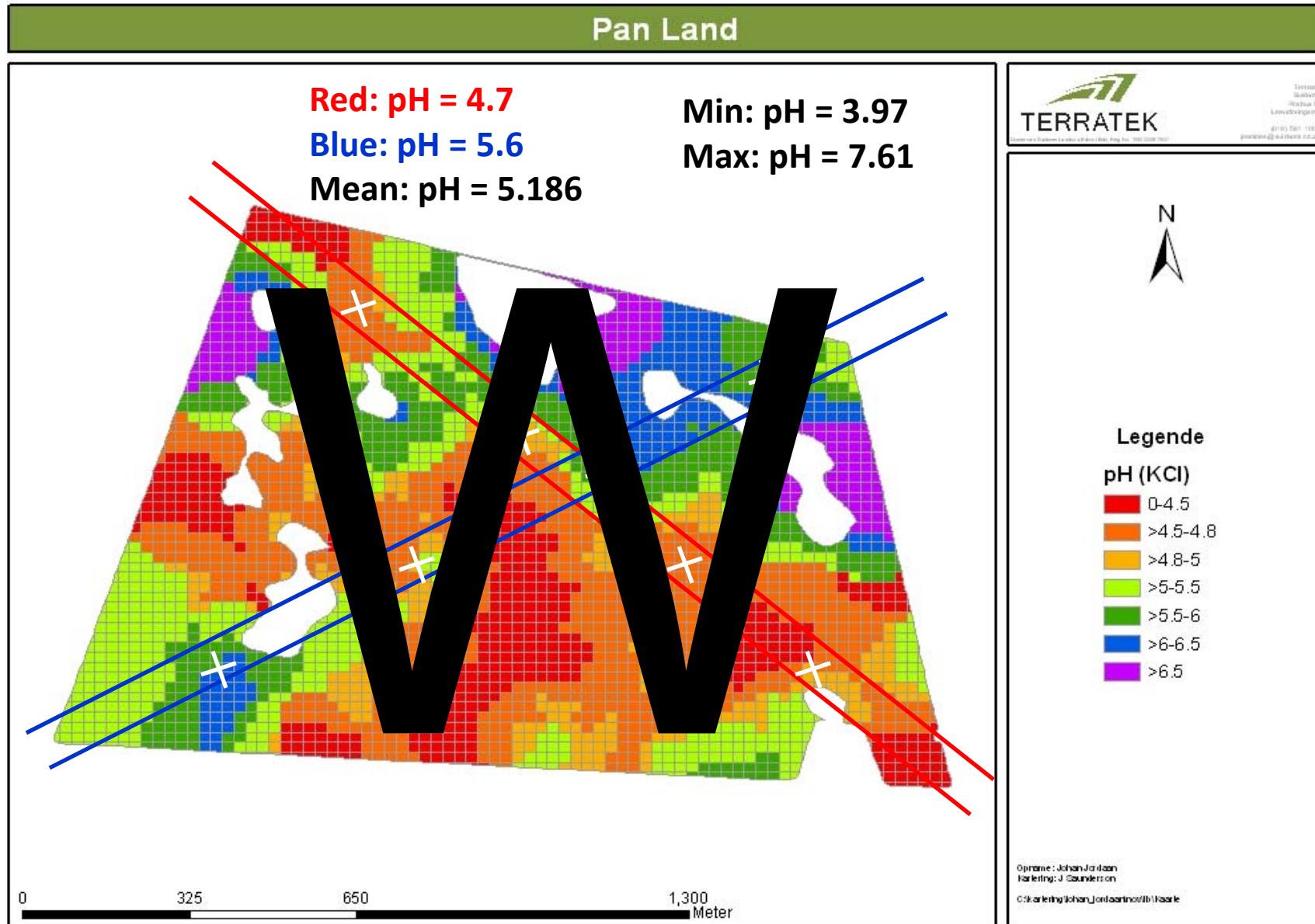
Topo sequence



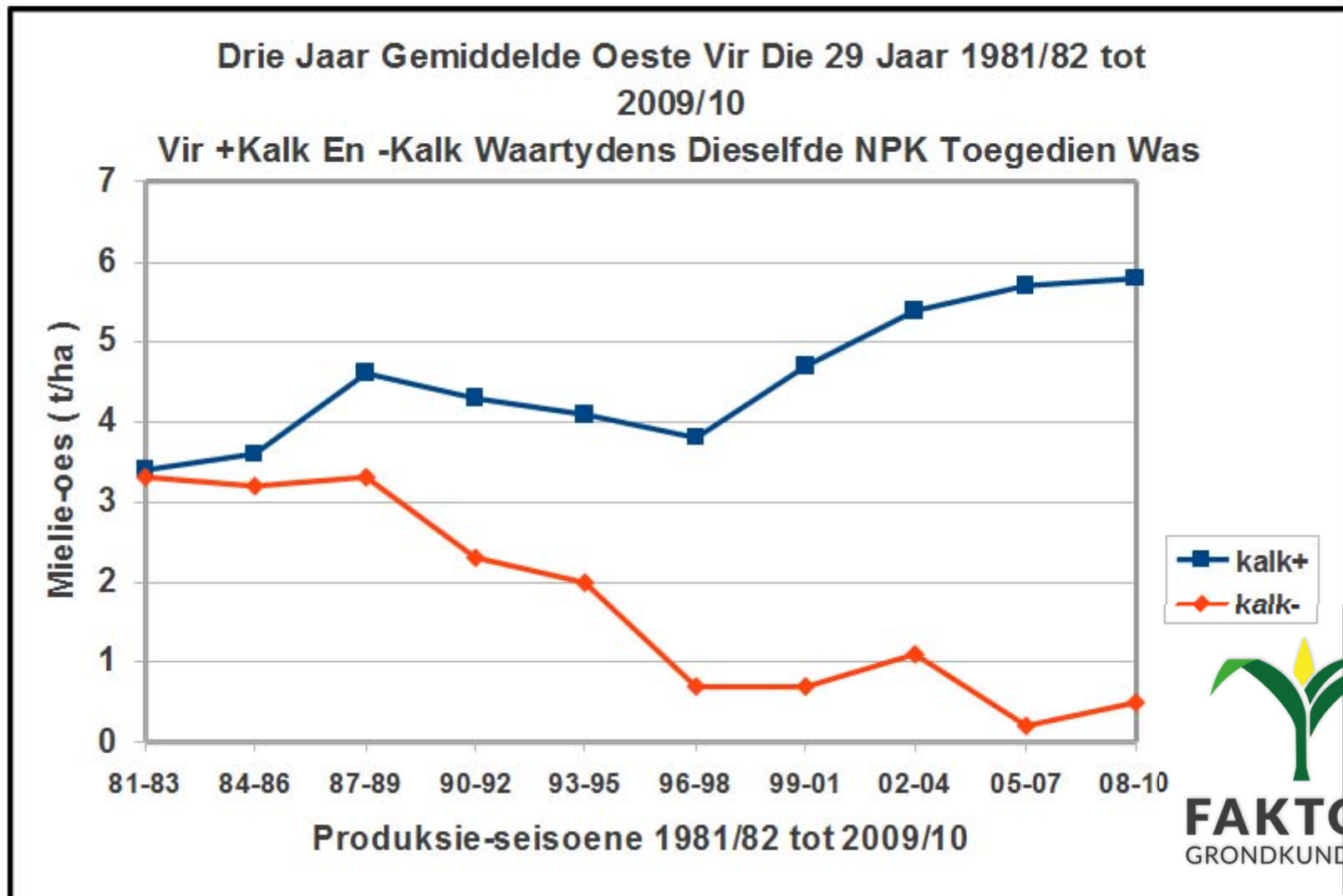
Drainage!!



