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DEPARTMENT OF PLANT  
AND SOIL SCIENCES



Potato Pathology  
Programme @ UP



# Potato Production in South Africa: Tribulations and Triumphs

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@jacquievdw

Potato  
production in  
Africa

Lessons  
learnt

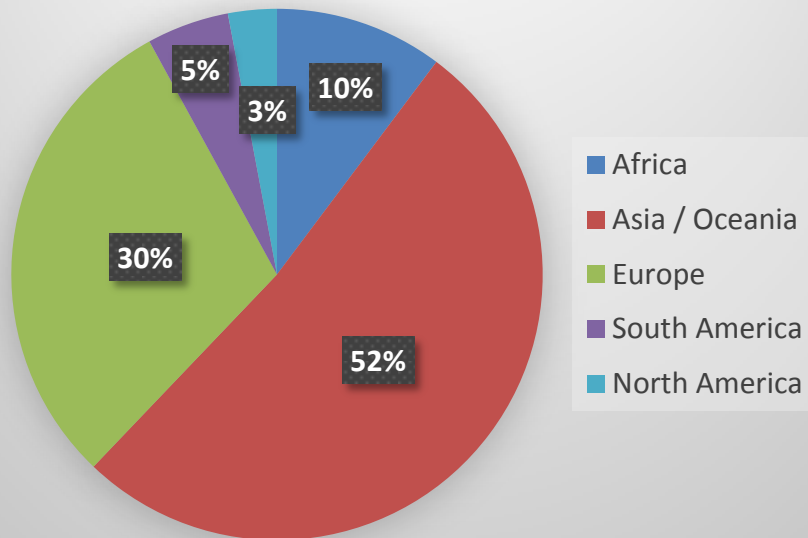


Potato  
production in  
South Africa

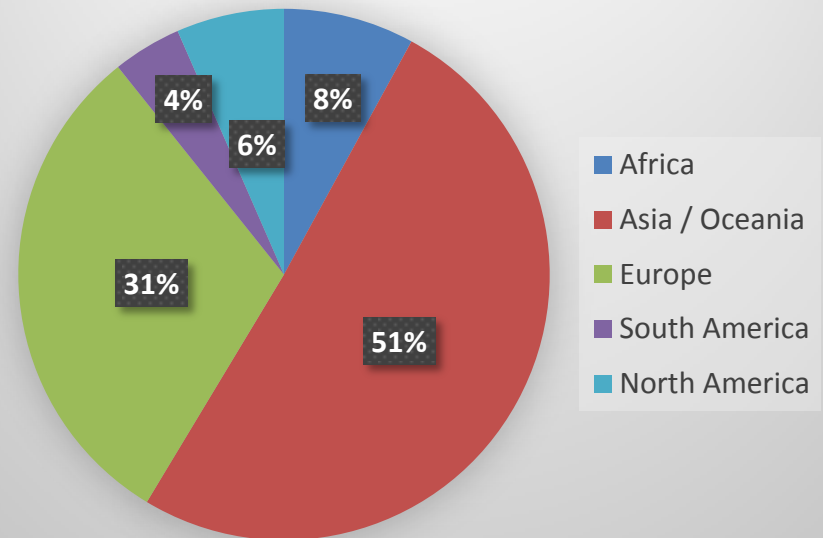
# 2013 Potato Production

(FAOSTAT)

