

# Demand for farmland in the Breede River Valley



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Landscape Initiative Knowledge Exchange

Slanghoek, 25 November 2010



# WORK PLAN

- How the concept of demand applies (1)
- Theory (15)
  - Demand
  - Profits, inputs & outputs, gross vs. net
  - Opportunity cost
  - Net present value (NPV)
  - Deflating
  - Discounting
- Worked example (5)
- District-level demand (9)
- Conclusions (2)

# How the concept of demand can help

- Demand = willingness to pay
- i.e. a summary of economic pressures on the environment
- Might explain why farmers plough illegally
- Efficient conservation

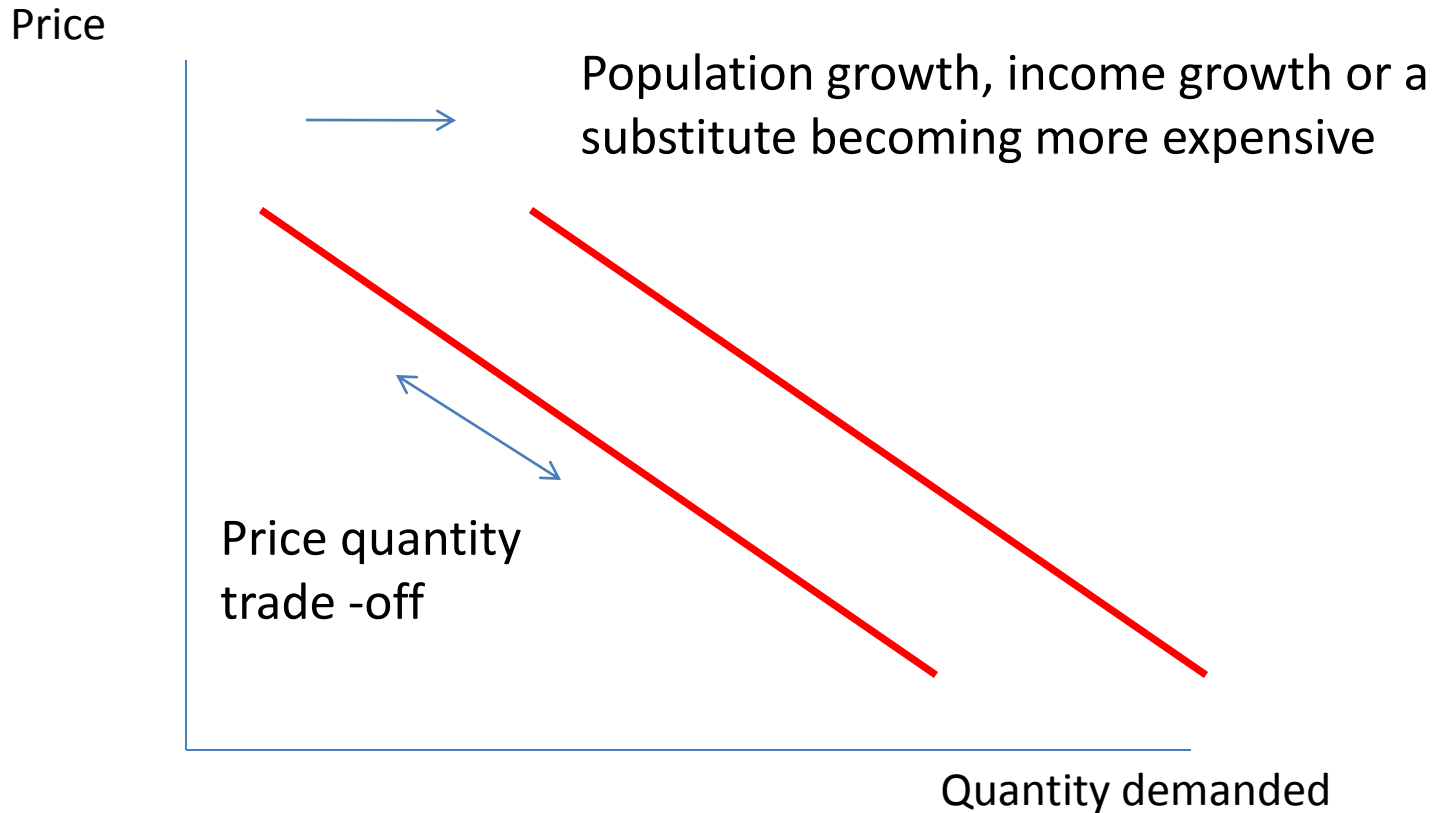
# **THEORY**

Howe, WC. 1985. Economic, legal and hydrological dimensions of potential interstate water markets. *AJAE* 1226-1230

# Consumer demand

- Behavioural assumption that more is better
- If the price goes up we buy less,
- we prefer cheaper alternatives (except for status symbols),
- and we really only buy Christmas trees in December (seasonality)
- We are budget constrained
- If our incomes rise we buy more
- If there are many of us with large salaries, demand grows and the economy grows (population)