pH Variation



Long term lime trial



Optimal soil pH (H₂O)

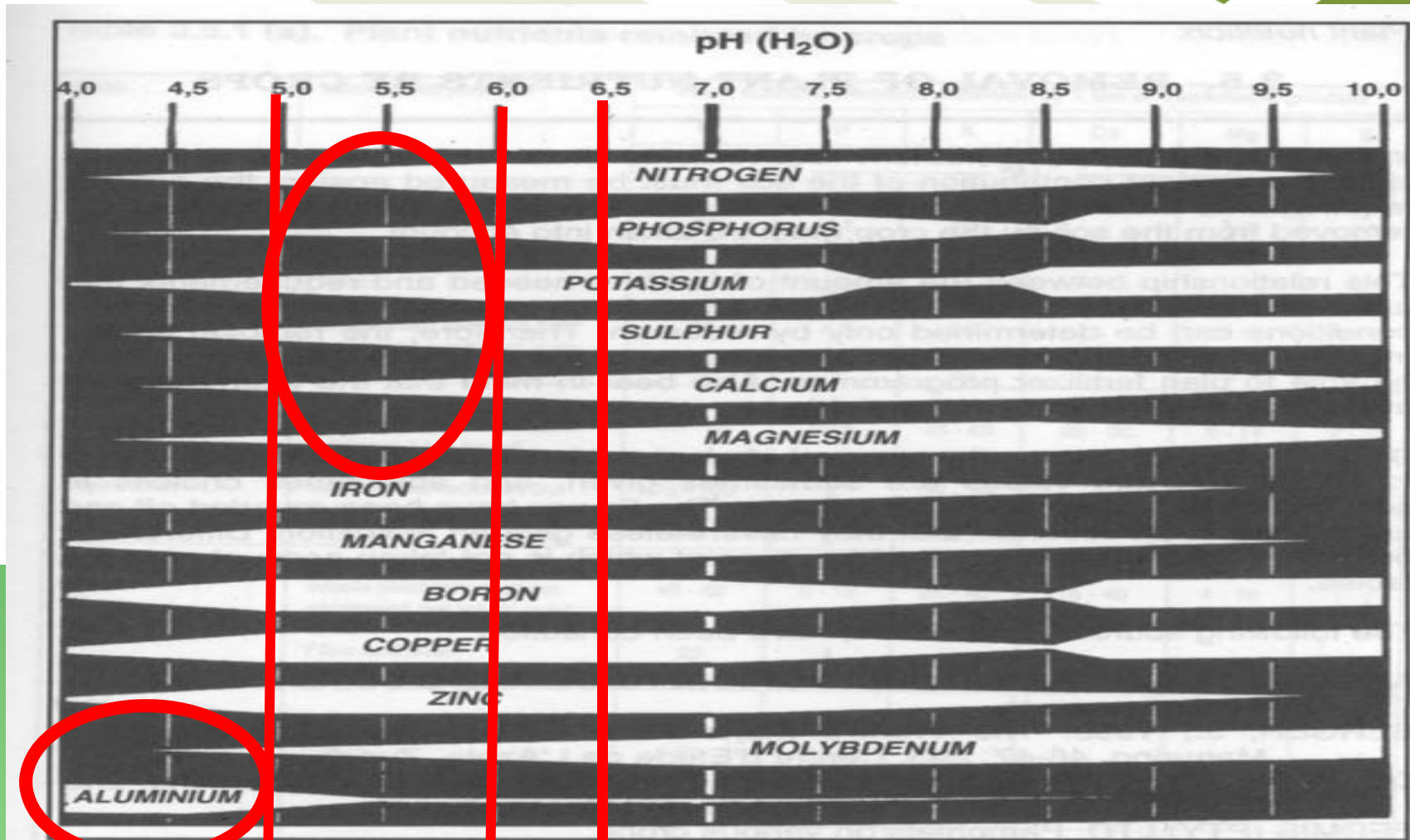


Figure 3.4.2 Availability chart of plant nutrients at increasing pH's (Truogh et al., 1964)



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Base information: Commercial field trials, University of Pretoria

(1986, GJ du Toit, DSc Agric thesis)

- 21 field trials across the maize triangle, part of commercial farming operations (0.2 – 1.2 ha in size) influenced by farmer choice:
 - Cultivar
 - Plant date
 - Cultivation practise
 - Number of plants per ha
 - Disease and pest control
 - Soil pH corrected to 6.0 (H₂O) if needed



University of Pretoria continue...