## Potato Production in Ha



## Tons Produced



# Top potato producing countries in Africa

Morocco  
36 t/ha

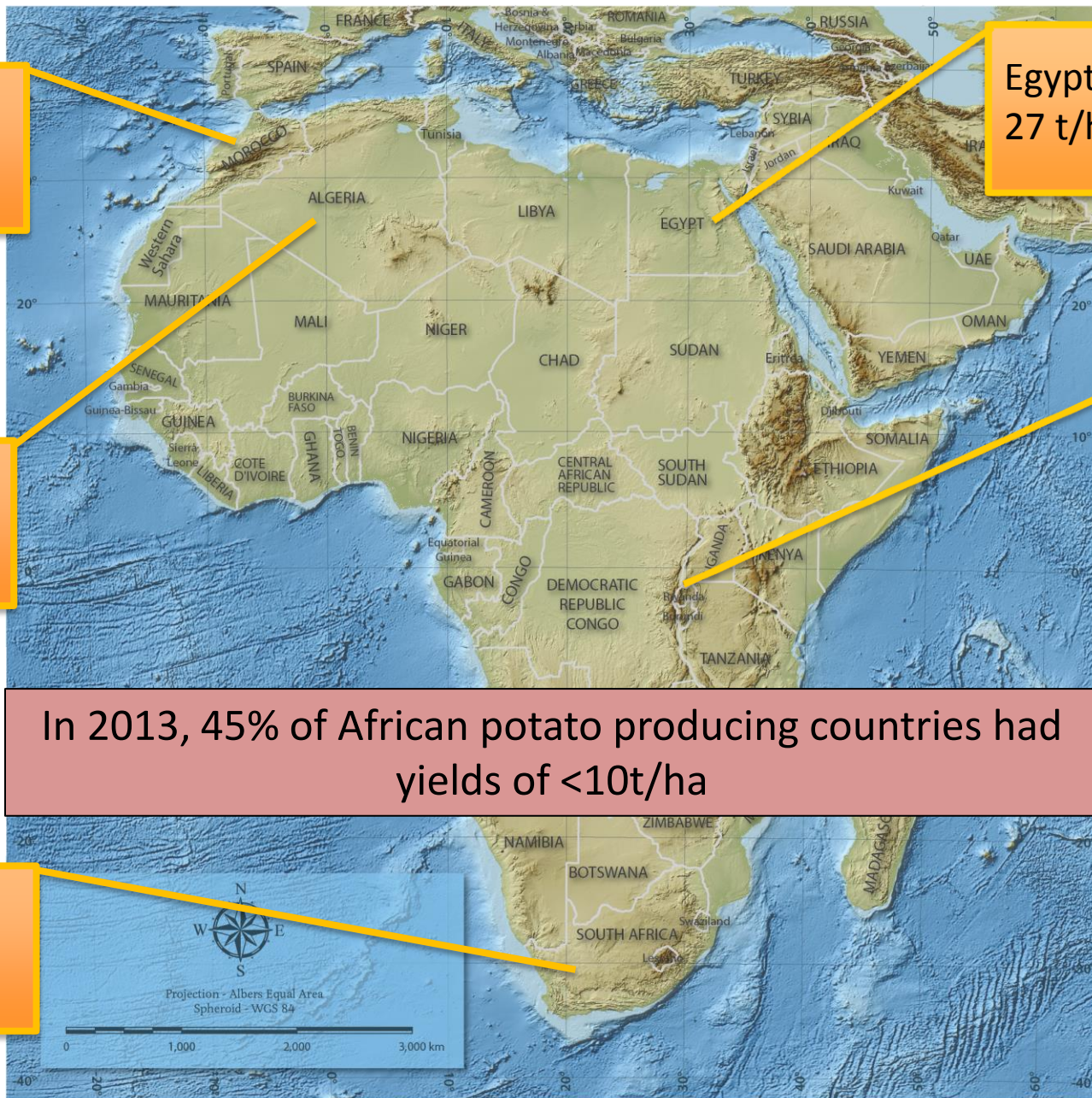
Egypt  
27 t/ha

Algeria  
31 t/ha

Rwanda  
14 t/ha

In 2013, 45% of African potato producing countries had yields of <10t/ha

South Africa  
44 t/ha



Map courtesy of  
Mr L. van Zyl,  
TerraGIS

# Why such low yields?

- Farming systems not ideal – subsistence farming on small fields; mixed farming with livestock
- Poor plant nutrition
- Lack of seed certification
- Insufficient grower training
- Limited use of irrigation
- Pests and pathogens
  - Ineffective management programmes (if any)



# Important pests and pathogens

## *Tuta absoluta* information network

*Tuta absoluta*

Discussion

Gallery

Reports

News

Conferences

Contact

### *Tuta absoluta* Distribution



(F Niederwieser)

# Focus on South Africa



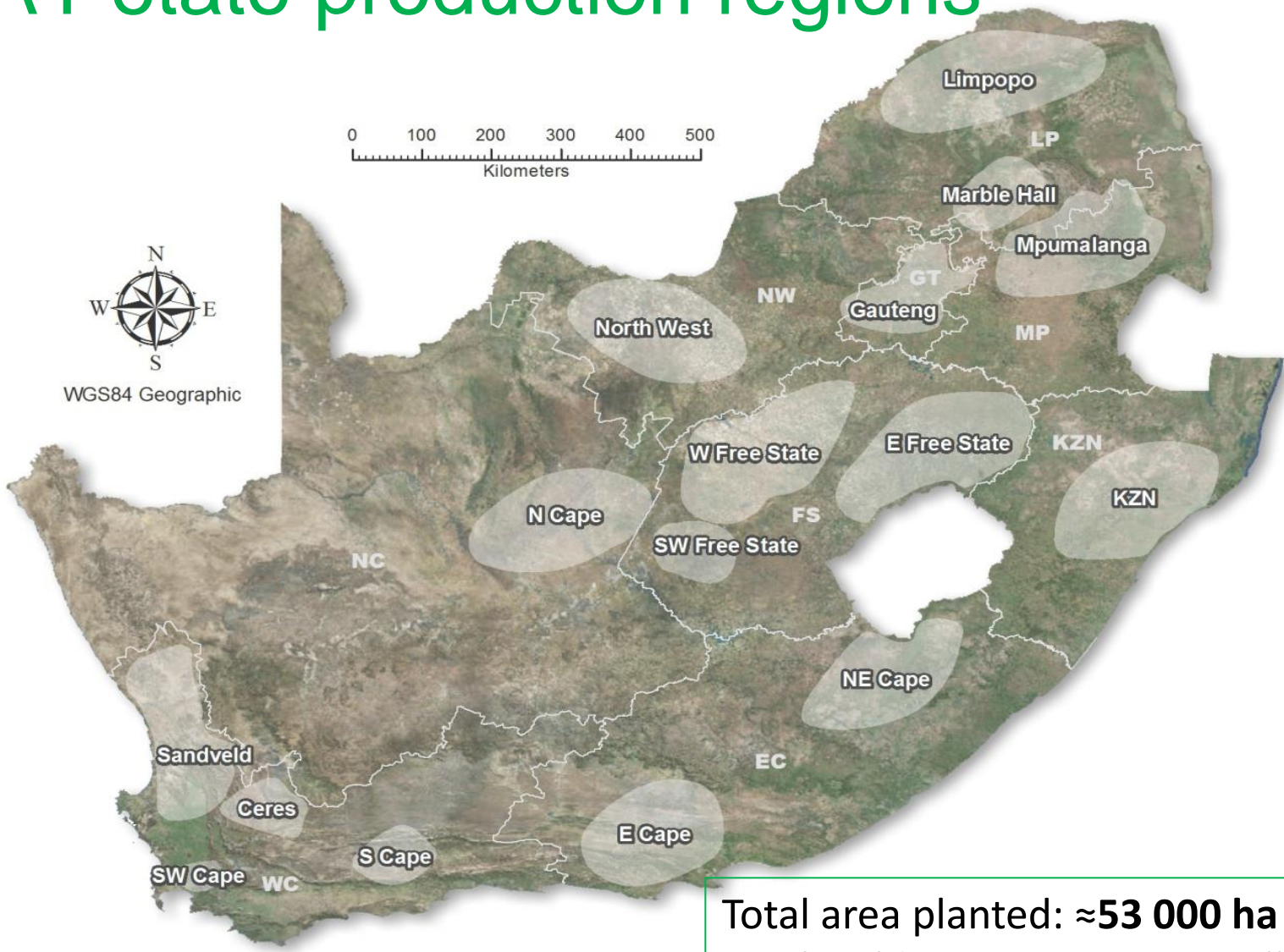
Projection - A  
Spheroid - WGS 84

0 1,000 2,000 3,000 km



Map courtesy of Mr L. van  
Zyl, TerraGIS

# SA Potato production regions



Total area planted: **≈53 000 ha** annually  
Total yield: **≈2.4m tons** annually  
<600 commercial growers  
>2000 subsistence farmers

Map courtesy of Mr L. van Zyl, TerraGIS



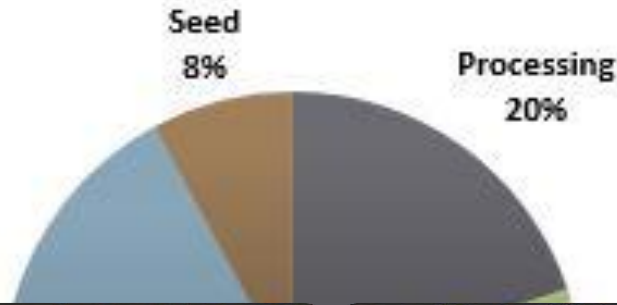
# South African Potato Industry

- Contrasting agro-ecological conditions in planting regions:
  - **Dry summer, wet winter**
  - **Wet summer, dry winter**
- Summer plantings
- Spring plantings
- Autumn (winter) plantings
- 90% Irrigated

