Disease epidemics in Queensland and the influence of varietal dominance on their development

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Two things are certain in life

- death and taxes

But wait, there are actually 3!

- death, taxes and disease epidemics!!

Long history of epidemics in Australia

- Series of epidemics has occurred over the years,
  - **right from industry beginnings**



Just kidding!

Major Australian diseases

Disease	Region	Time period	Variety(s)
Fiji leaf gall	Bundaberg-Isis	1970s-early 1980s	**NCo310**
Eye spot	Northern	Mid-1970s	**Q101**
Leaf scald	Burdekin	Late-1970s	**Q63**
Pachymetra root rot	Northern	1970s-early 1980s	**Q83, Q90**
Brown rust	Northern	Late 1970-early 1980s	**Q90**
Orange rust	Herbert, Central, Southern	2000-2001	**Q124**
Smut	Herbert, Central, Southern	Late 2000s	**Various**

Disease	Disease management strategies
Fiji leaf gall	Crop inspections, roguing; termination badly diseased crops; disease-free planting material; resistant varieties
Pachymetra root rot	Resistant varieties, Soil assay
Brown rust	Resistant varieties
Eye spot	Monitoring; discard Q101
Orange rust	Emergency transfer R varieties; resistance screening; fungicides; resistant variety acceleration
Leaf scald	Disease-free planting material; resistant varieties; S crop termination, compulsory plant source inspections; CSLHWT; compulsory disease-free seed cane
Smut	Emergency transfer R varieties; resistant varieties; disease-free seed cane; termination diseased crops

Disease control

- There are many forms of management
- but the most important control measure in Australia

Is **varietal resistance!**



This paper



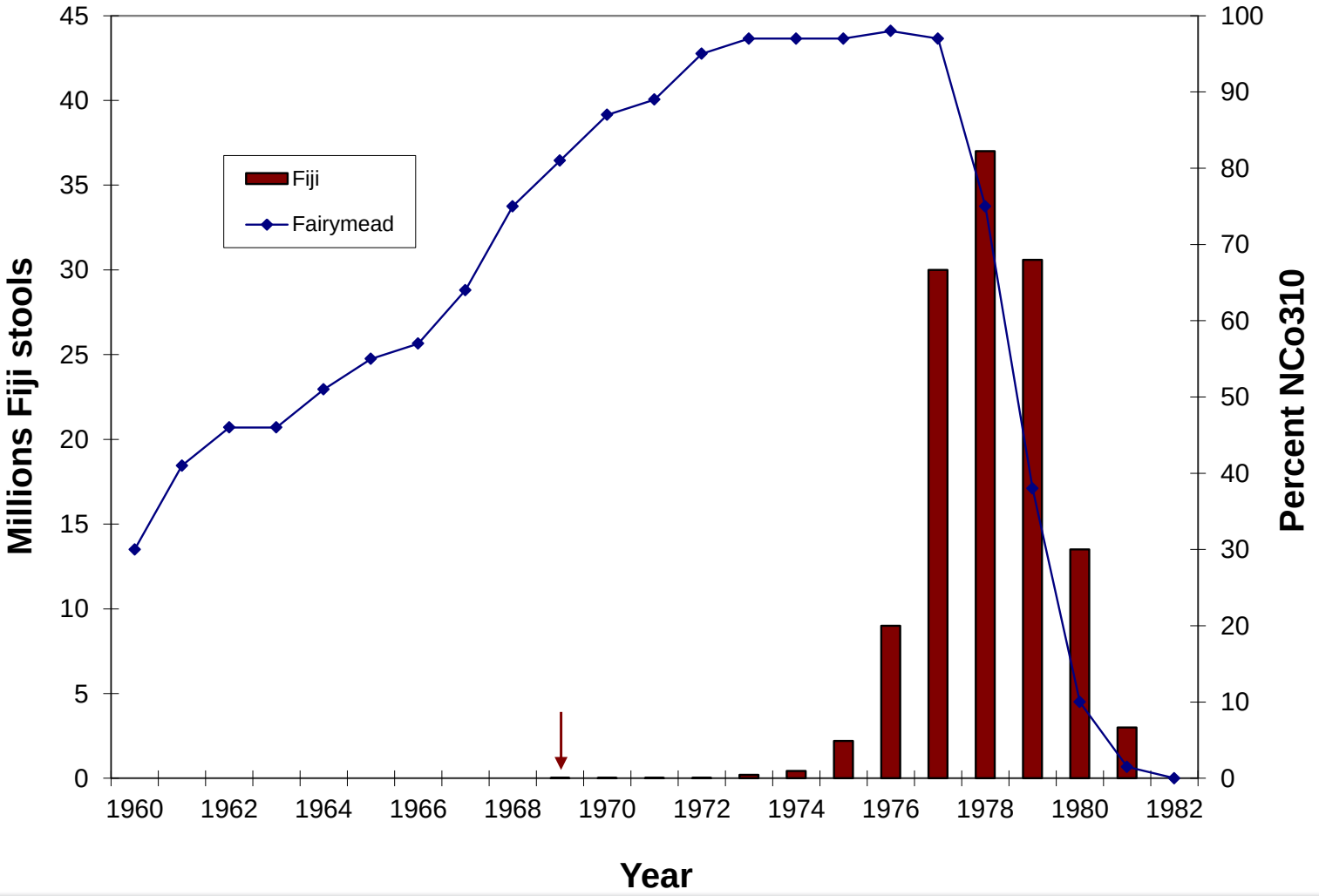
Will explore factors that influence the epidemics