- Data from approximately 300 small area field trials across the maize triangle:

Season	MVSA Research	Yield	N	P	K	P Bray II
1965/66		2.72	0	0	0	
1983/84		3.67	41	19	13	
1978/79						
1983/84		3.8	41	0	0	12
	16 %	4.75	0	0	0	21
	46 %	2.64	101	37	29	



Research base for present field trials

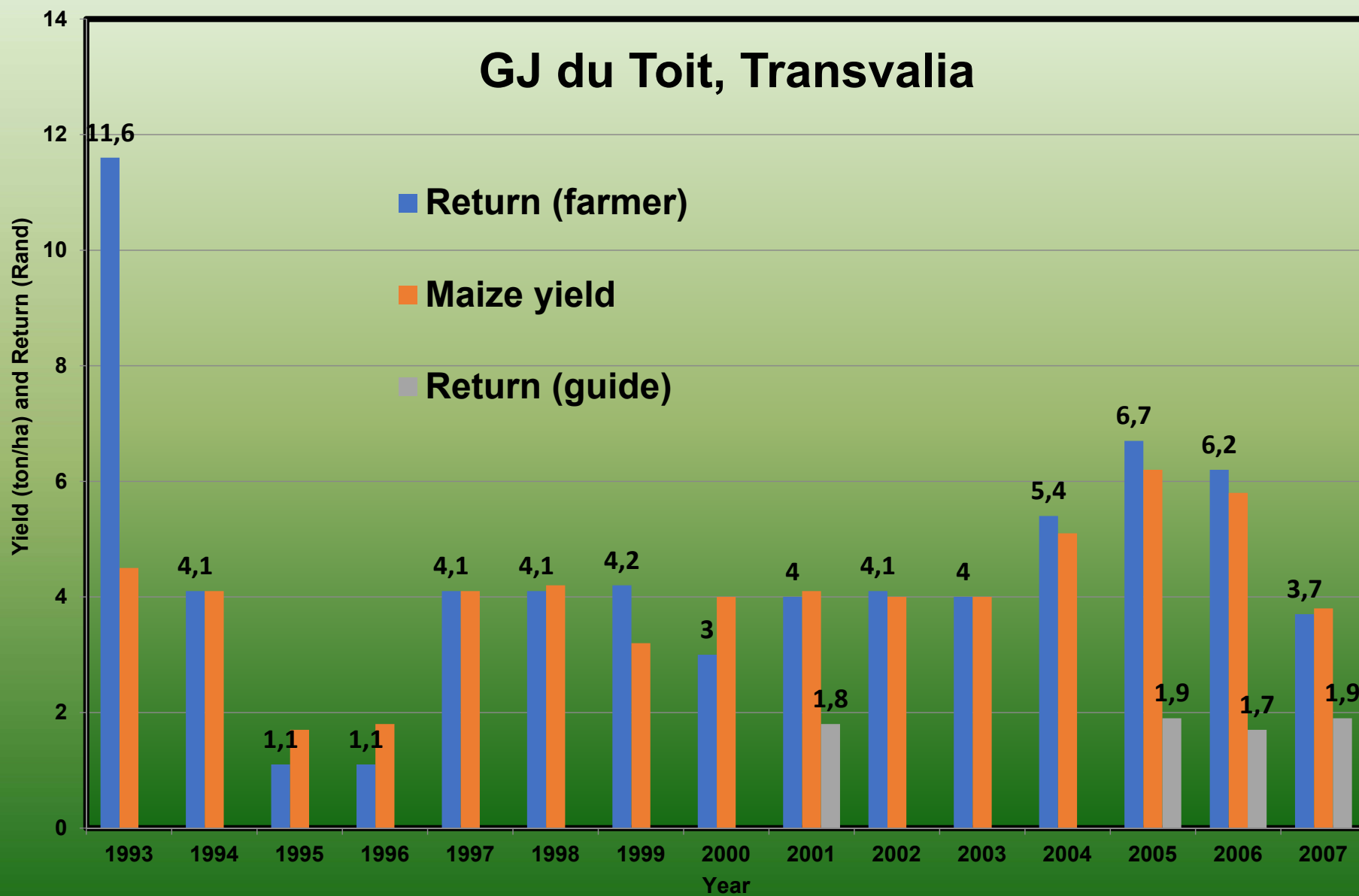
- High seasonal variation (East & West)
- Fertilisation during a 4 year trial period did not play a dominant role
- Principle of nutrient carry over (reason why control treatments can provide large profit)
- Financial risk increases with over supply of nutrients (return)
 - expected yields (potential?)

Case studies

Transvalia

	N	P	K
	kg fertilizer per ha		
Soil analysis	pH (H ₂ O) - 6	5 – 20 (Bray I)	50 - 80
Year 1	13	8	4
Years 2 - 15	53	8	4

GJ du Toit, Transvalia





Nutrient carry over

Soil profile depth cm	pH (H ₂ O)	kg N per ha	pH (H ₂ O)	kg N per ha	pH (H ₂ O)	kg N per ha	pH (H ₂ O)	kg N per ha
	Bothaville		Bultfontein		Leeudoringstad		Wolmeranstad	
0-60	6.45	98	5.61	72	5.2	55	5.21	60
30-60	5.64	602	7.15	408	4.8	171	6.08	46
60-90	5.83	89	4.99	97	4.79	34	6.3	59
90-120	7.08	31	6.44	113	5.64	31	5.16	9
120-150	5.85	35	5.90	46	6.17	30	5.32	12
180-210	6.12	24			5.52	29		
210-240	7.01	30						