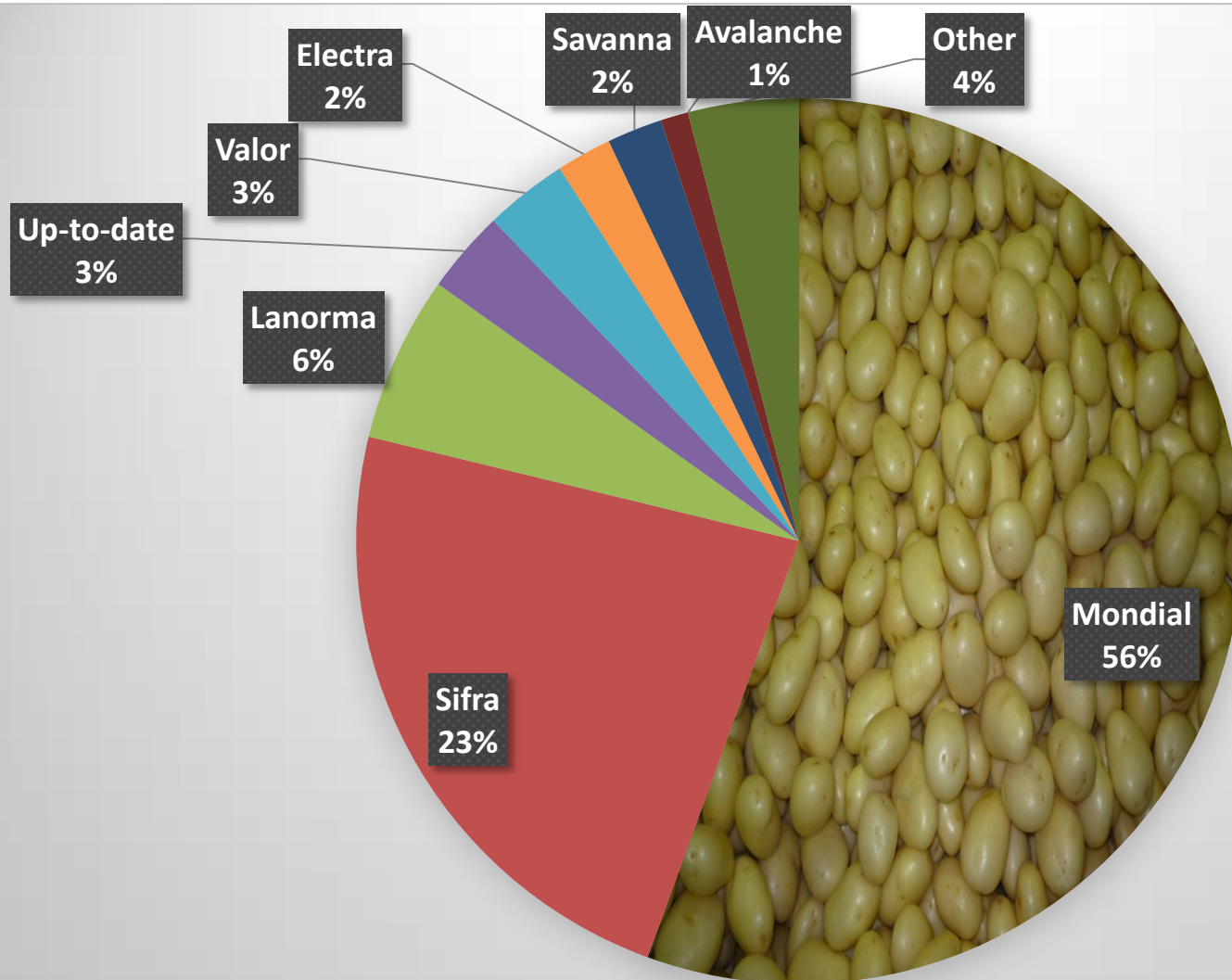


# Distribution of potato crop

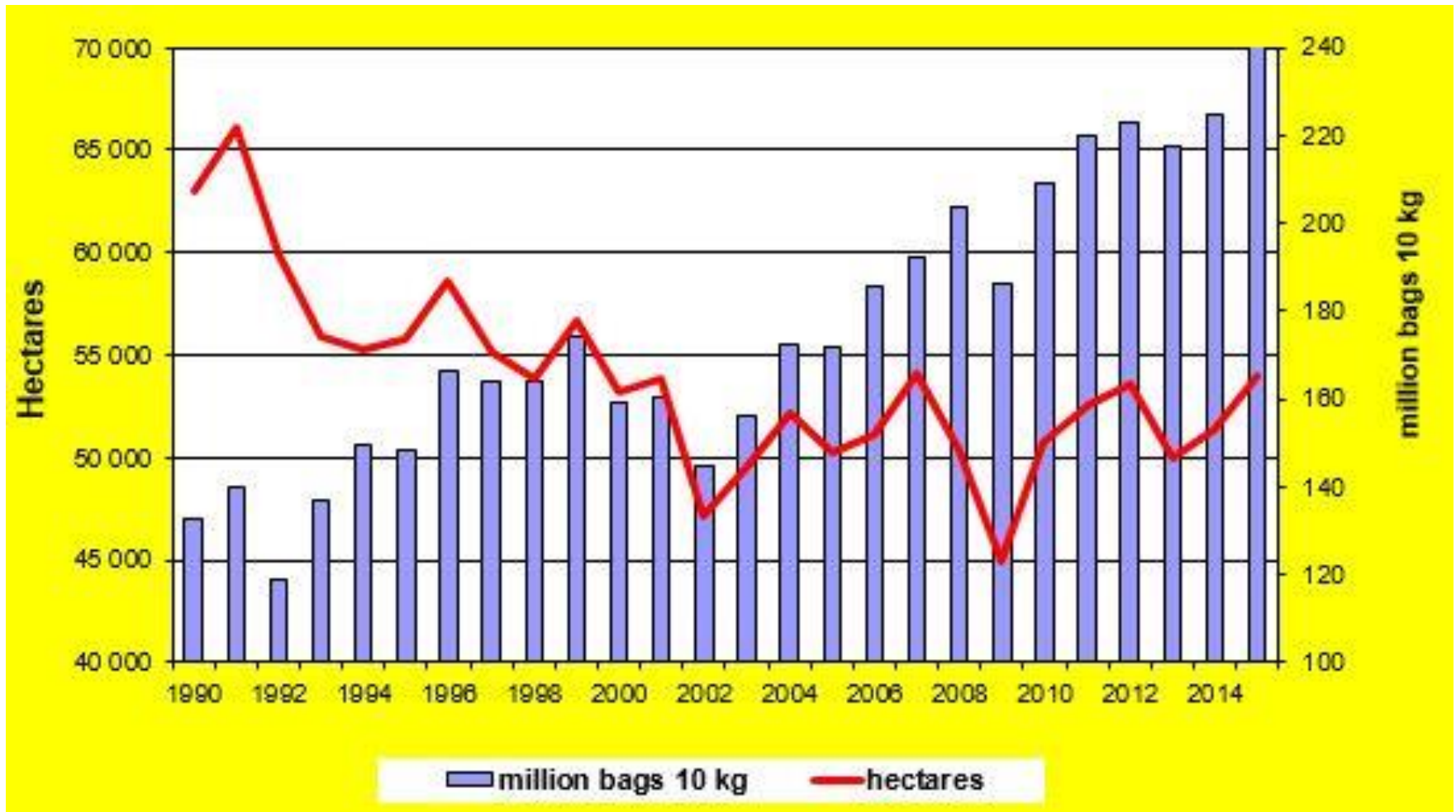
Distribution of total potato crop - 2013 crop year