- **Specifically % of mill area planted to a single variety**
- **Plotted area with susceptible variety**

Fiji leaf gall

Late 1970s-early 1980s



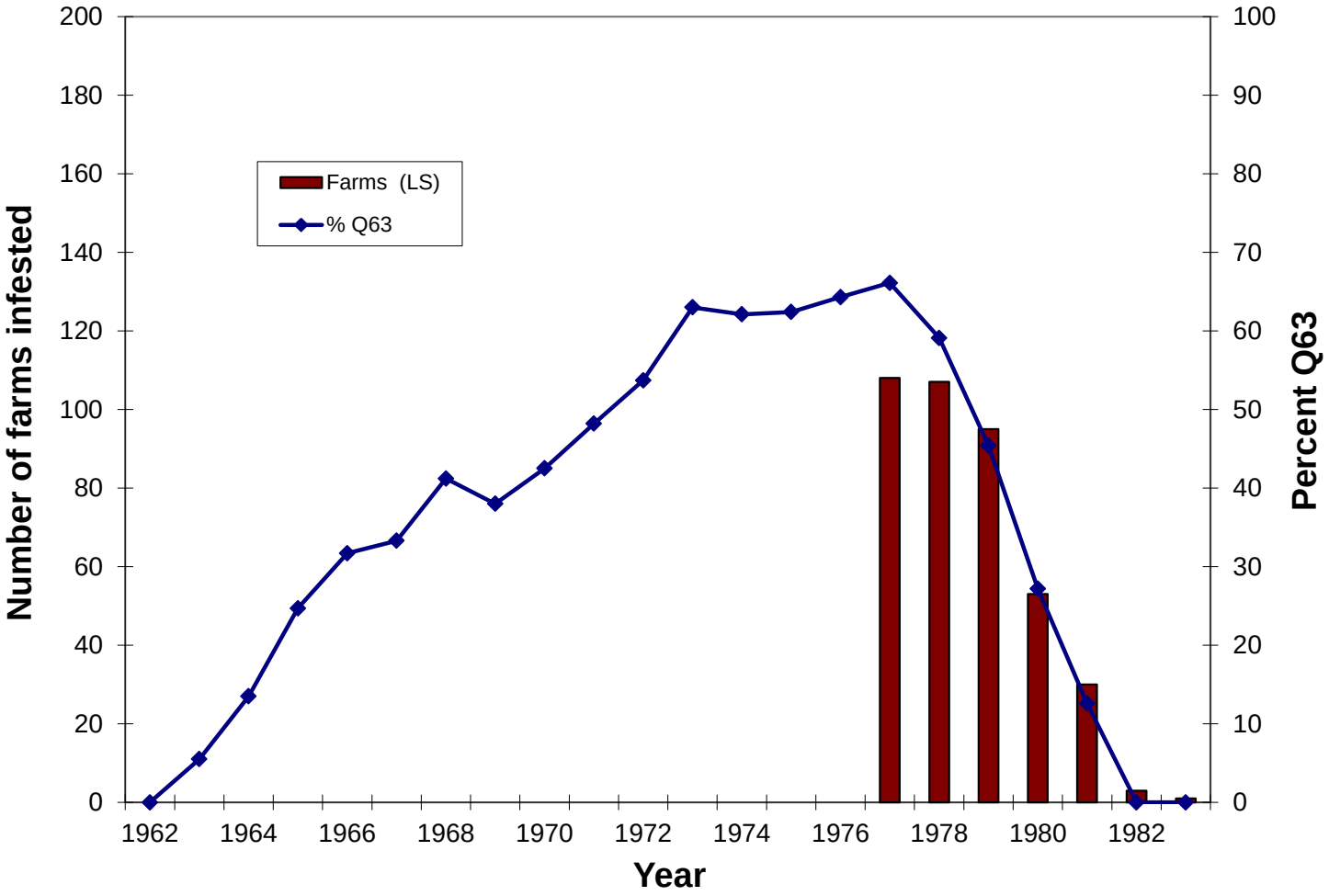

Millions Fiji stools
Percent NCo310
Year
Fiji
Fairymead
0
5
10
15
20
25
30
35
40
45
0
10
20
30
40
50
60
70
80
90
100
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982