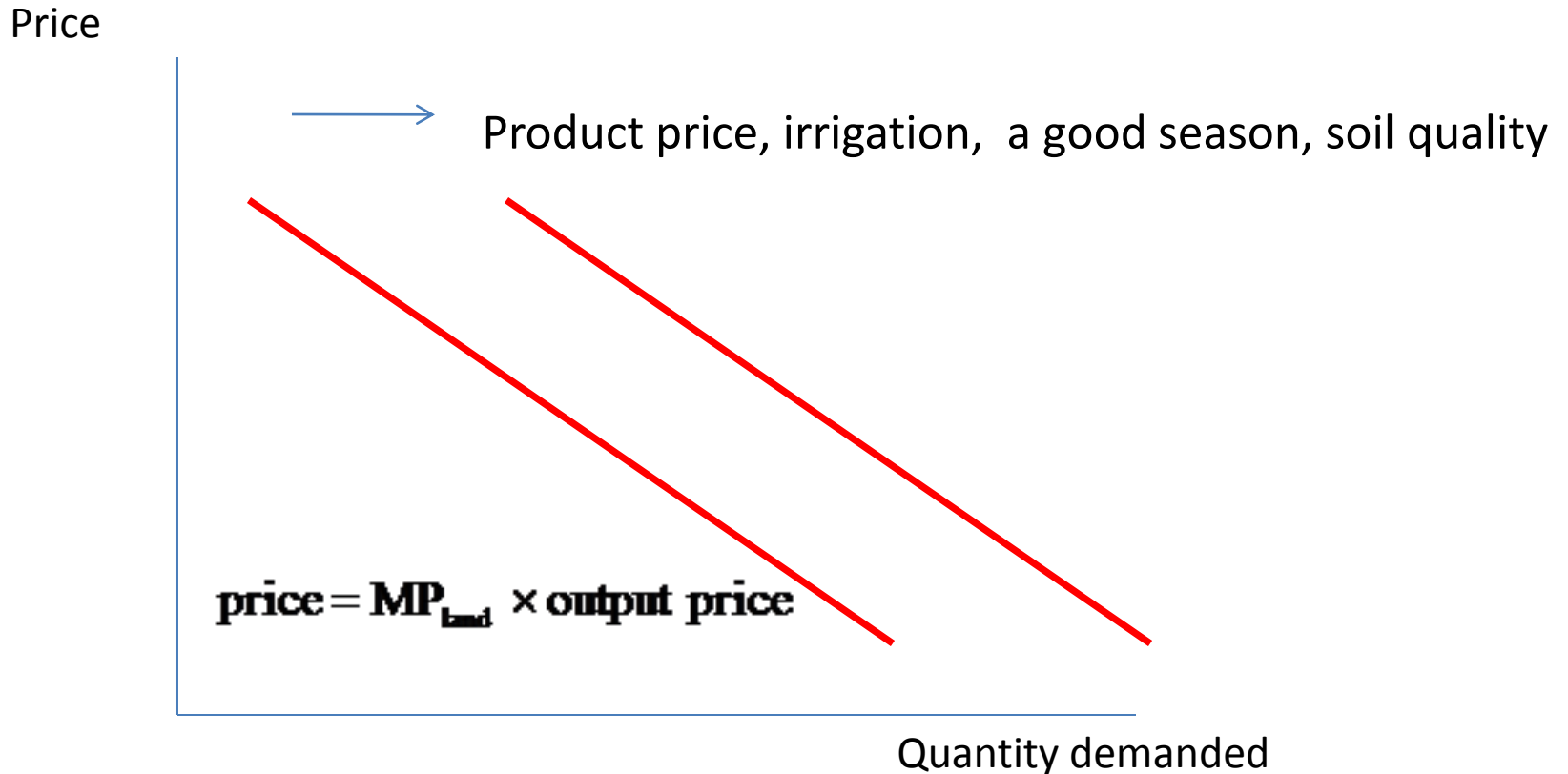
# Demand curve



# Input demand (factors of production)

- Behavioural assumption: Firms maximise profits (by controlling costs)
- If product prices rise, firms produce more & use more inputs
- Firms source the cheapest inputs of suitable quality
- Firms with higher productivity use less input per unit of output than firms with low productivity
- Technological progress is productivity enhancing (land or labour)

