

THE NATIONAL SOYBEAN CULTIVAR TRIALS IN SOUTH AFRICA – 34 YEARS’ OF EXPERIENCE AND PROCESS

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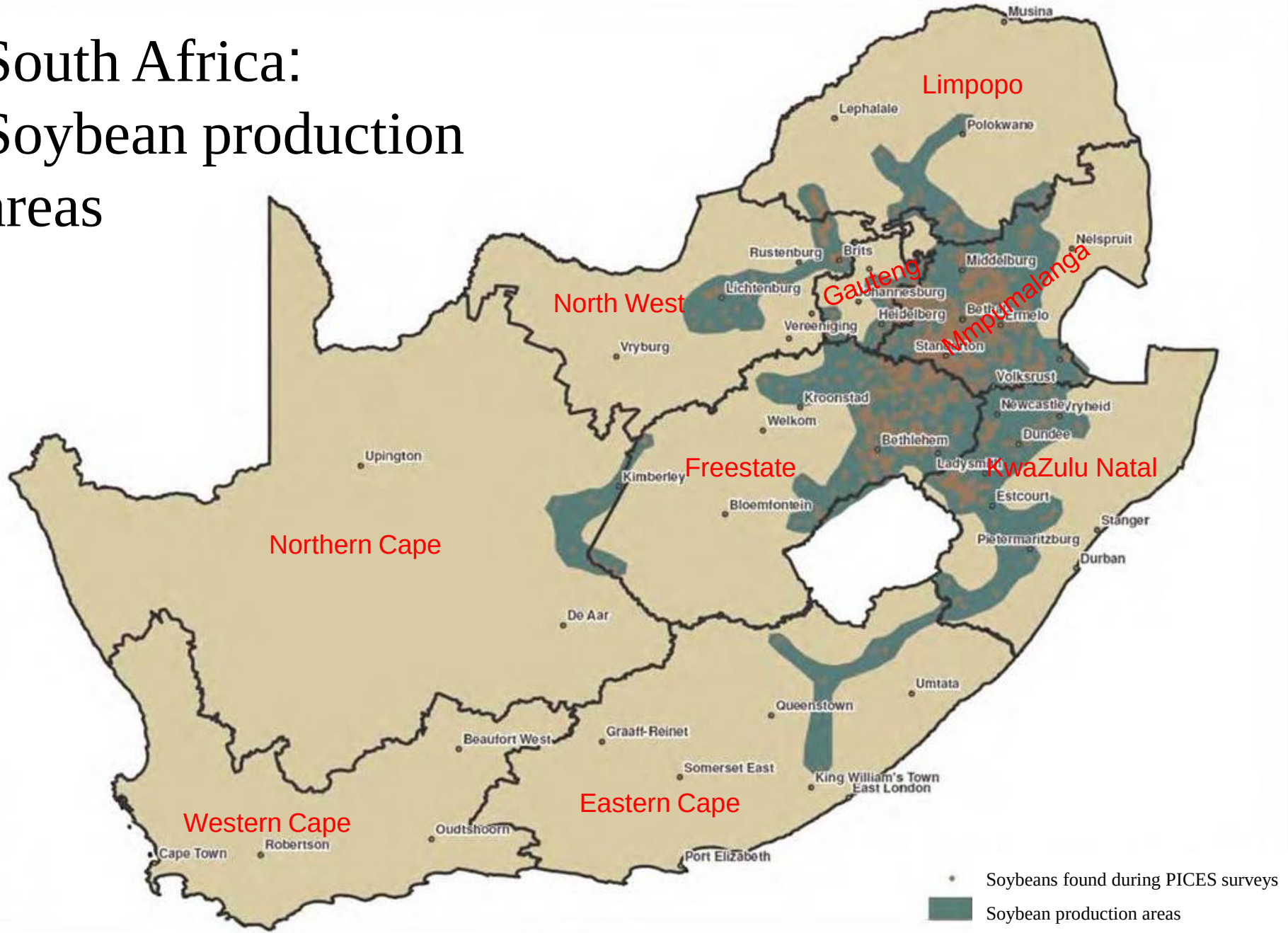
Soybean (*Glycine max*) is a small but important growing component of South Africa’s agricultural economy. For example, soybean production in the country increased from 144 000 t (25%) to 710 000 t on 418 00 ha in the 2010/11 production year in comparison with the previous year (566 000 t). However, individual cultivars are very limited in adaptability due to photoperiod sensitivity. Growing any soybean cultivar without knowing its potential in a particular environment may have dire consequences, even though such a cultivar may perform satisfactorily elsewhere. Cultivar evaluation programmes are therefore common practice in all soybean producing countries. A standardised national soybean cultivar evaluation programme was initiated by the ARC-Grain Crops Institute in South Africa in 1978/79 under government directives in order to stimulate and support the local soybean industry. The aim of the project was primarily to compare cultivars for agronomic performance and to test the adaptability of cultivars and new releases for specific areas and cultivation practices.