# Top 10 cultivars on Fresh Produce Markets June 2016



# SA Potato Industry: Hectares and crop size



# Threats to production: Africa

- Farming systems not ideal – subsistence farming on small fields; mixed farming with livestock
- Poor plant nutrition
- Lack of seed certification
- Insufficient grower training
- Limited use of irrigation
- Pests and pathogens
  - Ineffective management programmes (if any)



# Threats to production SA cf. Africa

- Farming systems not ideal – subsistence farming on small fields; mixed farming with livestock
- Good cropping systems
- Rotations >3 years
- Large fields



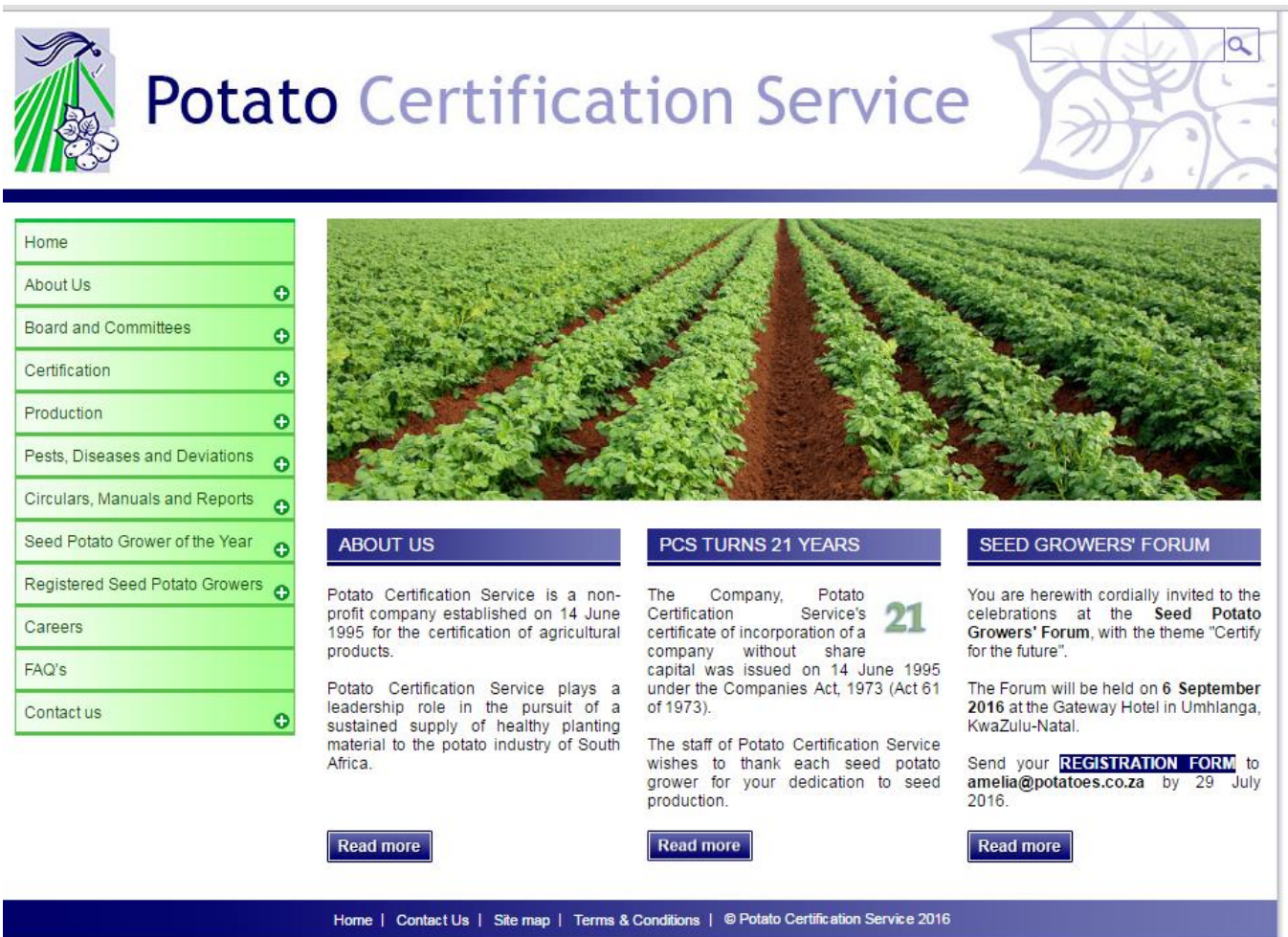
# Threats to production SA cf. Africa

- Poor ~~plant~~ nutrition
- Healthy plants



# Threats to production SA cf. Africa

- Lack of seed ~~certification~~



**Potato Certification Service**

- Home
- About Us +
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- Production +
- Pests, Diseases and Deviations +
- Circulars, Manuals and Reports +
- Seed Potato Grower of the Year +
- Registered Seed Potato Growers +
- Careers
- FAQ's
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**ABOUT US**

Potato Certification Service is a non-profit company established on 14 June 1995 for the certification of agricultural products.

Potato Certification Service plays a leadership role in the pursuit of a sustained supply of healthy planting material to the potato industry of South Africa.

[Read more](#)

**PCS TURNS 21 YEARS**

The Company, Potato Certification Service's 21<sup>st</sup> certificate of incorporation of a company without share capital was issued on 14 June 1995 under the Companies Act, 1973 (Act 61 of 1973).