Phosphate fertilizer field trials Nooitgedacht Research Farm

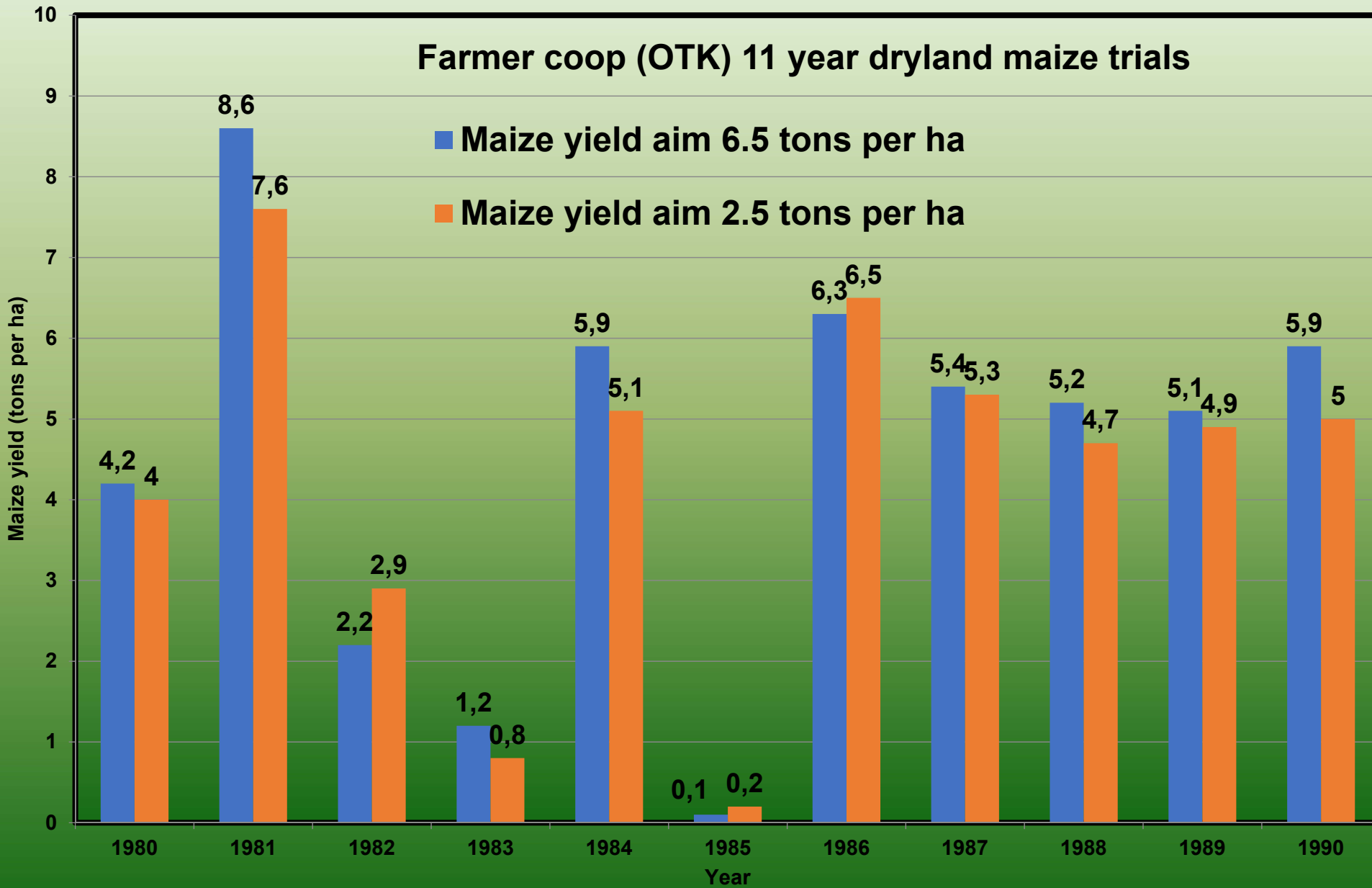
Broadcast	Band	P Bray II	Maize Yield
kg per ha P		ppm	tons per ha
0	0	10	8
0	15	10	11.1
0	30	10	11.6
160	0	40	11.7
160	40	40	11.7