Progress over the past 34 years has been measured by looking, for example, at yield and other important agronomic developments that had a major impact on the soybean industry in South Africa. An average yield increase for the long seasonal cultivars was 0.43 t/ha and 0.56 t/ha for the short seasonal growers if the data of the 1981/82 and 2010/11 growing seasons are compared. However, the introduction of “Roundup Ready” cultivars impacted the most in such a way that 90% of the current production in South Africa consists of “Roundup Ready” cultivars. The development of root-knot nematode tolerant cultivars also contributed to the fact that soybeans can be planted on soils previously susceptible to substantial yield losses due to nematode occurrence. The first nematode tolerant cultivar, namely Egret, was released by the ARC in 2002.

The national soybean cultivar trials in South Africa – 34 years experiences and progress

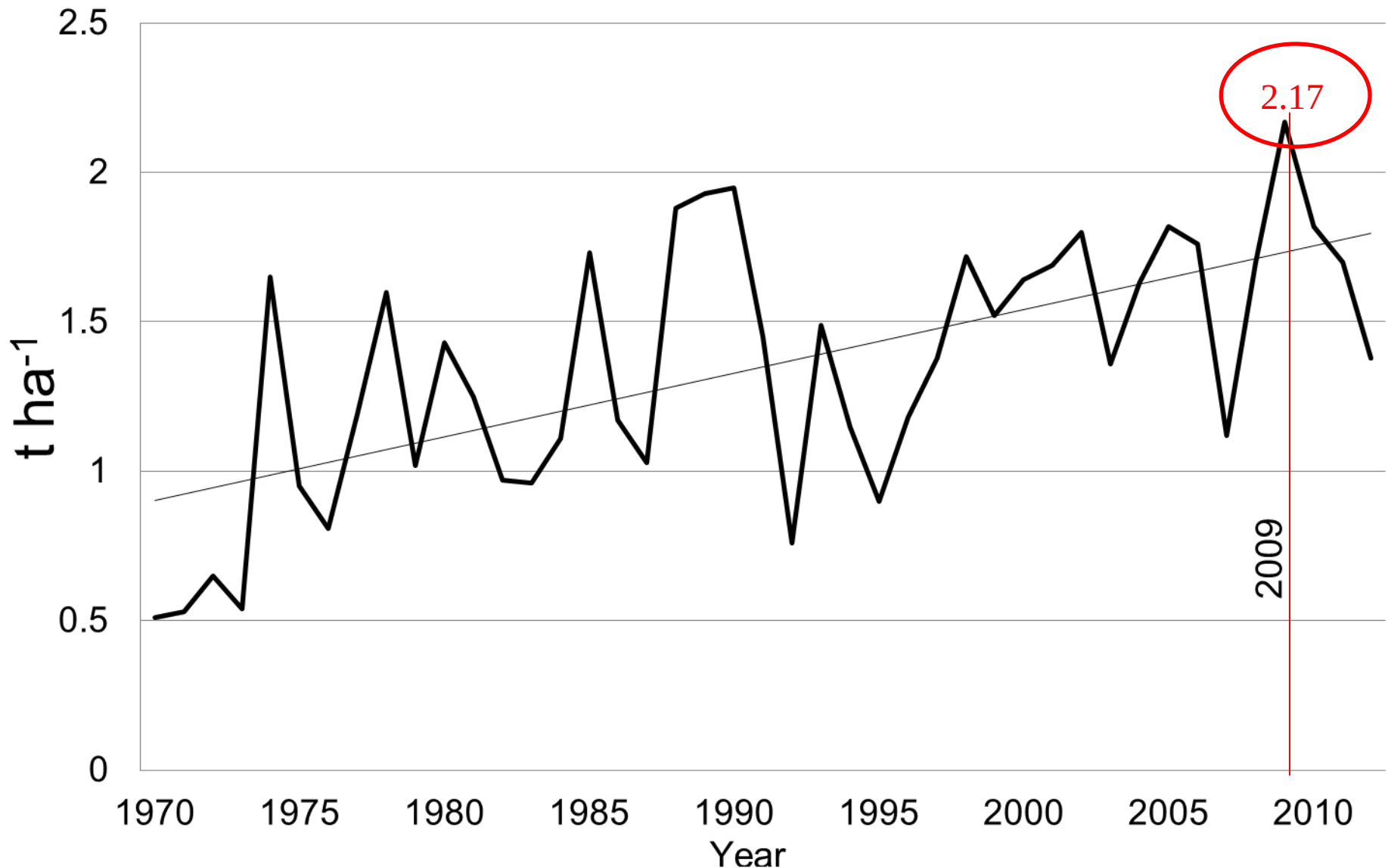
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South Africa: Soybean production areas