The staff of Potato Certification Service wishes to thank each seed potato grower for your dedication to seed production.

[Read more](#)

**SEED GROWERS' FORUM**

You are herewith cordially invited to the celebrations at the **Seed Potato Growers' Forum**, with the theme "Certify for the future".

The Forum will be held on **6 September 2016** at the Gateway Hotel in Umhlanga, KwaZulu-Natal.

Send your **REGISTRATION FORM** to [amelia@potatoes.co.za](mailto:amelia@potatoes.co.za) by 29 July 2016.

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# Threats to production SA cf. Africa

- Insufficient grower training
- Good technology transfer – room for improvement



# Threats to production SA cf. Africa

- Limited use ~~of~~ irrigation
- 90% irrigation
  - Better use of irrigation scheduling



# Threats to production SA cf. Africa

- Pests and pathogens
  - Ineffective management programmes (if any)



## Late blight

- Climate not conducive to epidemic development
- Controlled by fungicide spray programmes
- Only A1 present in South Africa (Pule *et al.*, 2013)



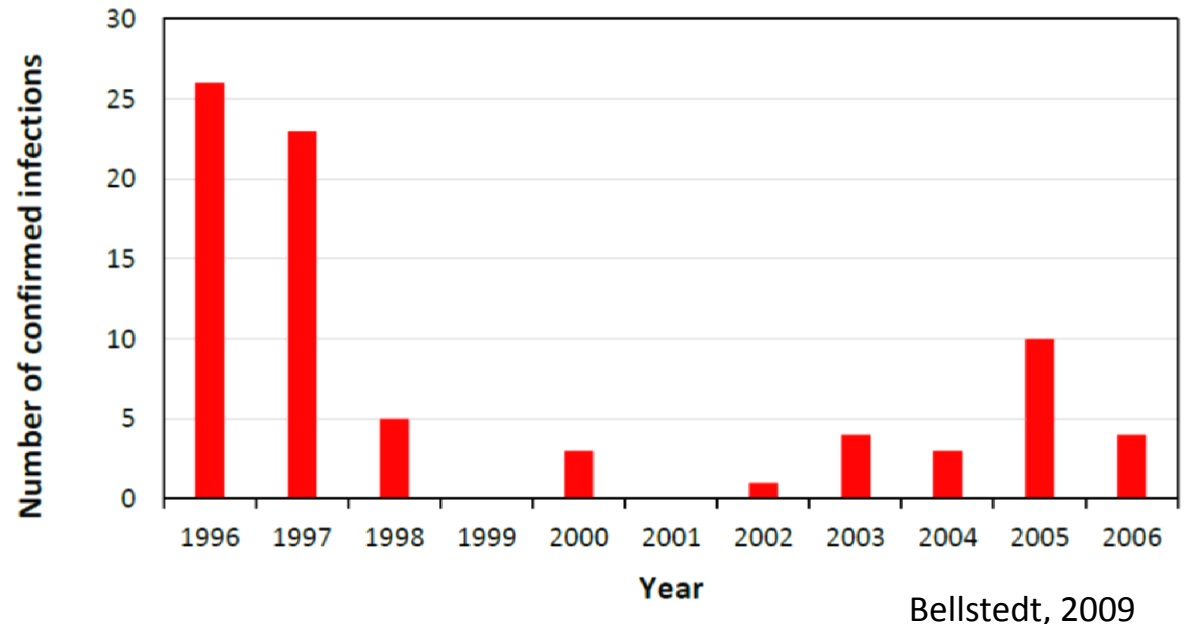
## Early blight

- Climate conducive to disease development
- Controlled by fungicide spray programmes



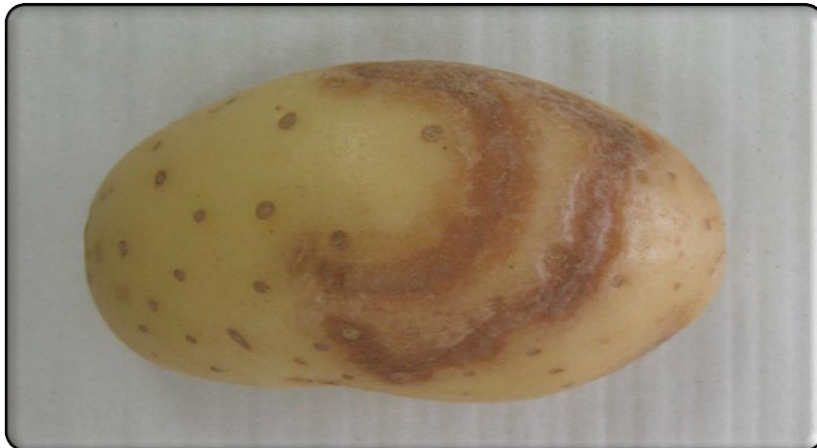
# Bacterial Wilt: A South African Success Story

- 1914-1970: Four incidences of BW
- After 1970: Number of confirmed cases began to rise sharply
- Several research projects launched in early 1990s
- 1995: Establishment of Potato Certification Service (PCS)
  - All registered seed potato plantings tested by ELISA
  - Bacterial Wilt
- *R. solanacearum* industry



# PVY

- PVY<sup>O</sup>, PVY<sup>N</sup> → PVY<sup>NTN</sup>, PVY<sup>N</sup>-Wilga (Visser & Bellstedt 2009)
- Currently not a major problem in SA
  - Seed certification
  - Aphid monitoring
    - Yellow bucket traps
    - Rothamsted Suction Traps



UNIP  
UNIV  
YUN

(K. Krüger)

# PLRV (Bellstedt *et al.*, 2016)

- Steady increase in incidence of PLRV
- High infection rates occur, but PLRV levels of leaves and tubers **below detection limit of ELISA**
- Late infections occur as a result of uninterrupted aphid flight throughout the year
- Advice to growers:
  - Kill off seed crops early to stop late season infection
  - Plant seed crops in cooler seasons or areas to reduce leaf to tuber transmission
  - Monitor and control aphids
  - Grow seed crops in isolation
  - **Plant seed tested by qRT-PCR**



# What are the threats in SA then?

Crop Protection 84 (2016) 44–55



ELSEVIER

Contents lists available at [ScienceDirect](#)

Crop Protection

journal homepage: [www.elsevier.com/locate/cropro](http://www.elsevier.com/locate/cropro)

## Grower perceptions of biotic and abiotic risks of potato production in South Africa

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<sup>b</sup> Department of Soil, Crop and Climate Sciences, University of the Free State, Bloemfontein, 9300, South Africa