Leaf scald

Mid-1970s

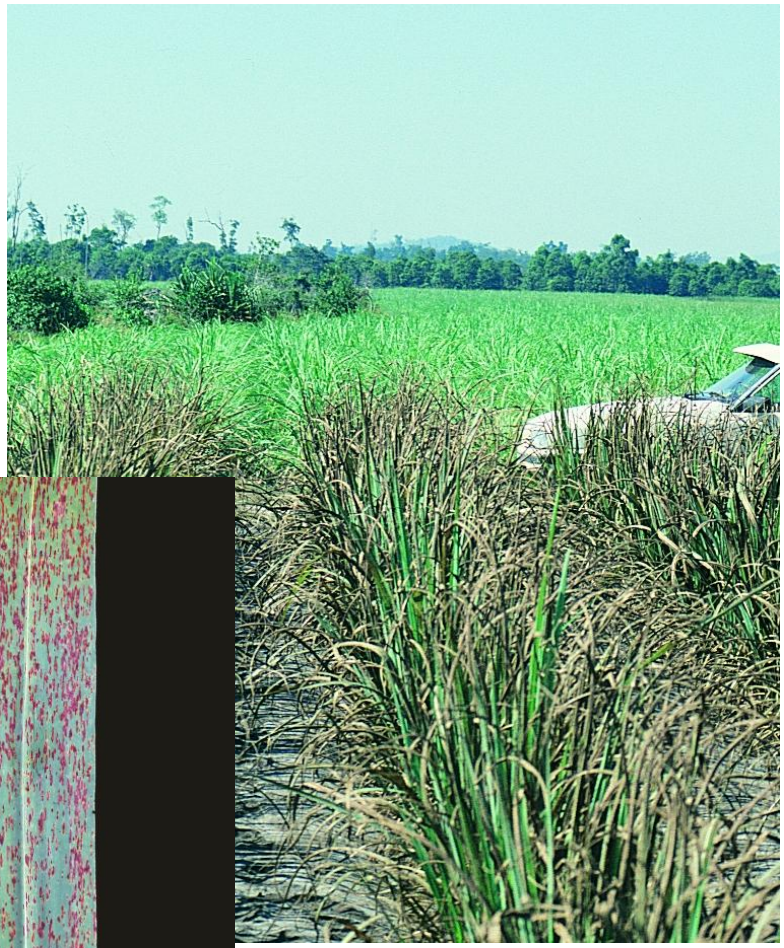


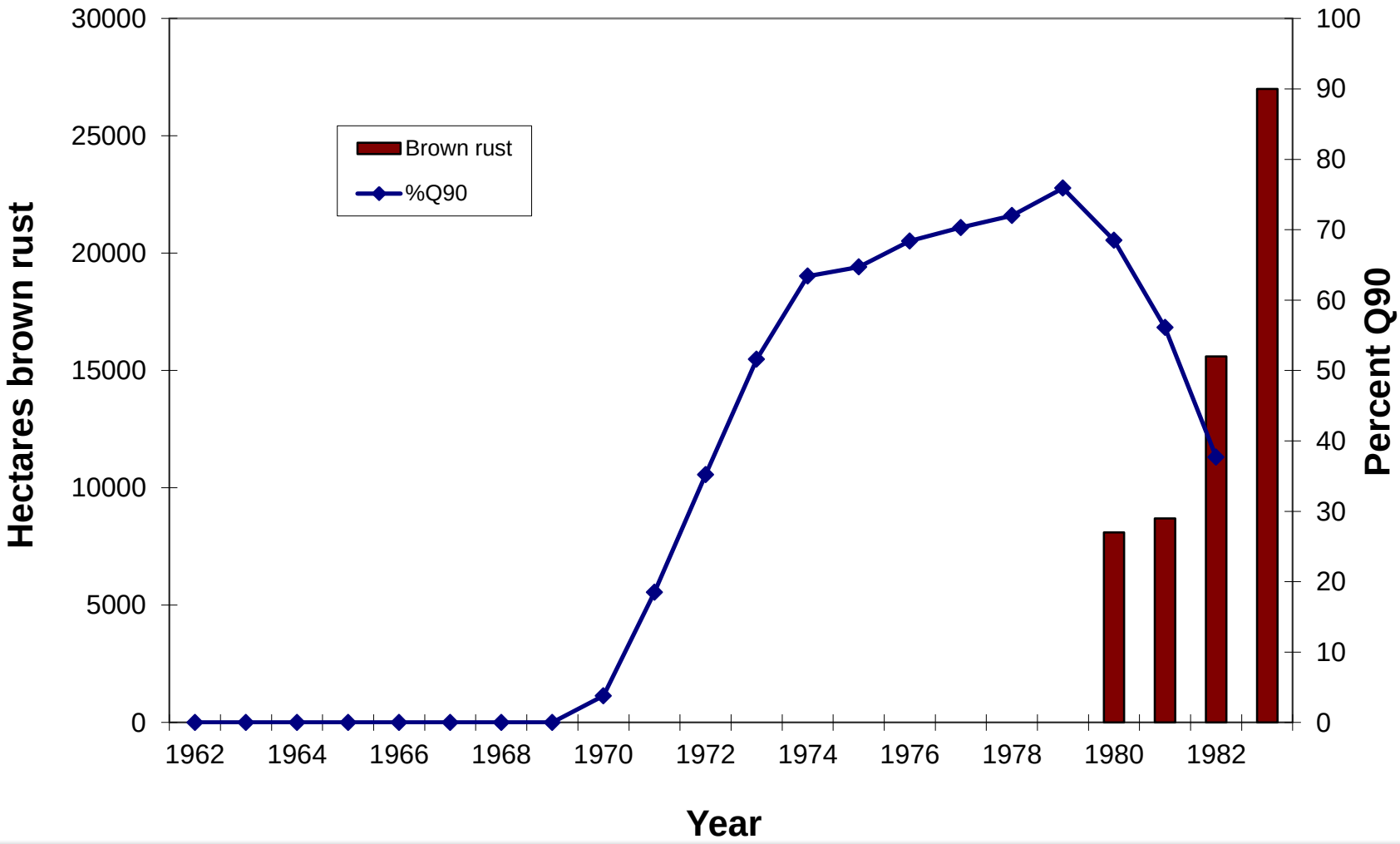



Number of farms infested
Percent Q63
Year
Farms (LS)
% Q63
200
180
160
140
120
100
80
60
40
20
0
100
90
80
70
60
50
40
30
20
10
0
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982