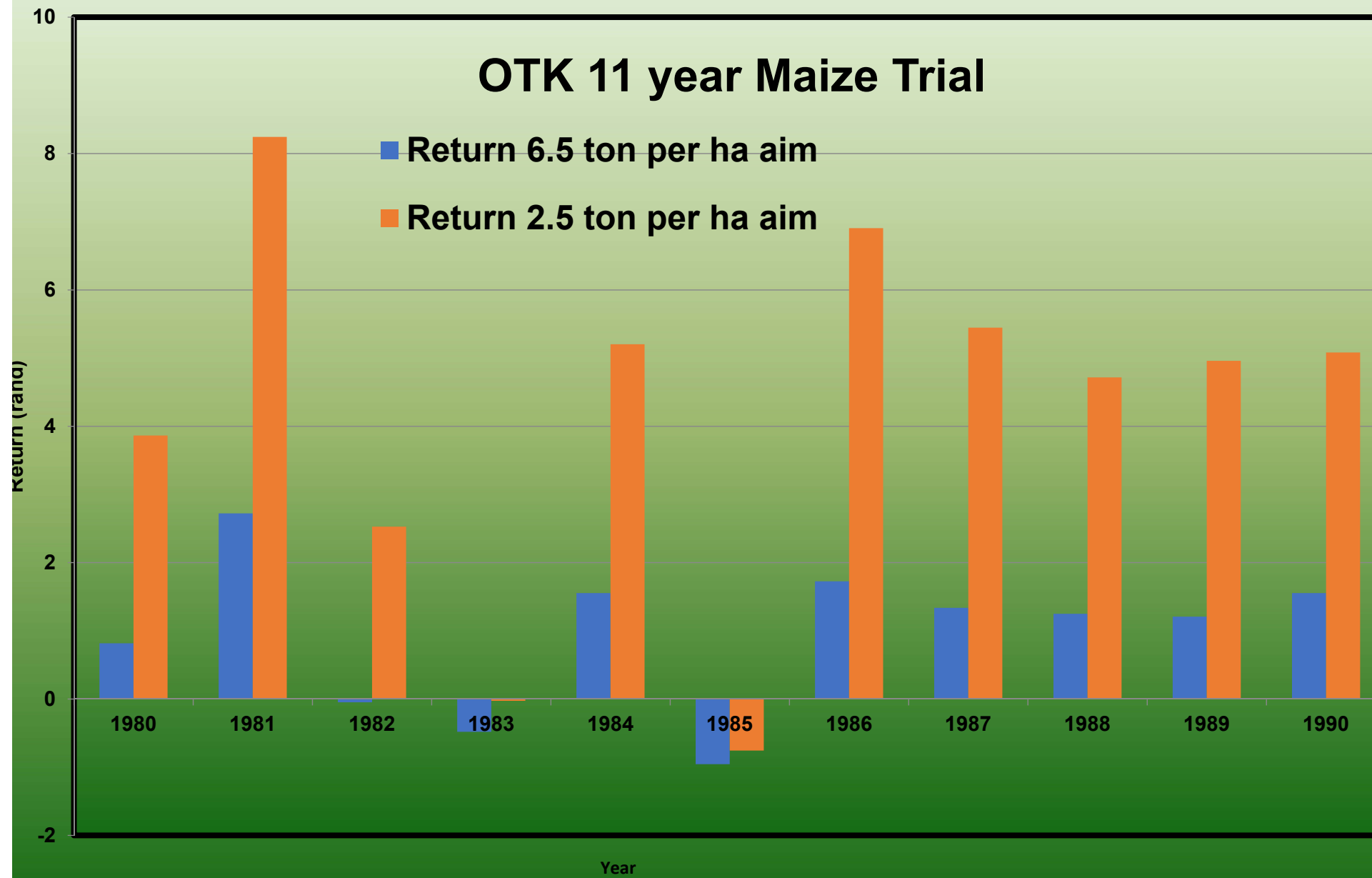
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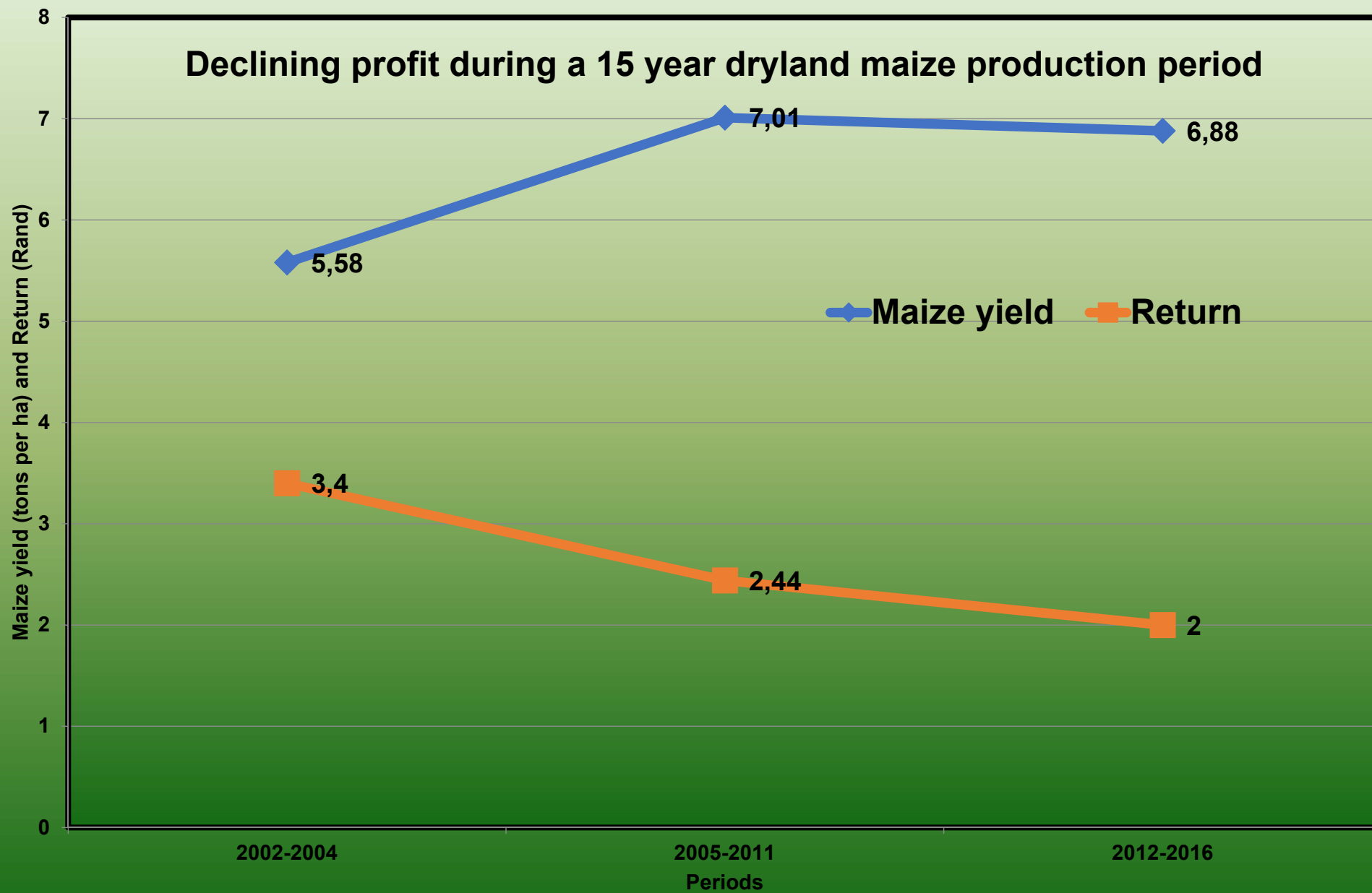
Farmer coop (OTK) 11 year dryland maize trials