<sup>c</sup> Plant Research International, Wageningen University and Research Center, P.O. Box 16, 6700 AA, Wageningen, The Netherlands


# Risk perceptions

- Growers were asked about yield losses caused by
  - pathogens and pests over the past 5 years, and
  - extreme weather events over the past 10 years



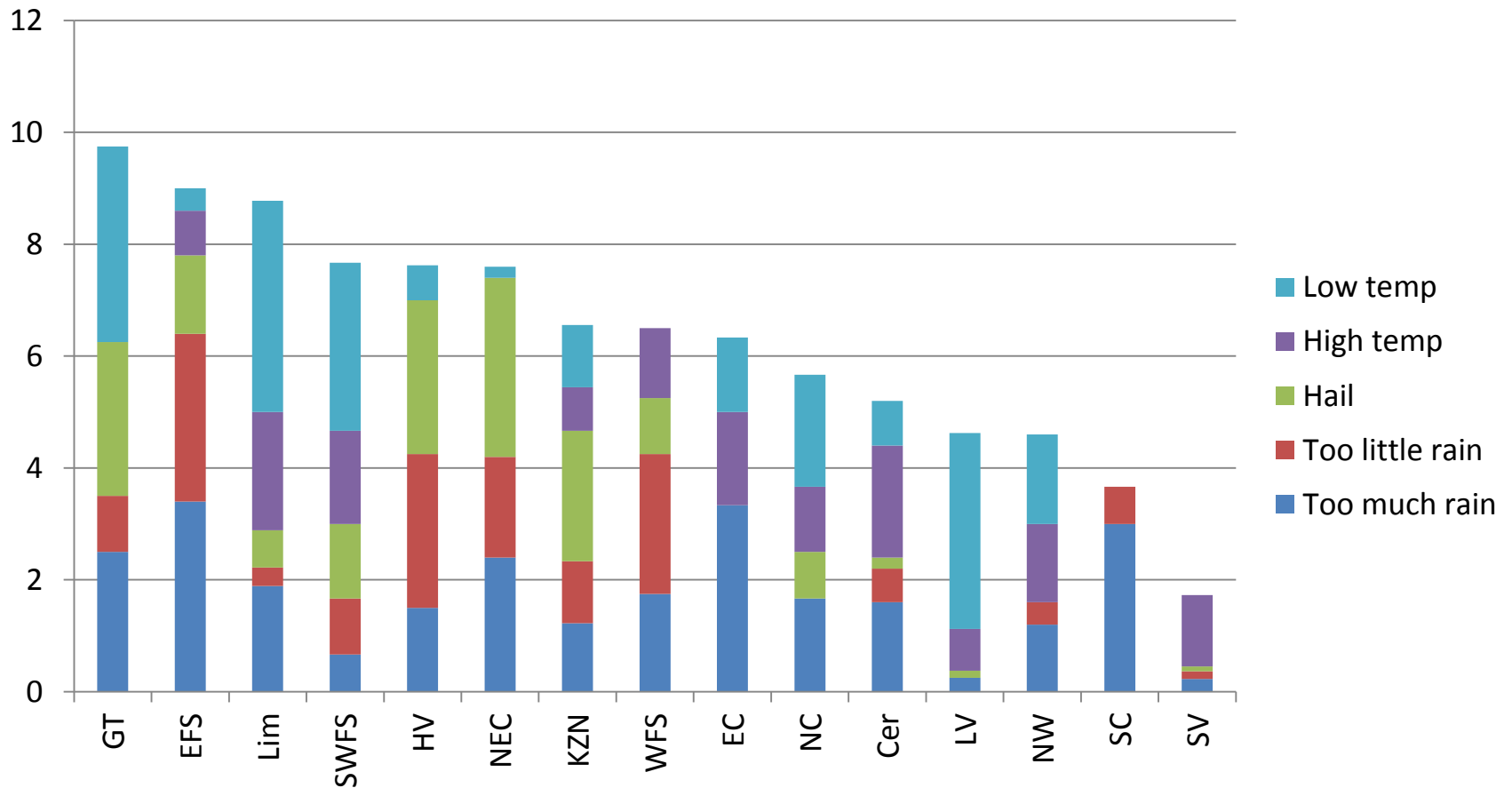


# Risks associated with extreme weather events

Frequency of serious losses over 25 % due to extreme weather events		
Event	Stage	How often in 10 years?
Too much Rain	Planting	
	Growth	
	Harvest	
Hail	Growth	
Too little Rain	Planting	
	Growth	
	Harvest	
Temperature too high	Planting	
	Growth	
	Harvest	
Temperature too low	Planting	
	Growth	
	Harvest	



# Extreme weather events



Cumulative frequency of weather events causing more than 25% crop damage between 2003 and 2012 in potato growing regions in South Africa

# Extreme weather events

- Regional variations expected
- Yields in some regions could be higher if abiotic risks could be avoided or effects thereof mitigated
- Drought vs irregular rainfall
- Shifts in planting dates vs market prices