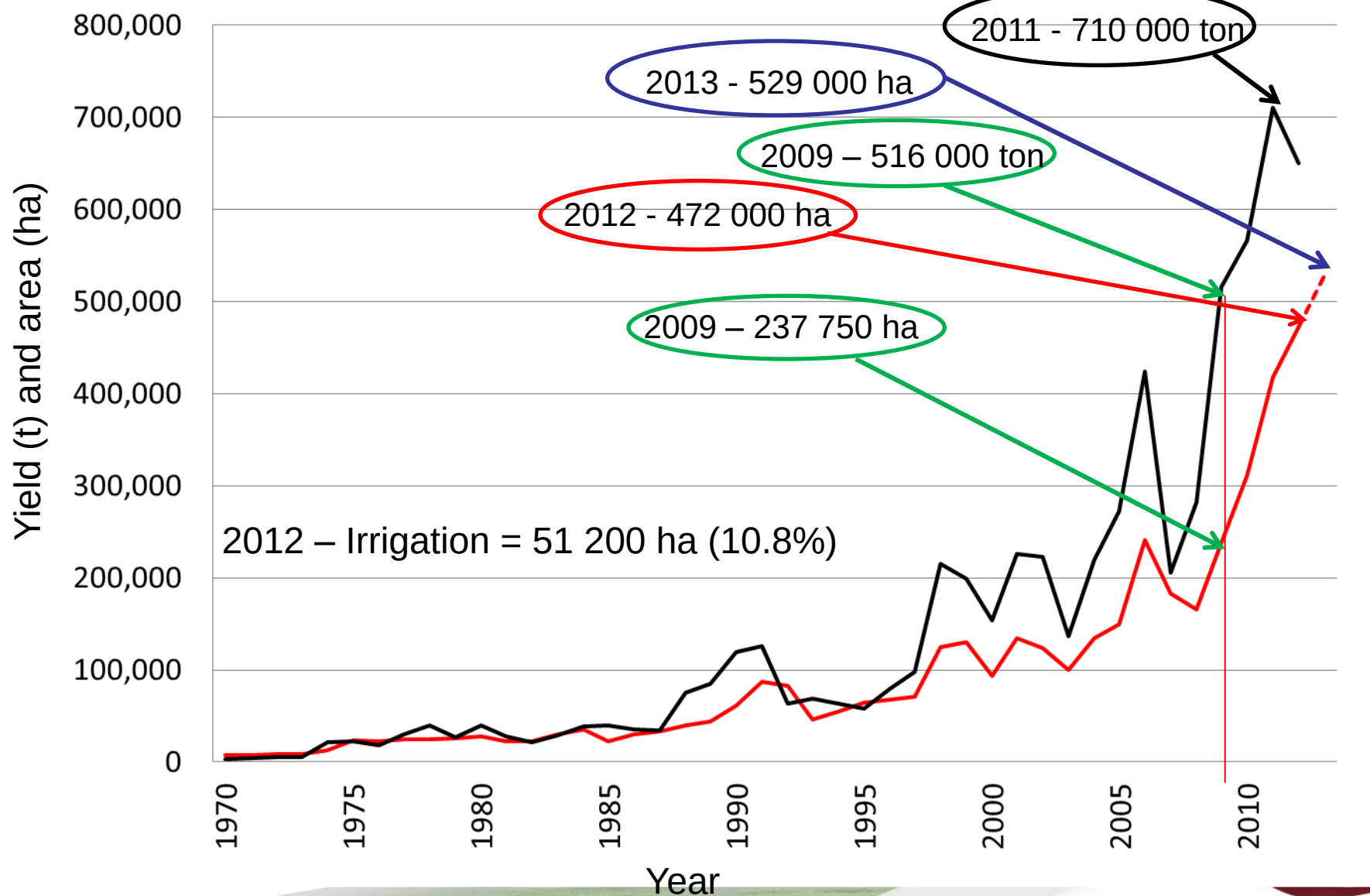
(Blignaut and Taute, 2010)

Average commercial soybean yield per hectare from 1970 to 2012 in South Africa



(Crop estimates committee, 2013)

Soybean production from 1970 to 2013 in South Africa



(Crop estimates committee, 2013)