OTK 11 year Maize Trial



Declining profit during a 15 year dryland maize production period

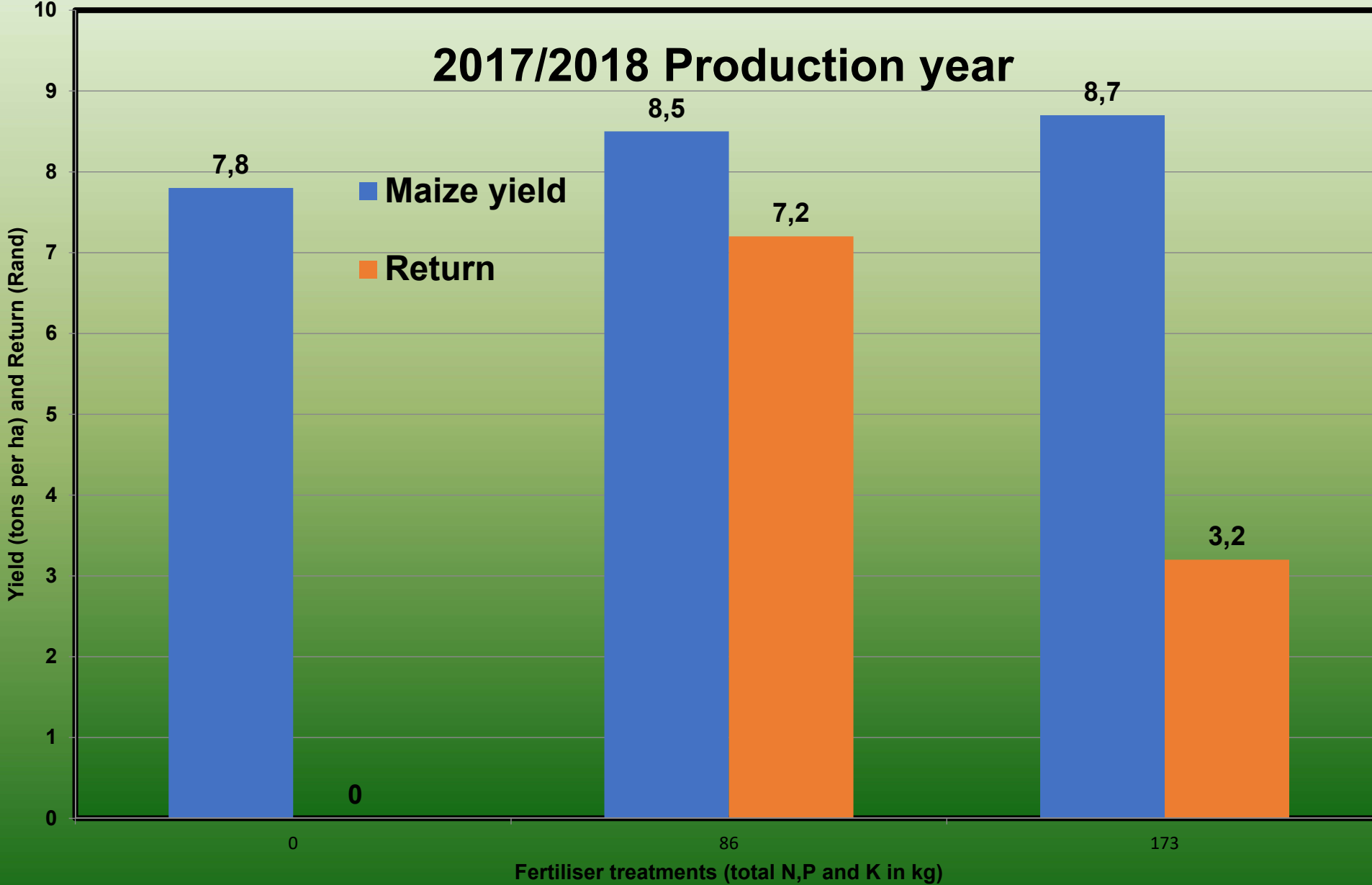


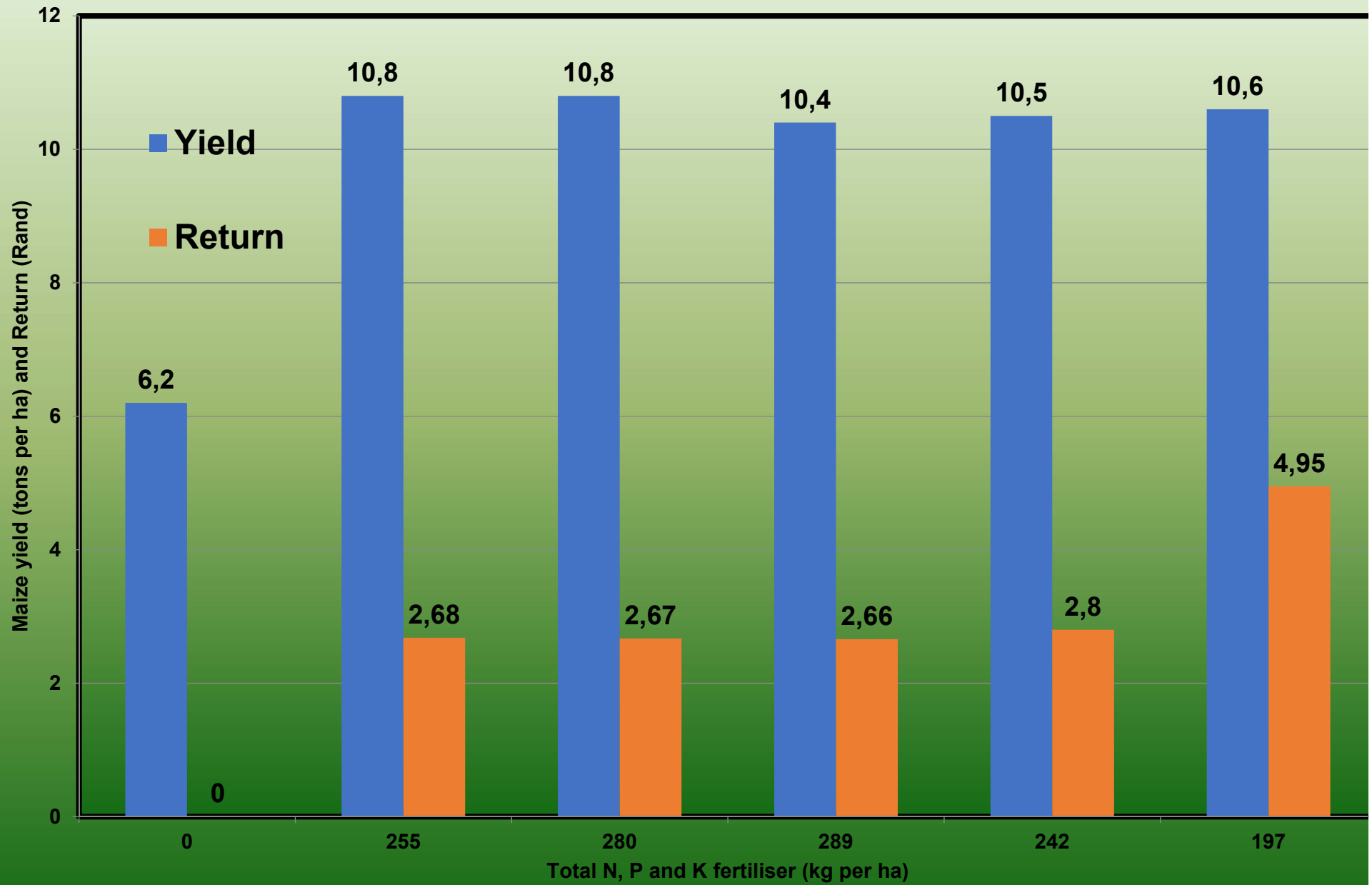
Soil depth	pH (H ₂ O)	Bray II	K	Na	Ca	Mg	N-NH ₄	N-NO ₃
cm	-	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Trial 0-30	5.88	88	175	13	733	151	2.53	7.57
Trial 30-60	6.13	10	44	15	528	159	1.65	9.39
Control 0-30	5.72	5	254	20	662	201	2.45	0.55
Control 30-60	5.44	3	89	14	422	206	2.08	0.27