Brown rust

Late 1970s



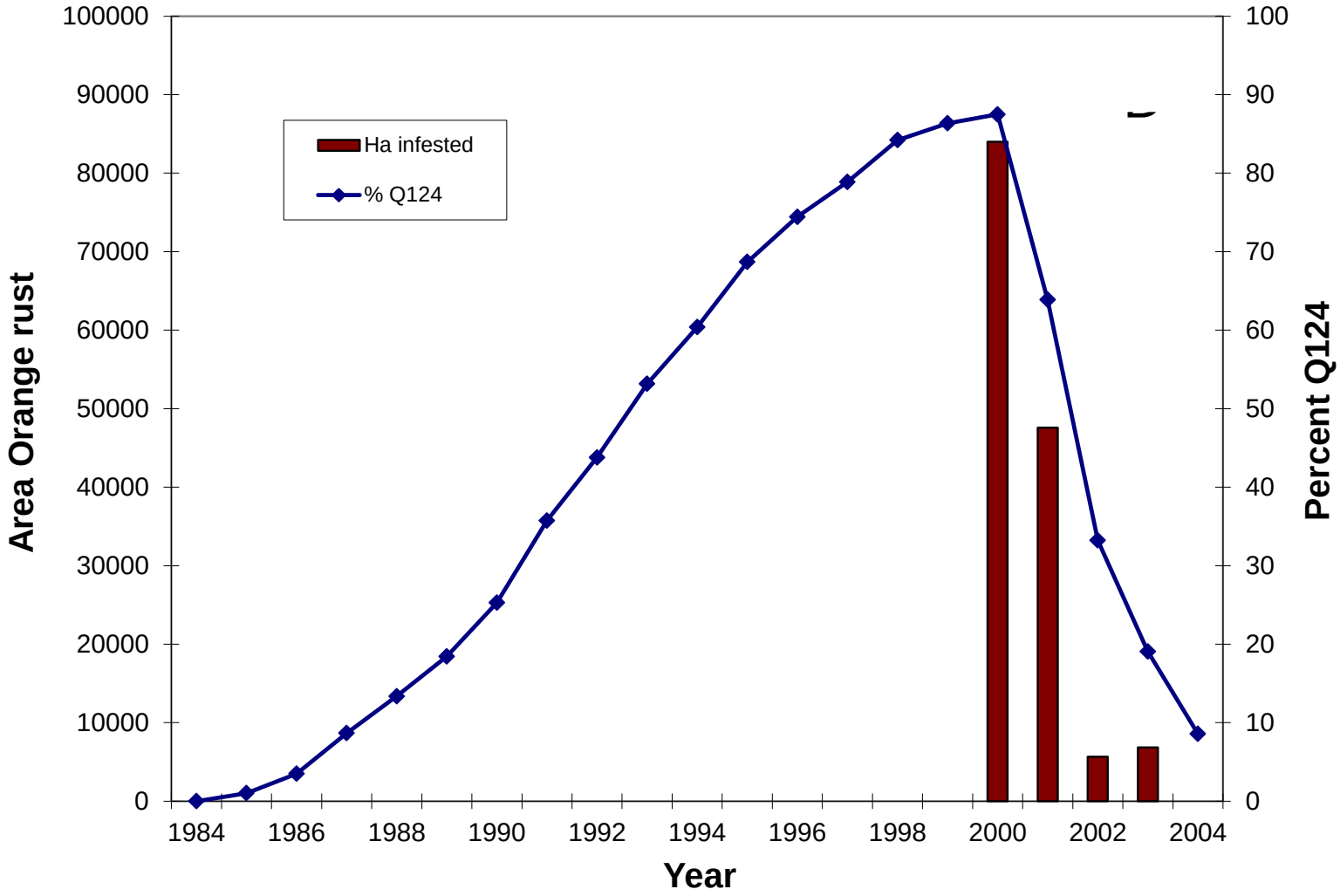

Hectares brown rust
Percent Q90
Year
Brown rust
%Q90
30000
25000
20000
15000
10000
5000
0
100
90
80
70
60
50
40
30
20
10
0
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982