Production targets

- 2015: 1 million tons on 455 000 hectares (2.2 t ha⁻¹)
- Since 2012 the above set hectare target has been reached
- 2020: 2.5 million tons on 1 million hectares (2.5 t ha⁻¹)



A typical national soybean trial

34 years from 1978 to 2011



Start of national soybean trials

was initiated in 1978/79 by the then Oil and Protein Seed Centre (now ARC-GCI) under government directives in order to stimulate and support the local soybean industry



Aim of national soybean trials

- To compare cultivars for agronomic and economic performance; and
- to test the adaptability of cultivars and new releases for specific areas and cultivation practices



Statistics of the national soybean trials

- 943 entries were evaluated in the soybean trials
- 1486 trials were planted throughout the soybean cultivation area
- 35 conventional and 33 Roundup-Ready® (RR) cultivars is currently registered in South Africa (Sadie, 2012)

Variables measured:

- Days to 50% flowering
- Days to physiological maturity
- Days to harvest maturity
- Pod height
- Plant height
- Green stem %
- Lodging %
- Oil %
- Crude protein %
- Seed quality
- Shattering %
- Yield

Determined:

- Yield reliability and stability



Root-knot nematode tolerant research

- 1981/82 season a need for root-knot nematode (*Meloidogyne incognita* and *M. javanica*) tolerant research arose which resulted in the release of Egret during 2002
- This is still the only available root-knot nematode tolerant cultivar