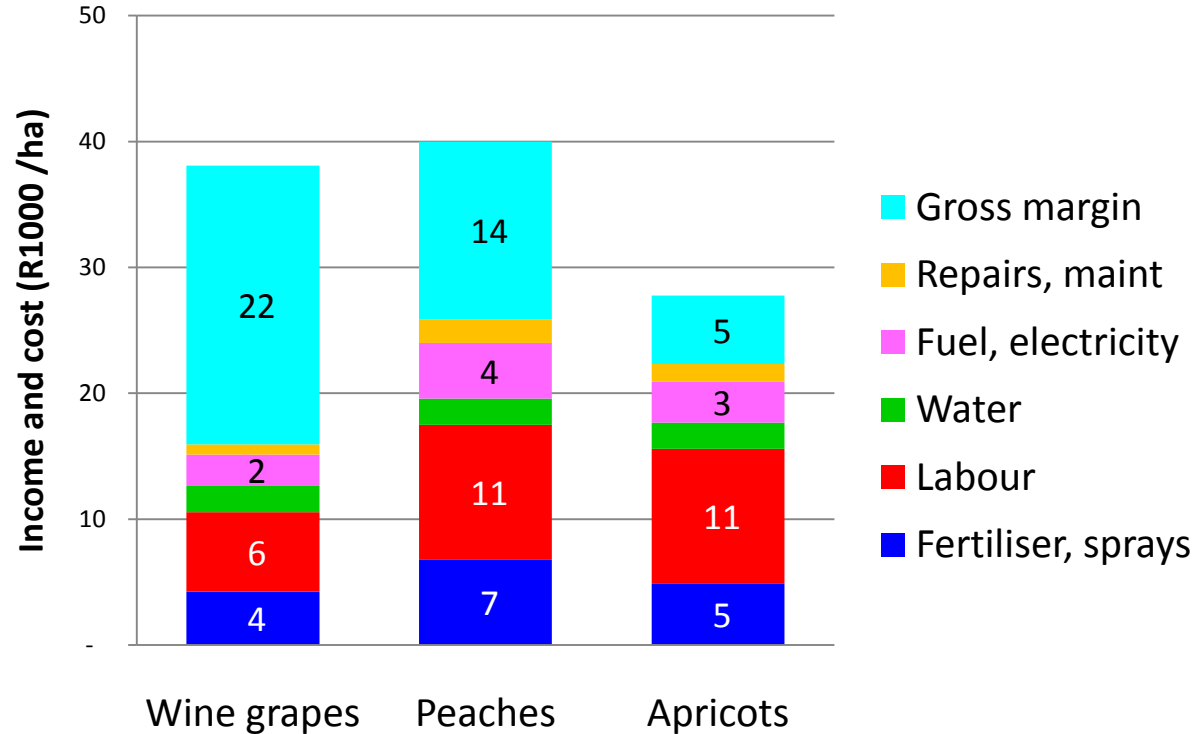
# The demand for land



Marginal product (MP) = output from an extra unit of land