BSES
Sugarcane for the future

Orange rust

Early 2000s

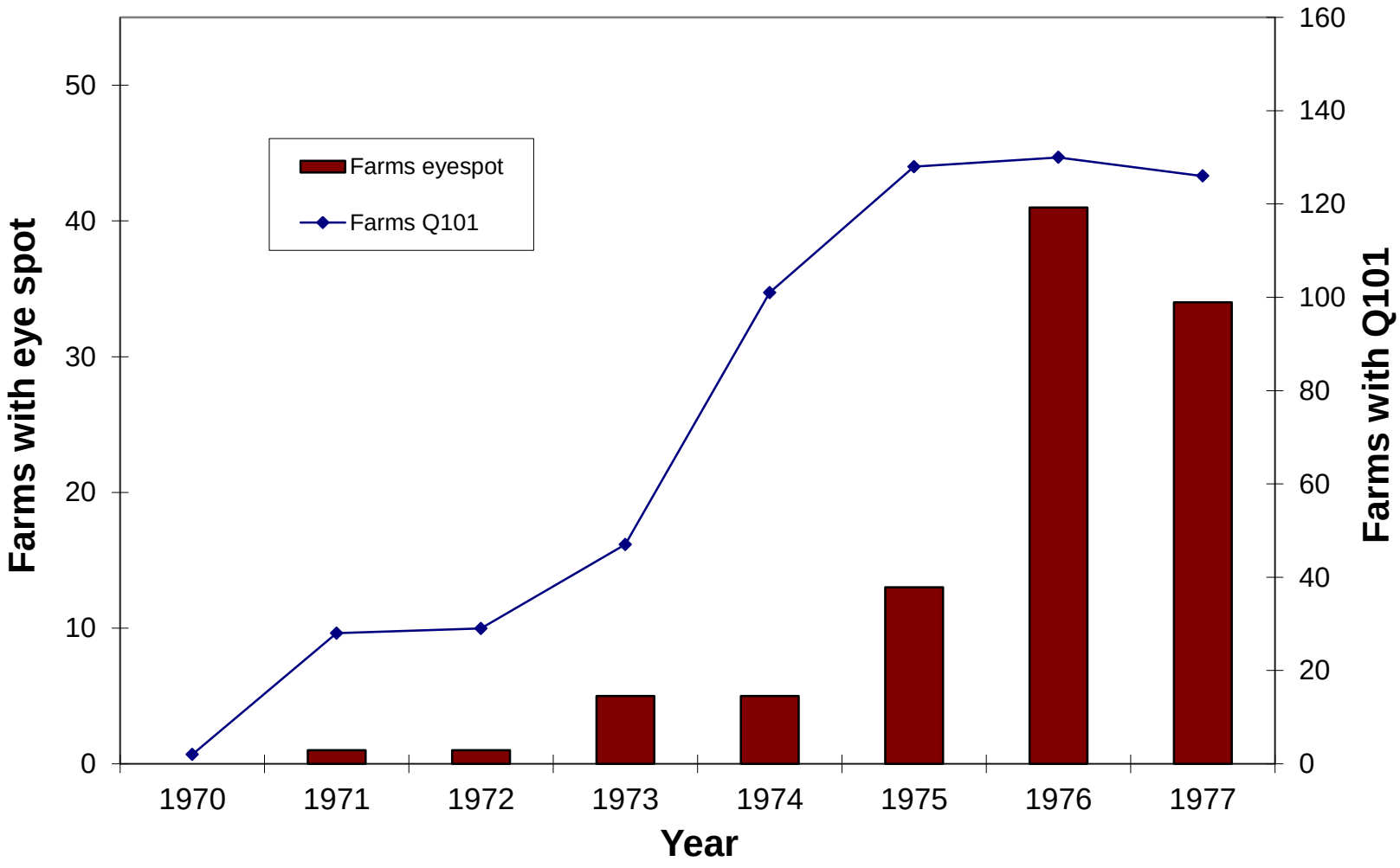



Ha infested
% Q124
Area Orange rust
Percent Q124
Year
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
100
90
80
70
60
50
40
30
20
10
0
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004

Eye spot

Early 1970s




Farms with eye spot
Farms with Q101
Year
Farms eyespot
Farms Q101
0
10
20
30
40
50
0
20
40
60
80
100
120
140
160
1970
1971
1972
1973
1974
1975
1976
1977