# Risk perceptions: Pathogens and Pests

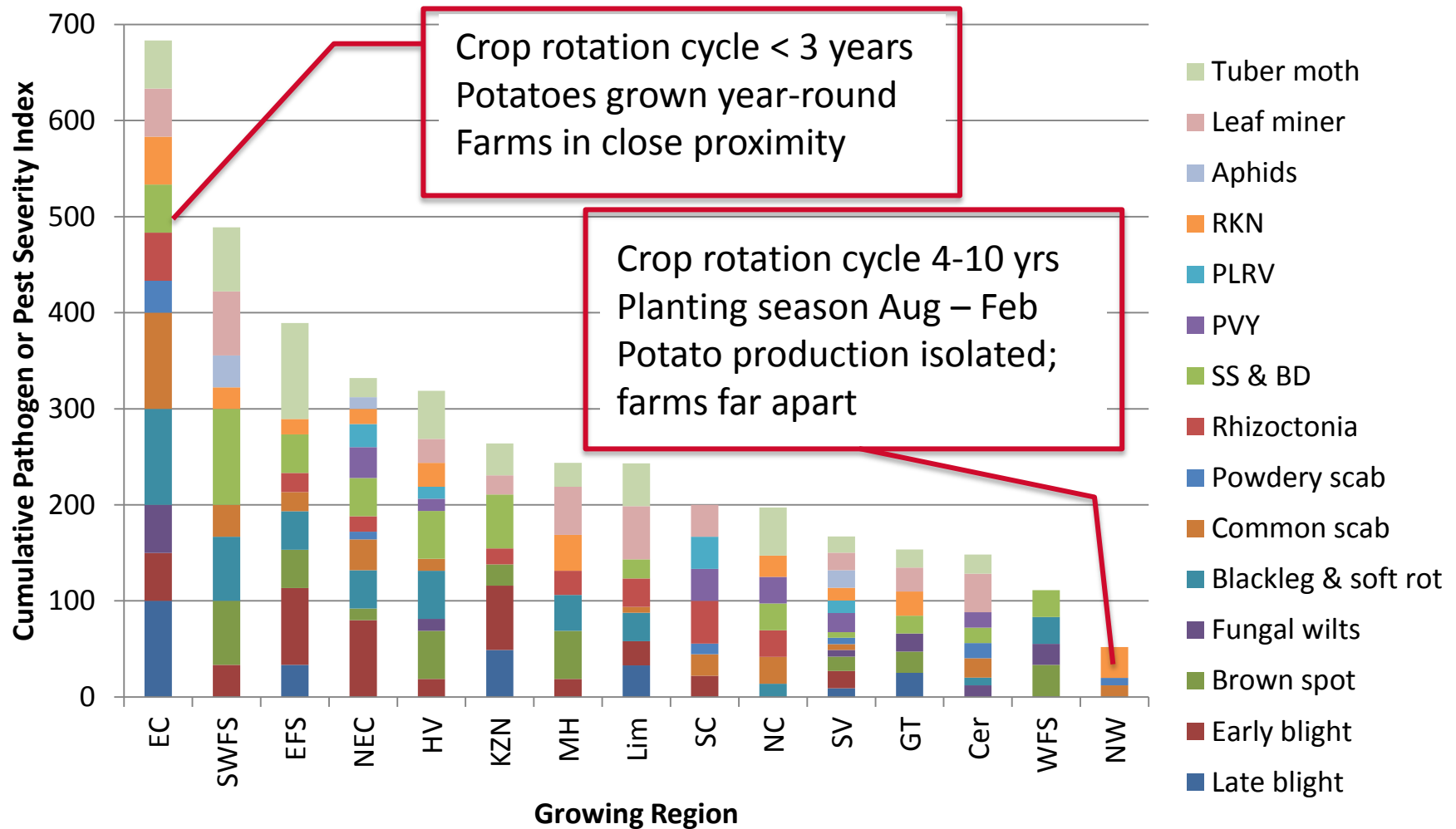
<b>Information about pests and diseases</b>		
<b>Pest or disease</b>	<b>Occurrence Yes / No</b>	<b>Is the average loss <math>&gt;&lt; 3\%</math> per season (if control is applied)</b>
Late blight		
Early blight		
Brown spot		
Wilt caused by fungi (Fusarium / Verticillium)		
Blackleg and soft rot		
Common scab		
Powdery scab		
Rhizoctonia		
Silver scurf and black dot		
PVY		
PLRV		
Root knot nematode		
Aphids		
Leaf miners		
Tuber moth		



# Incidence and Severity Calculations

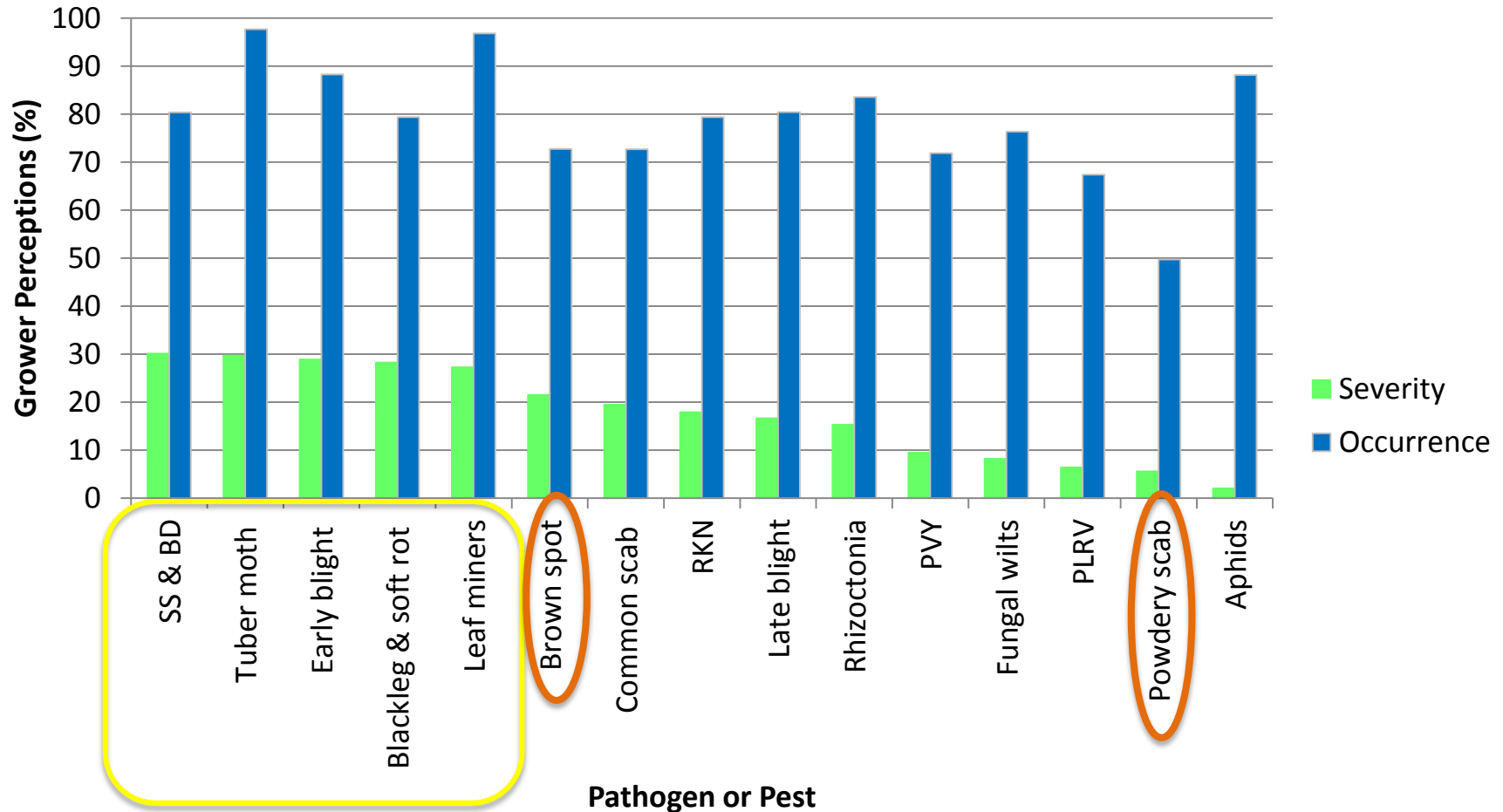
- Incidence = ( $\#$  respondents who reported presence of pest or pathogen on farm / total number of respondents)  $\times$  100
- Severity = ( $\#$  respondents who regarded the yield losses due to the pathogen or pest as more than 3% / total number of respondents)  $\times$  incidence