Soil Fertilisation

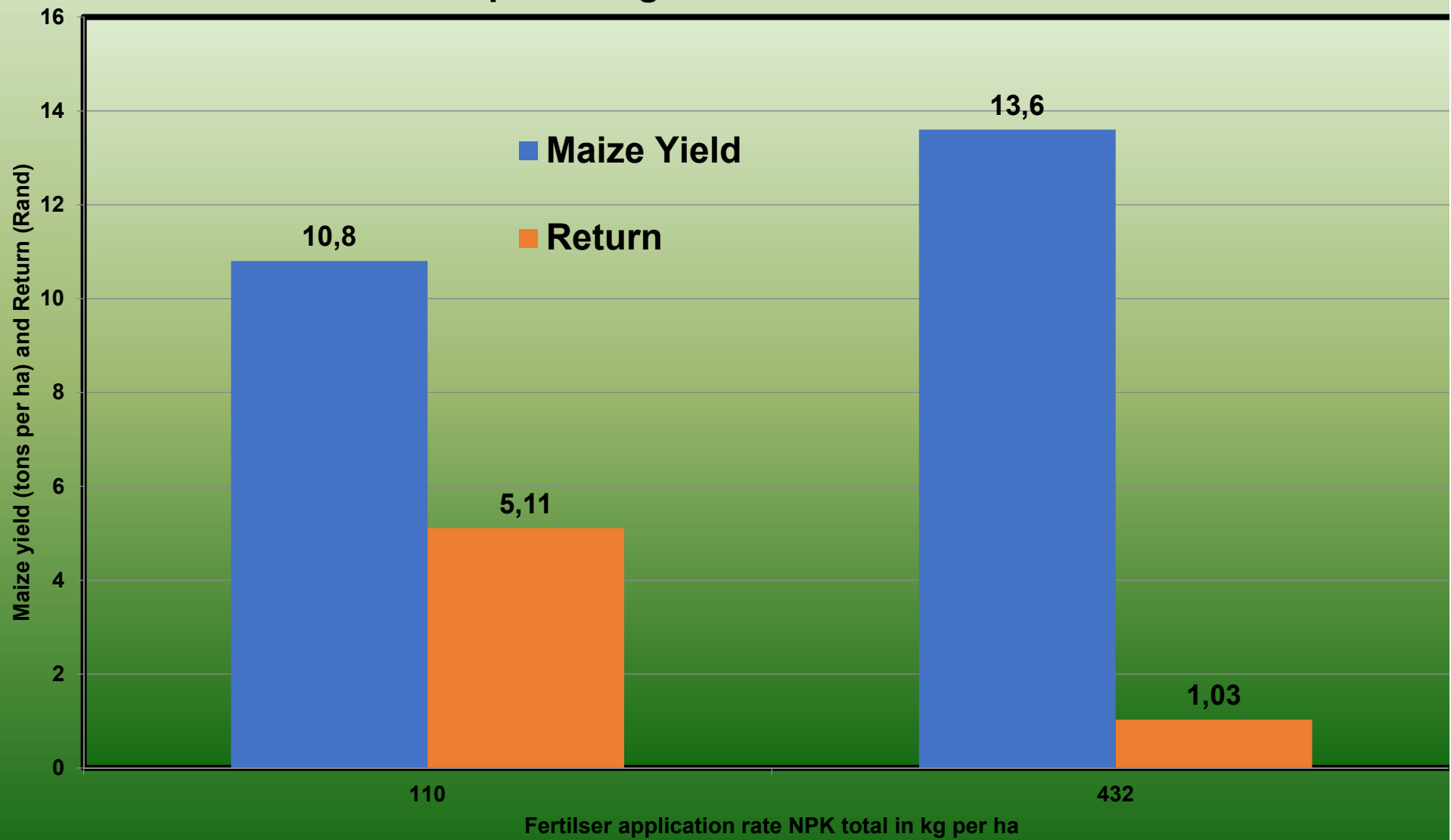
Treatments	N	P	K
0	0	0	0
87	65	12	10
173	130	23	20