# Inputs outputs, gross & net income

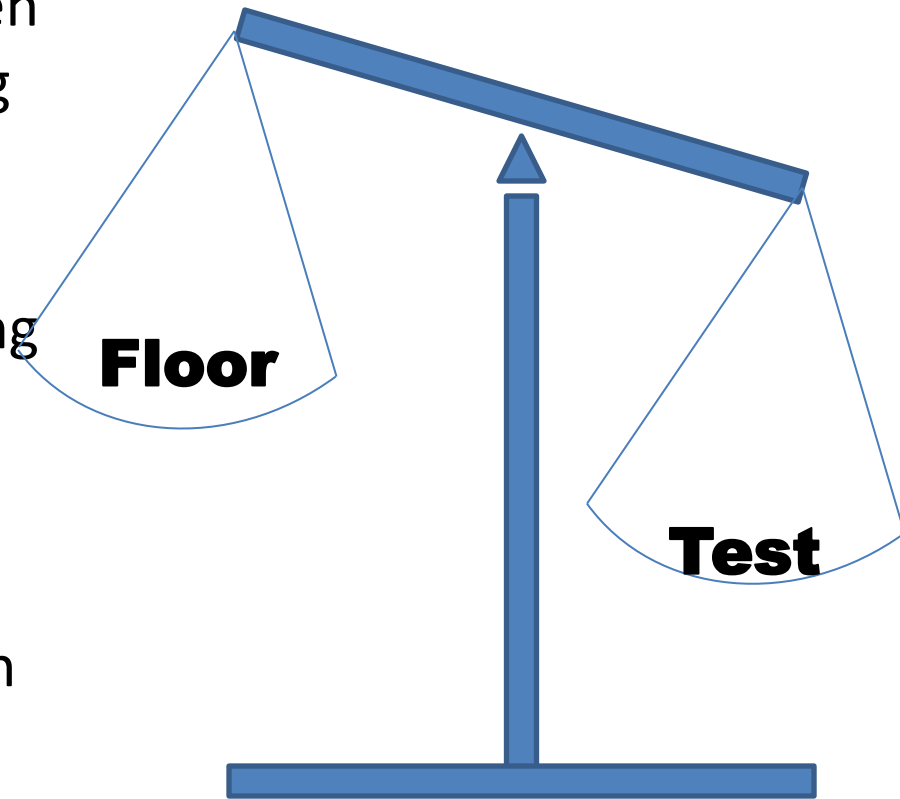
- Profit = Income – costs = gross margin = net income