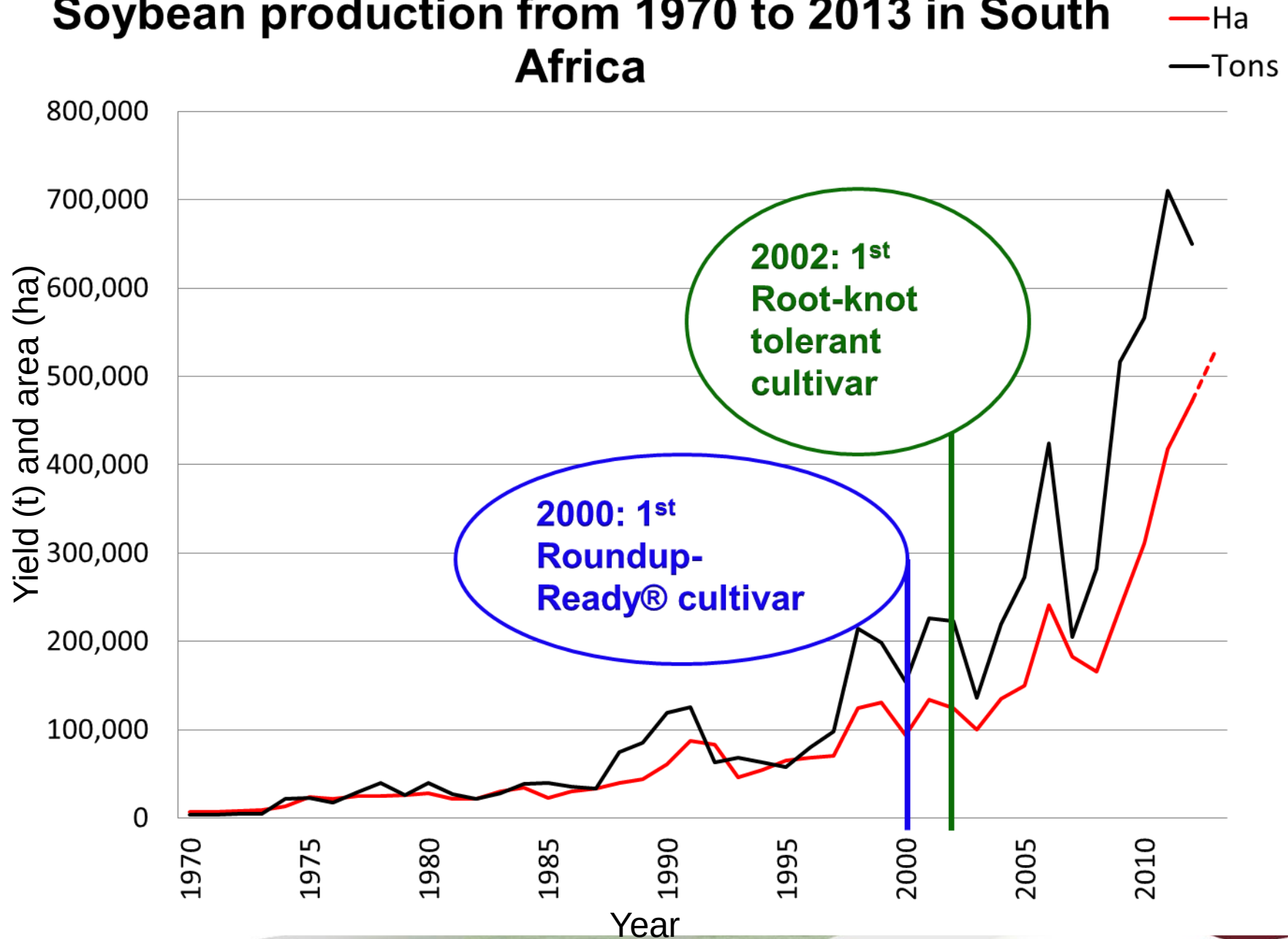


Roundup-Ready®

- During 2000 the first Roundup-Ready® cultivar (A5409RG) was registered in South Africa and is still widely planted



Soybean production from 1970 to 2013 in South Africa



(Crop estimates committee, 2013)

Maturity groupings

Maturity group	Classification (growers)
4 - 4.9	Short (S)
5 - 5.9	Medium (M)
6 - 6.9	Medium-long (ML)
7+	Long (L)

[illegible]