Growing one variety

- **Huge increase in risk**
- **Almost every time – epidemic develops**



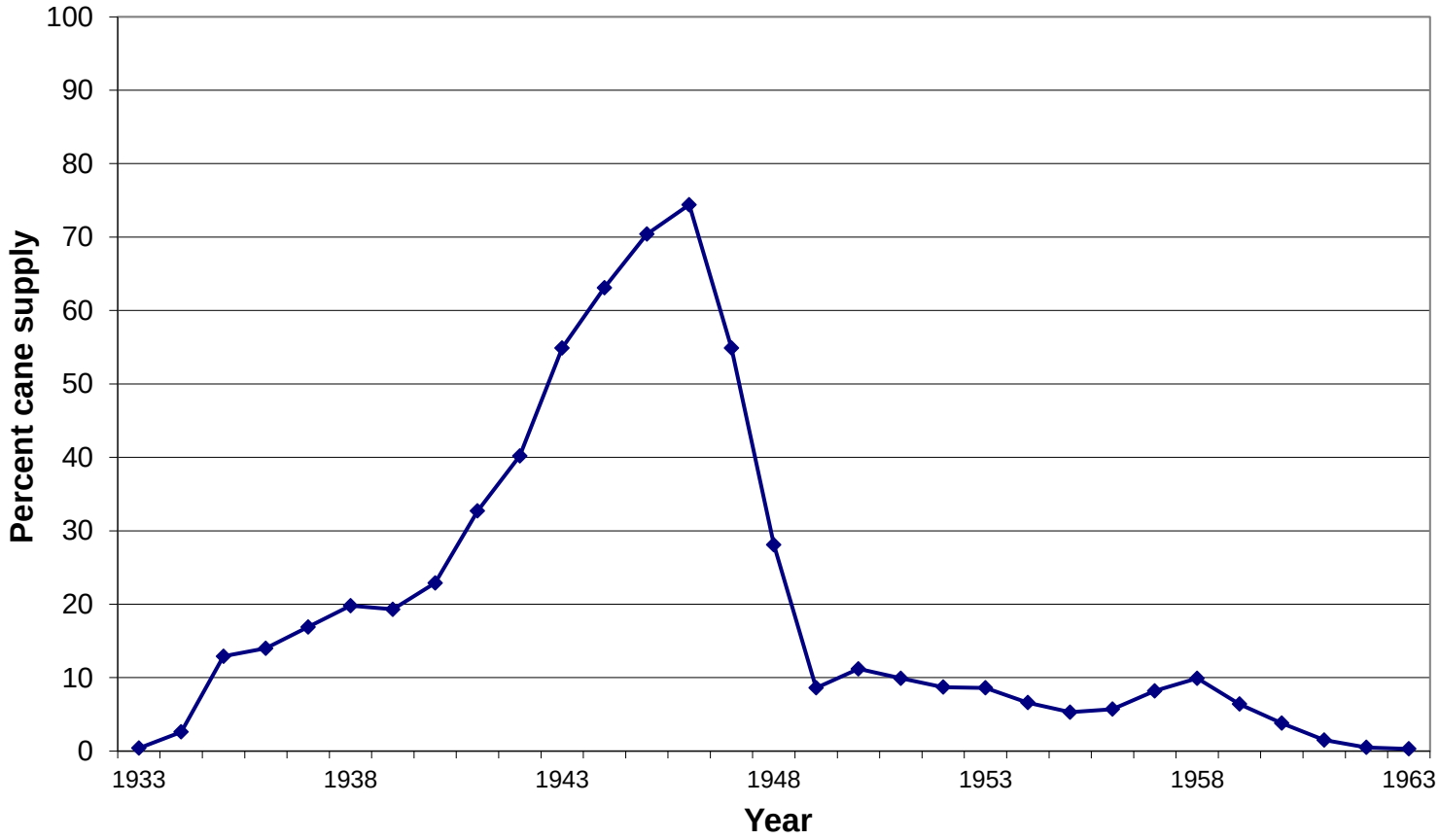
Preventing an epidemic

Variety SJ4: **Mossman Mill (1947)**

- **SJ4 susceptible to gumming disease**
  - **Serious bacterial disease, now eradicated from Australia**
- **Pre-emptive measure to prevent development**
  - **used legislation to eliminate variety (no further planting allowed)**