Enterprise budgets

# Opportunity cost

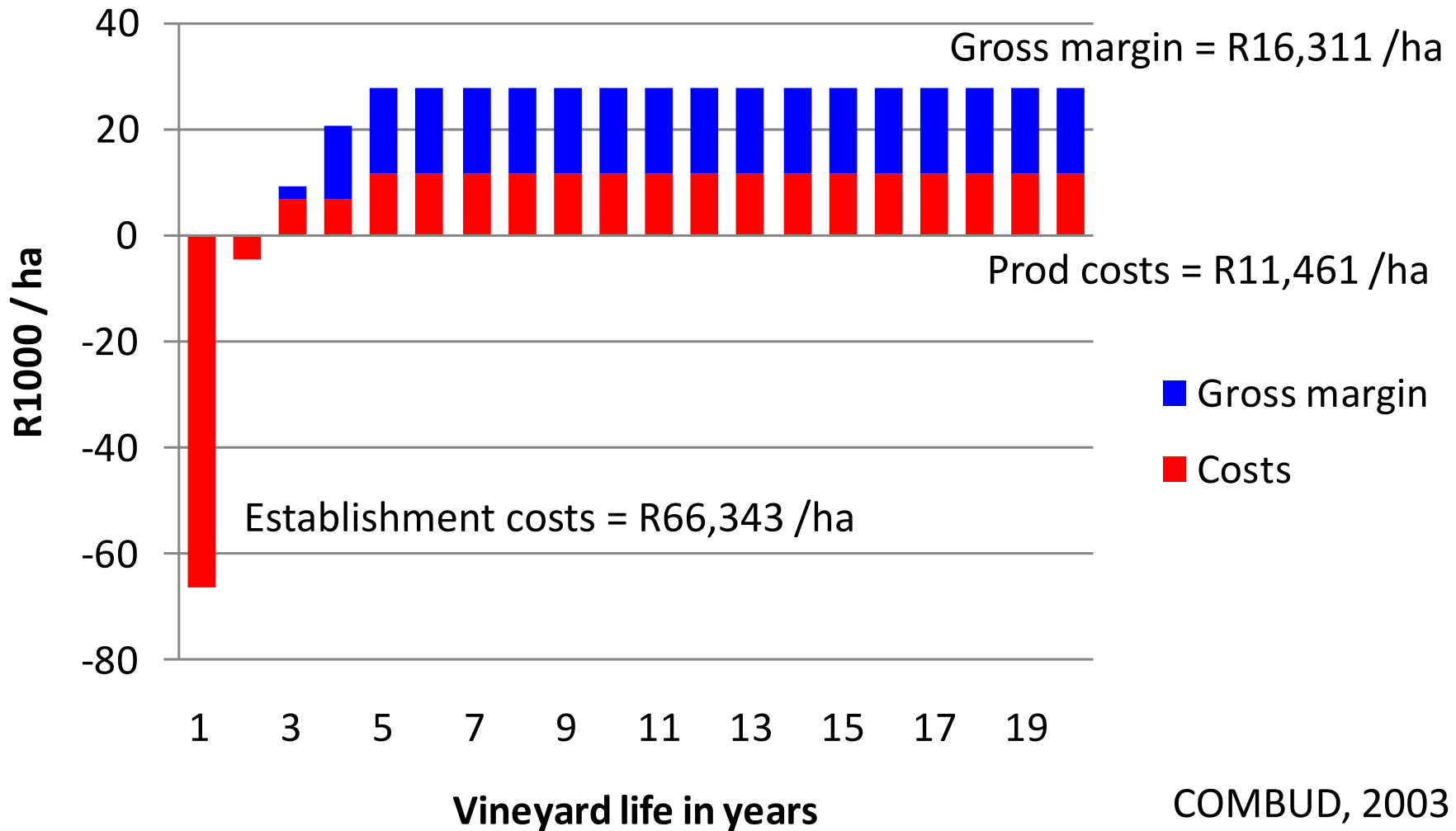
- A student must choose between studying for a test and cleaning the bathroom floor
- The opportunity cost of studying for the test is not being able to clean the floor
- Opportunity cost is central to cost benefit analysis (CBA)
- A farmer must choose between planting peaches and grapes;
- The opportunity cost of planting grapes is the forgone income of not planting the peaches



# Net present value (NPV)

- Projects of more than one year
- Is it sensible to buy a house for R780,000 and rent it out for R6,000 per month?
- Is it sensible to spend R150,000 if that vineyard will produce an income of R32,000 (gross) for 10 years?
- Feasible projects:  $NPV > 0$