# Regional pest and pathogen indices



Cumulative pathogen and pest severity indices for the different potato growing regions in South Africa, for the period 2008 - 2012

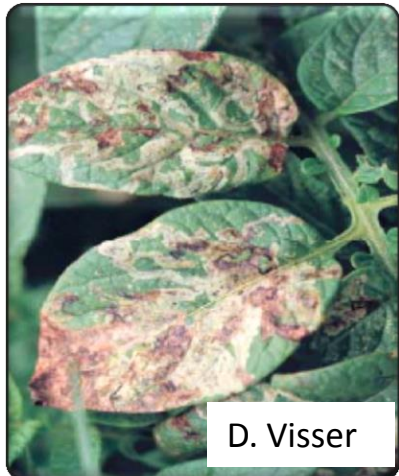
# Grower pest and pathogen perceptions



South African potato growers' perceptions of the occurrence and severity of various diseases and pests on their farms, for the period 2008 - 2012

# Leaf Miner and Tuber Moth

- Perception of importance high
  - Due to ability to identify pests and damage caused?
- Leaf miner numbers in the potato crop increase substantially after harvest of neighbouring vegetable crops



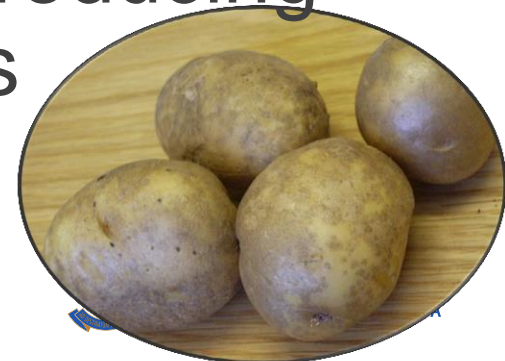
- Communication between growers
- Better timing of insecticide sprays





# Silver Scurf and Black Dot

- Both diseases have been increasing in importance globally (Errampalli *et al.*, 2001; Lees and Hilton, 2003)
- Ware potatoes not commonly kept in cold storage in SA but
  - Sometimes left in soil for extended periods before harvest
  - Heavy, moist soils in some regions prevent early lifting
- **Perceptions** of losses in seed producing regions higher than actual losses



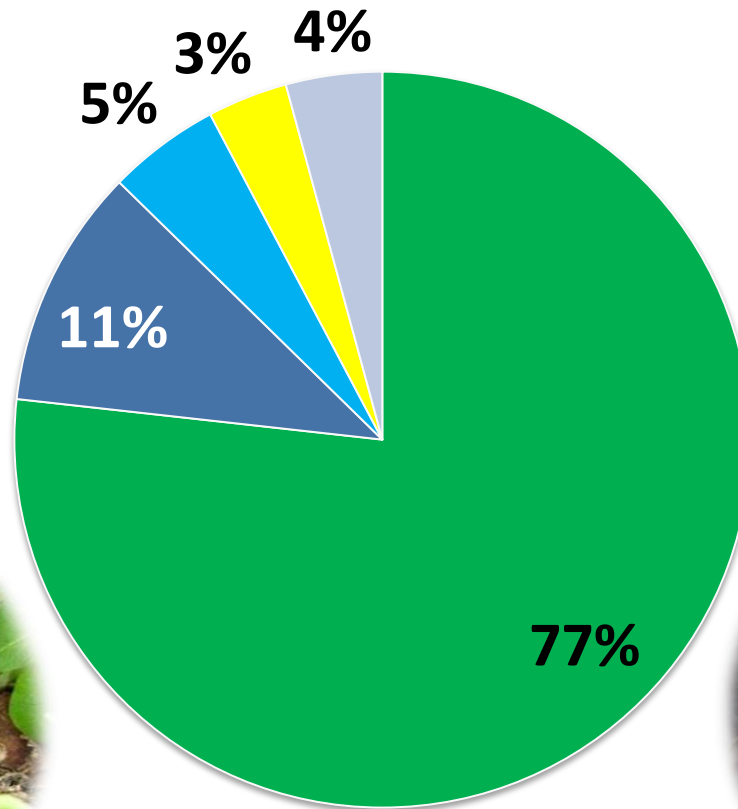
# Blackleg and Soft Rot

- Main causal agent in SA: *Pectobacterium carotovorum* subsp. *brasiliense* (van der Merwe *et al.*, 2010)
- Management!!
  - Technology transfer / grower education critical



# Species distribution 2006 - 2010

■ Pcb ■ Pcc ■ Pcc / Pcb ■ Dd ■ Unknown



# Species distribution 2011-2013

■ Pcb   
 ■ Pcc   
 ■ Pcb/Pcc   
 ■ Pecto spp   
 ■ Dd   
 ■ Pw

Permitted plants permissible/ toelaatbare plante	
DISEASE/SIEKTE	
ERWINKIA/BAKTERIEË	
<i>Pectobacterium carotovorum</i> <i>Pectobacterium atrosepticum</i> <i>Dickeya dadantii</i> *ERWINIA WILT, BLACKLEG/ *ERWINIA VERWELK, SWARTSTAM	
0	



# Early Blight vs. Brown Spot



- *Alternaria solani* (van der Waals *et al.*, 2001)
- Controlled with fungicides
- Easily identified



- *Alternaria alternata* (van der Waals *et al.*, 2011)
- Increased in intensity over last 10-15 years
  - G143A mutation = Reduced sensitivity to Qol fungicides (Dube *et al.*, 2014)
  - **Often misdiagnosed or treated too late**
  - **Grower education!**



# Powdery Scab

- Steadily increasing over past decade in SA
- Underestimated and misdiagnosed
- Seed inspectors do not use AgriStrips to distinguish between common and powdery scab when unsure
- Long term survival of resting spores in soil



# Other Challenges



- Porcupines
- Baboons
- Theft
  - Potatoes
  - Cables



# Conclusions

- Diseases can be managed!
- Never enough grower training
- Revisit certification scheme
- Monitoring of pathogen populations required



# Acknowledgements

- Linus Franke, Anton Haverkort, Martin Steyn
- Potatoes South Africa
- EAPR Pathology 2016 Conference Organising Committee