Cool production area: Line Fit Plot

● Mean L

● Mean M

● Mean ML

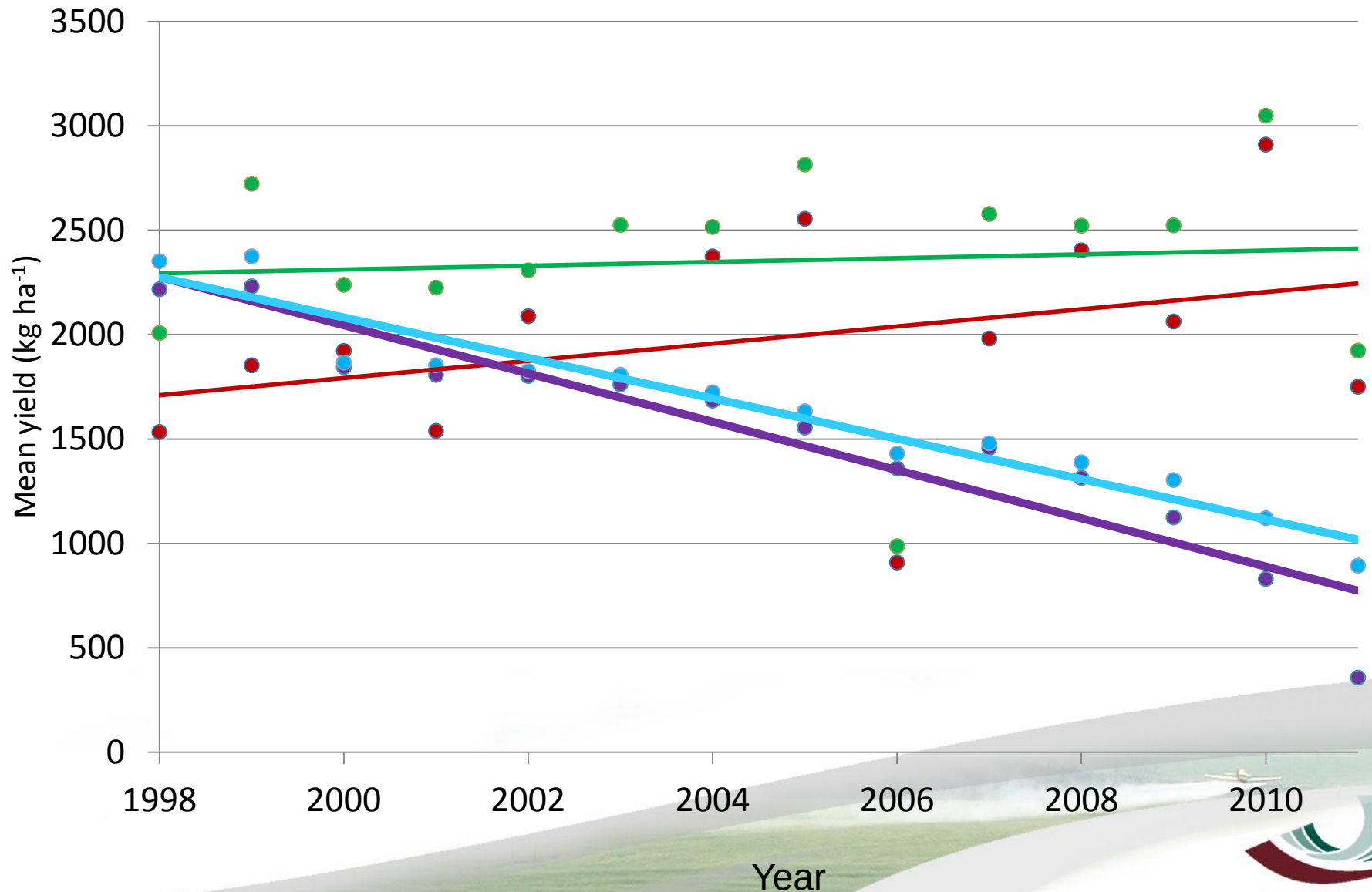
● Mean S

Trend = NS

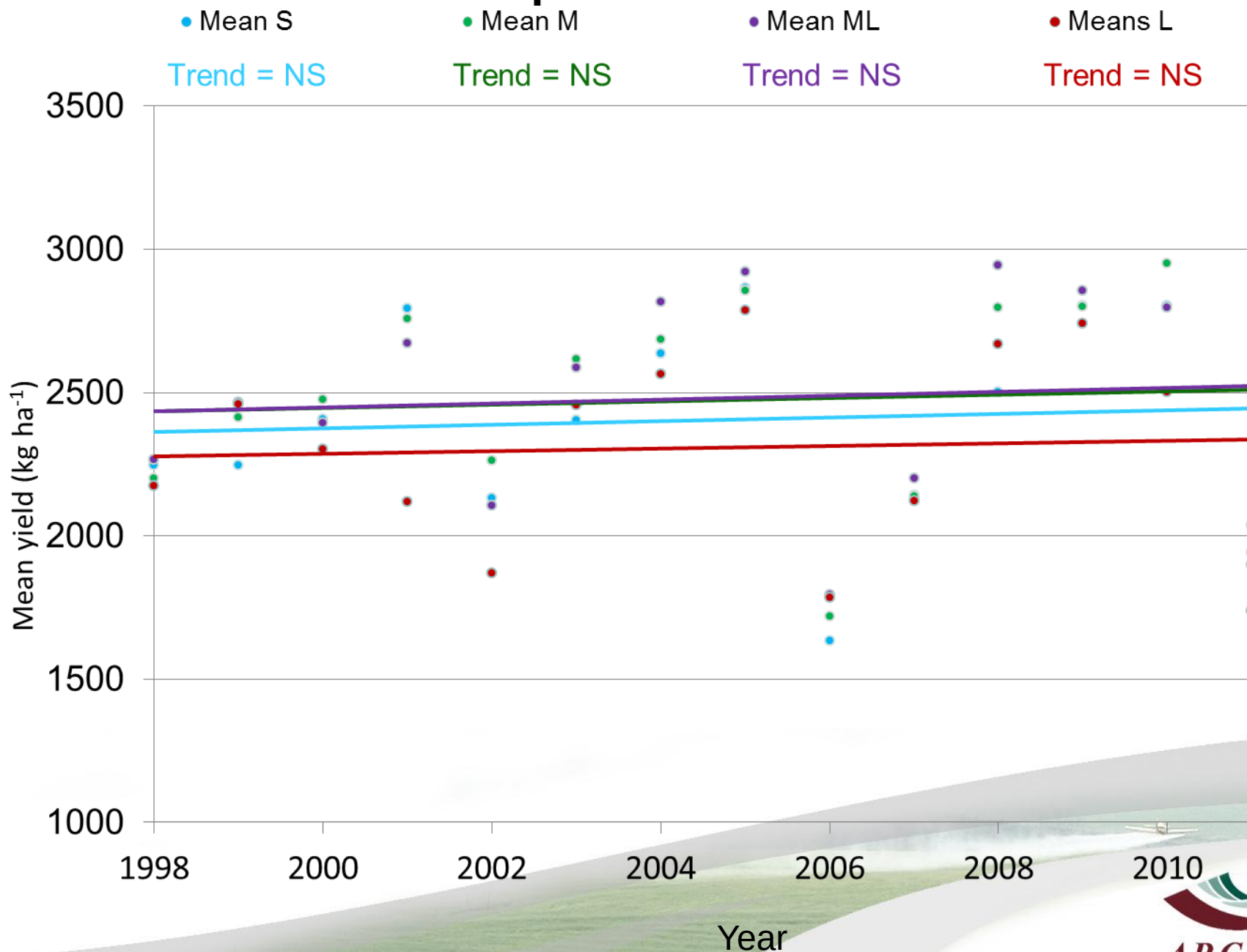