# Picture of NPV



# Inflation

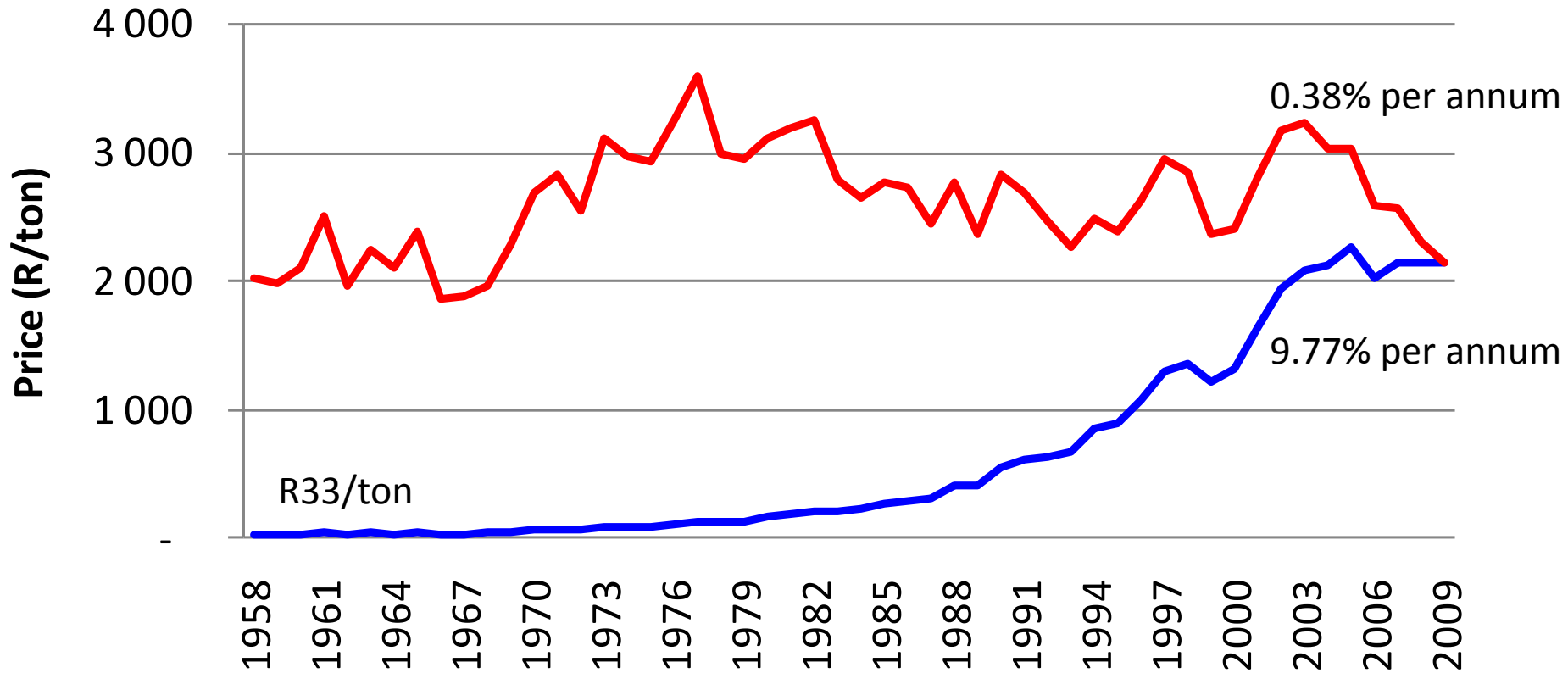
- A loss of purchasing power over time
- Inflation index = growth in ticket prices over time for the same basket of goods

$$\text{Real price}_y = \frac{\text{Nominal price}_x}{\text{CPI}_x} \cdot \frac{\text{CPI}_y}{1}$$