2017/2018 Production year



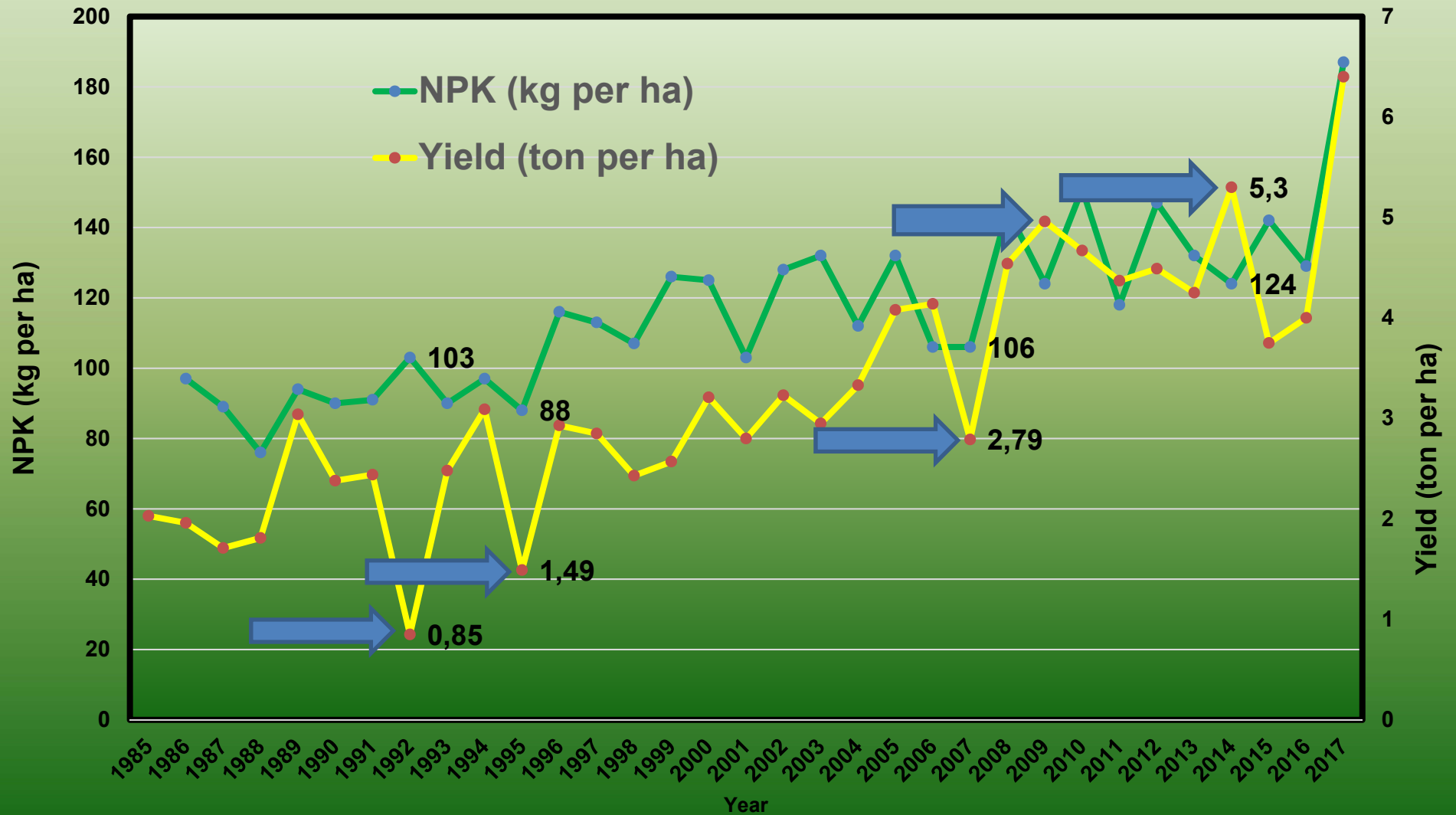


Maize Production Competition 2015/2016 production year Mpumalanga Province



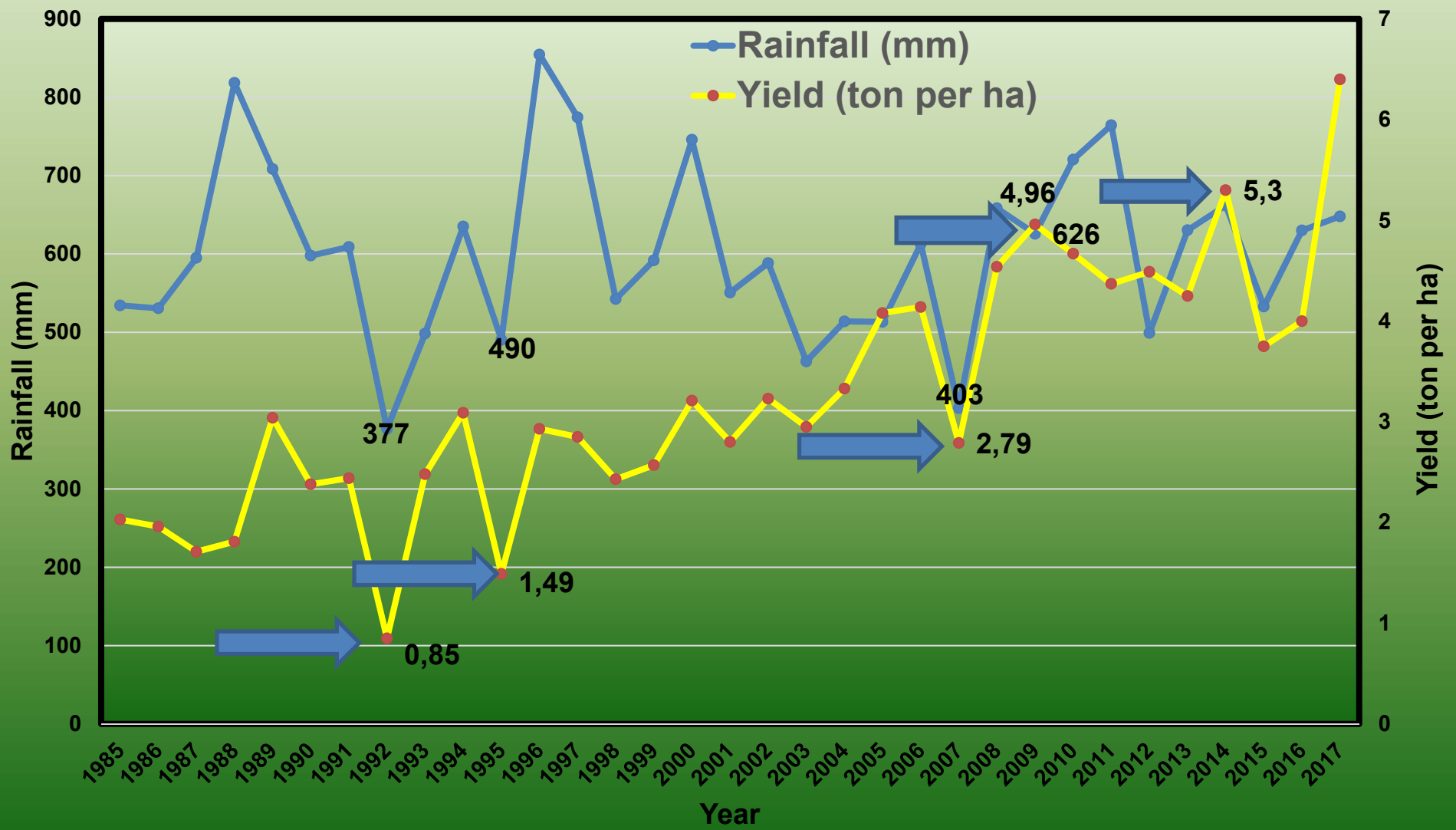
Maize crop/Fertilizer use

Historic combined NPK fertiliser use and yield per ha



Maize crop/Relevant rainfall

Historic rainfall and rainfed maize yield in South Africa



Summary

- Soil is a dynamic system
 - Interaction of many parameters
 - Conservative fertilisation, based on a sufficiency concept, can increase profit
- Evaluate on-farm production history
 - Historic data
 - Yield maps
- Attempt trials
 - Representation
 - Always have an untreated control



Recommendations

- Request scientific test results
 - Laboratory
 - Field trials
- If in doubt request help:
 - Suitably qualified; and
 - Scientific registered (SACNASP) professionals





Choices:

Profit cup

or

**Production
cup**

“The year brings the yield, not the field”

Erasmus's Adagia, 1.1.44