Trend = NS

Trend = $-115.57 \text{ kg ha}^{-1}\text{y}^{-1}$

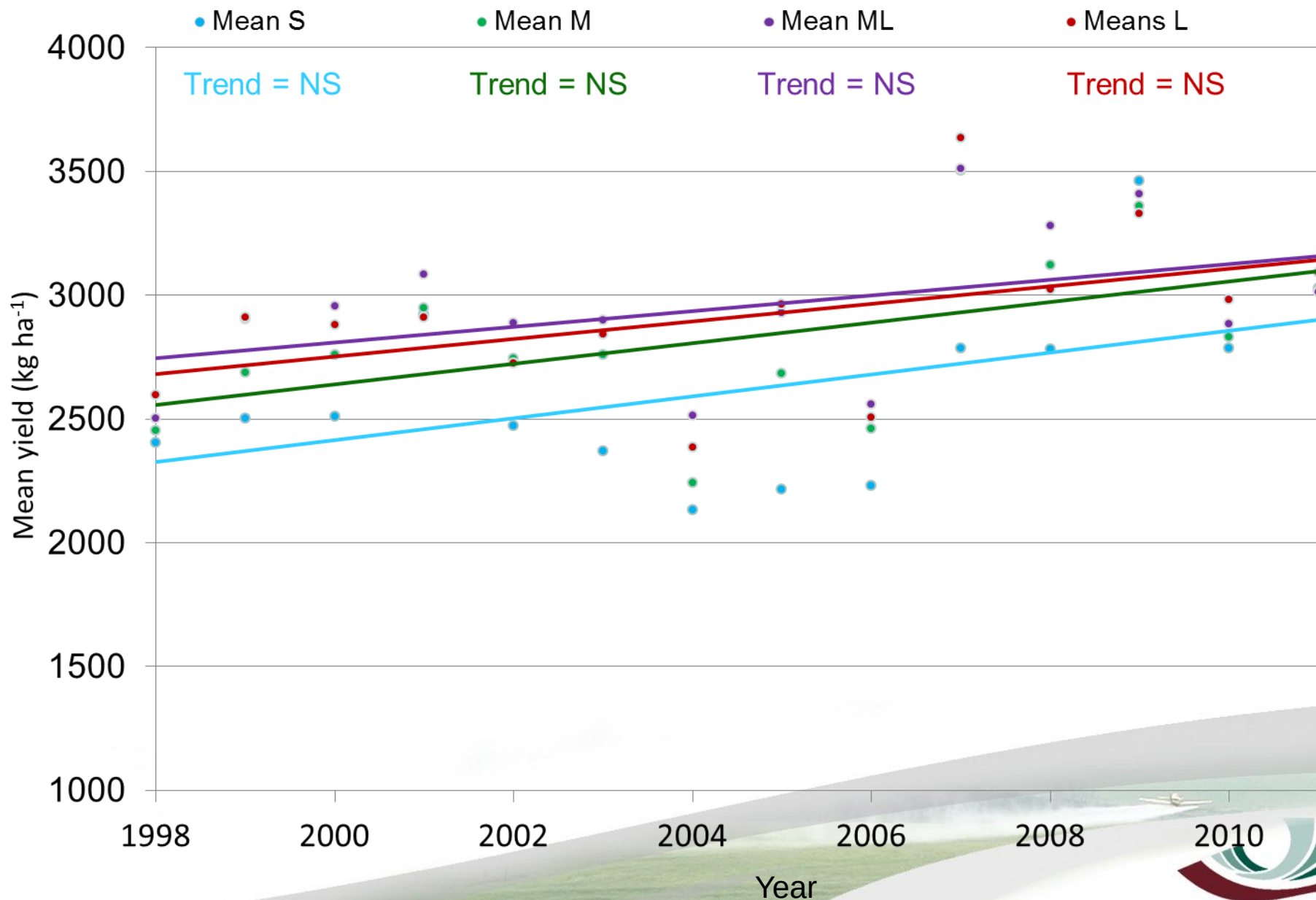
Trend = $-96.76 \text{ kg ha}^{-1}\text{y}^{-1}$