- Car of R5,000 in 1975

$$\frac{R5,000}{5.31} \times \frac{125}{1} = R131,190$$

# Inflation illustrated



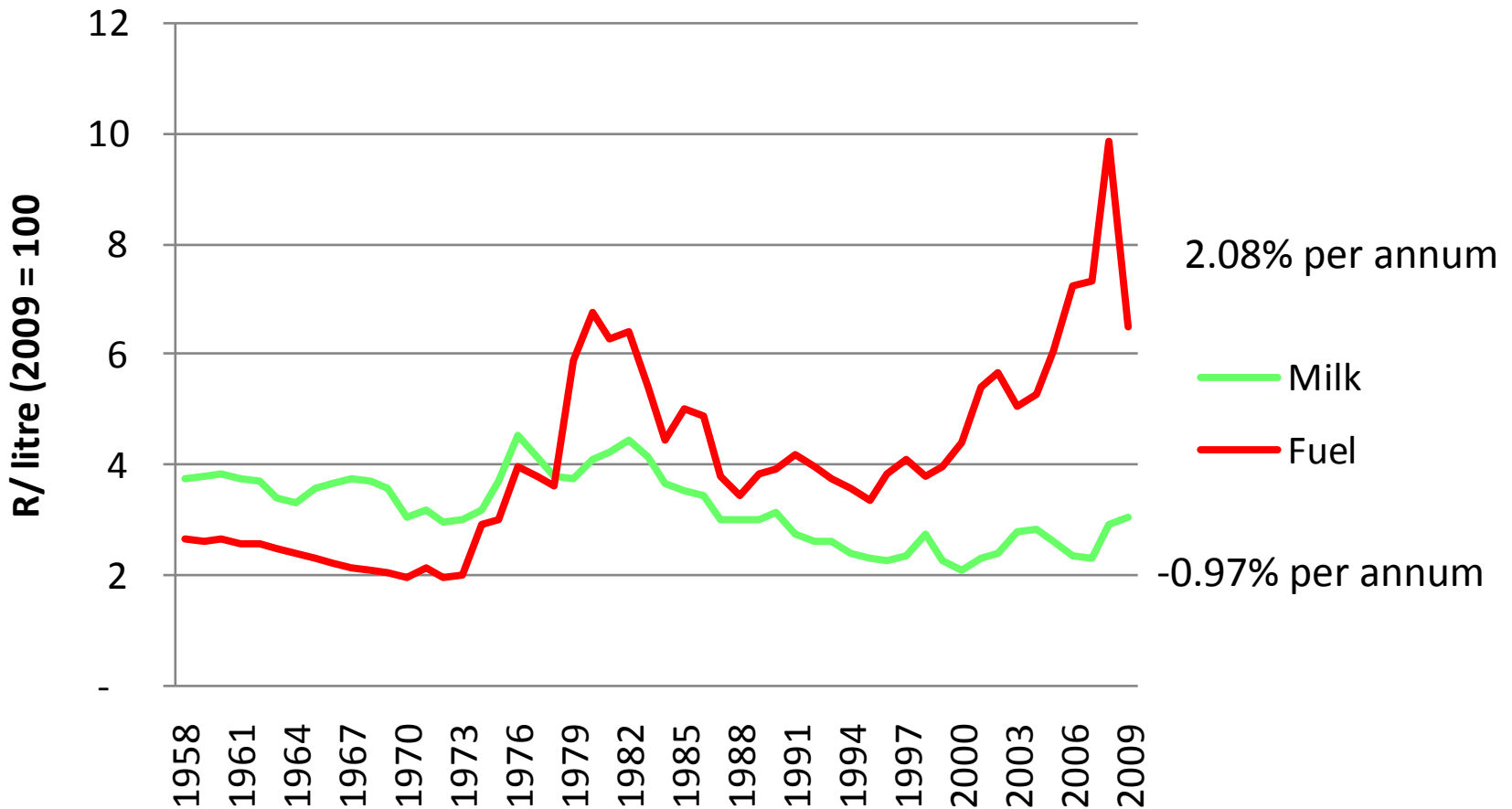