SJ4 Mossman mill area



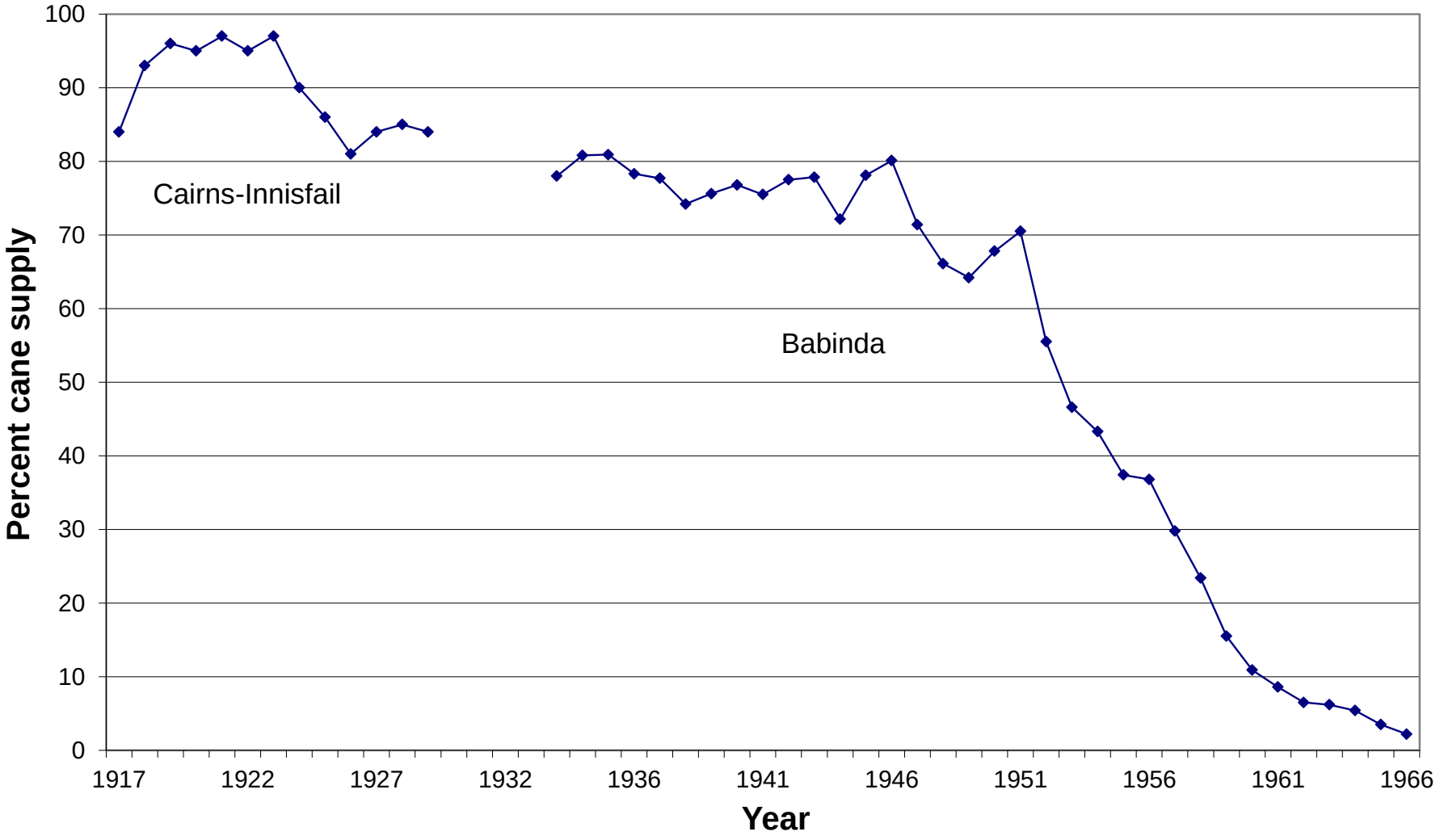
Single variety – does not always lead to an epidemic

NG15 (syn: Badila)

- Northern Mill areas: Innisfail-Babinda / Cairns
- Very popular
- Grown for long period
  - Some difficulty accessing such old mill records

Monoculture does not always lead to an epidemic!




Percent cane supply
100
90
80
70
60
50
40
30
20
10
0
Cairns-Innisfail
Babinda
1917
1922
1927
1932
1936
1941
1946
1951
1956
1961
1966
Year

Badila

Reasons

- Relatively small area?
- Something about germplasm?
- Less production pressure?



Conclusions

- **Beware: variety monoculture provides a high epidemic risk!**
- **Many examples illustrate this effect**
- **Losses from epidemics can be severe**
- **If high yielding variety – maybe economic advantage to go for high % area**
- **What's our next disease?**