Moderate production area: Line Fit Plot



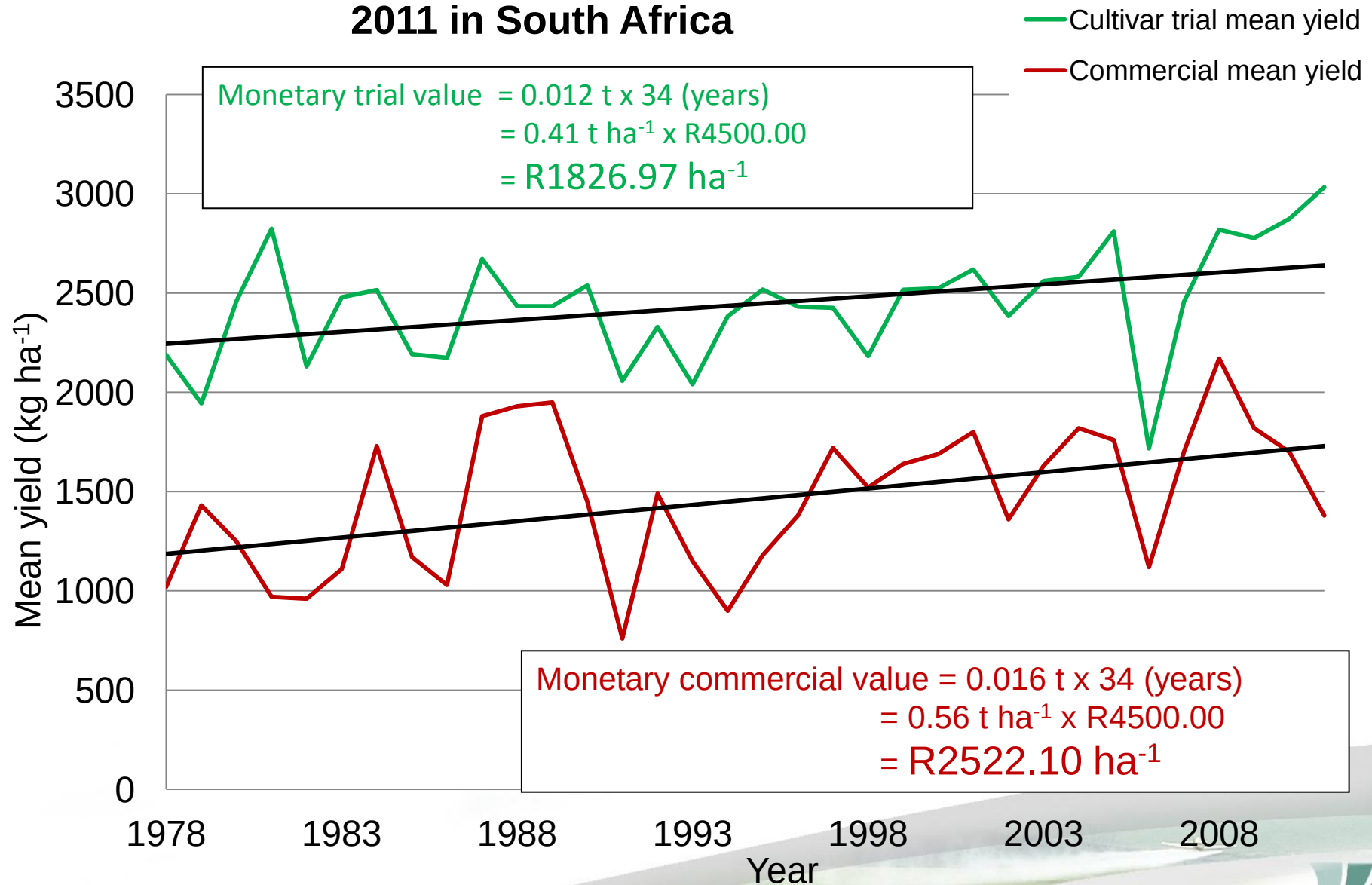
Warm production area: Line Fit Plot



Maturity groups within area combination means (t ha⁻¹)

Maturity groups	Cool areas	Moderate areas	Warm areas
Short (4 - 4.9)	1.65 ^b	2.40 ^b	2.61 ^b
Medium (5 - 5.9)	2.35^a	2.47^a	2.83^a
Medium-long (6 - 6.9)	1.52 ^b	2.48^a	2.95^a
Long (7+)	1.98 ^b	2.31 ^c	2.91^a
LSD _{p=0.05}	0.28	0.08	0.09

Annual average soybean yield per hectare from 1978 to 2011 in South Africa



1979: Best overall performer with a yield of 2.31 t ha⁻¹



2011: Best overall performer with a yield of 2.64 t ha⁻¹



Conclusions/Highlights



- Medium growers (MG 5 – 5.9) widely adapted
- The increase in yield ha⁻¹ is mostly due to the genetic improvement of cultivars
- **90% + of all plantings are Roundup-Ready® cultivars and can be regarded as the largest impact in the industry (A5409RG – 2000)**
- ARC-GCI released the **first root-knot nematode tolerant** cultivar (Egret) in 2002 (Sandy soils)

Past



Present



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