— Nominal wine grapes

— Real wine grapes

Abstract of Ag Stats

Weighted avg. wine grapes

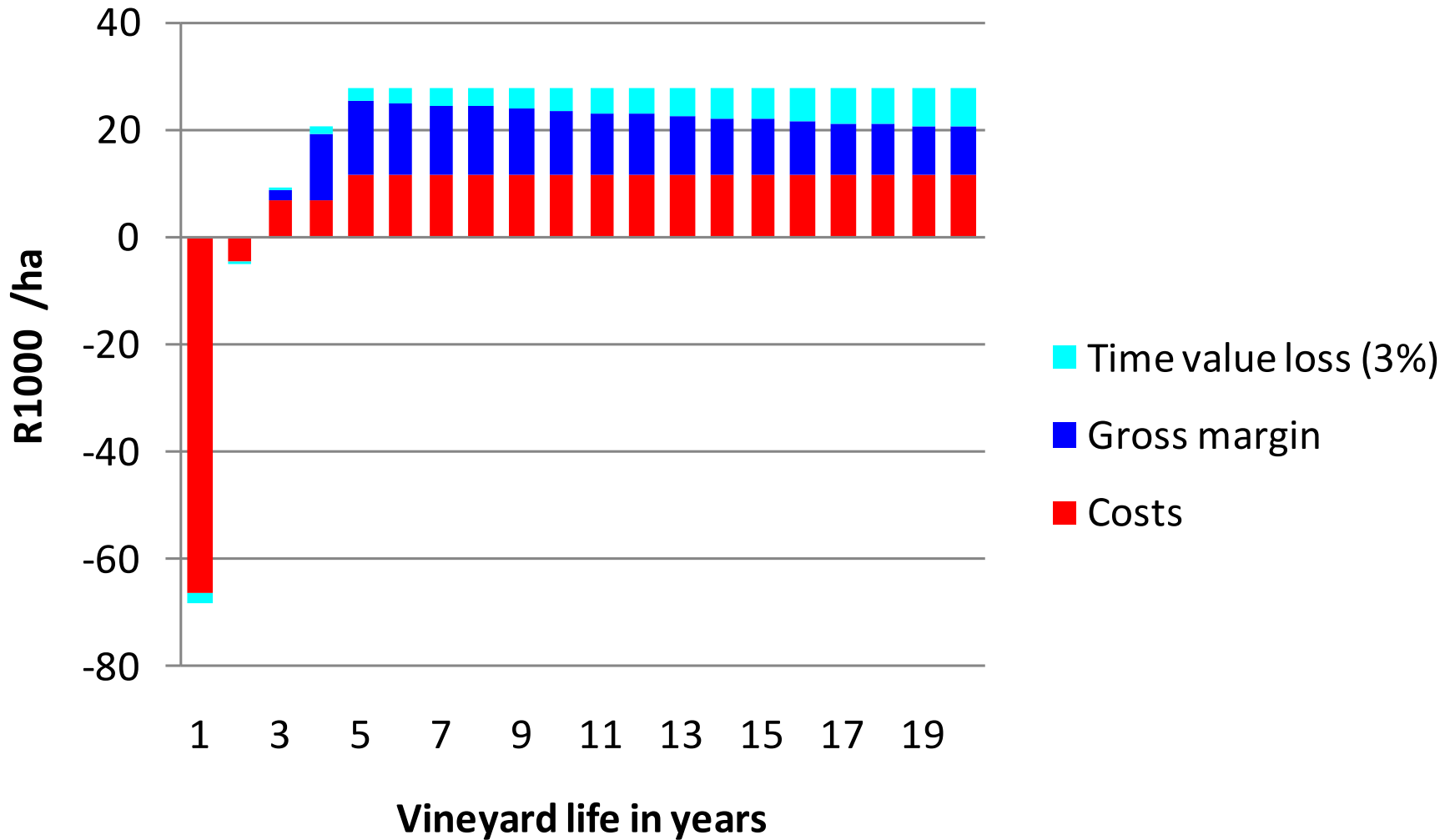
# How do dairy farmers keep up?



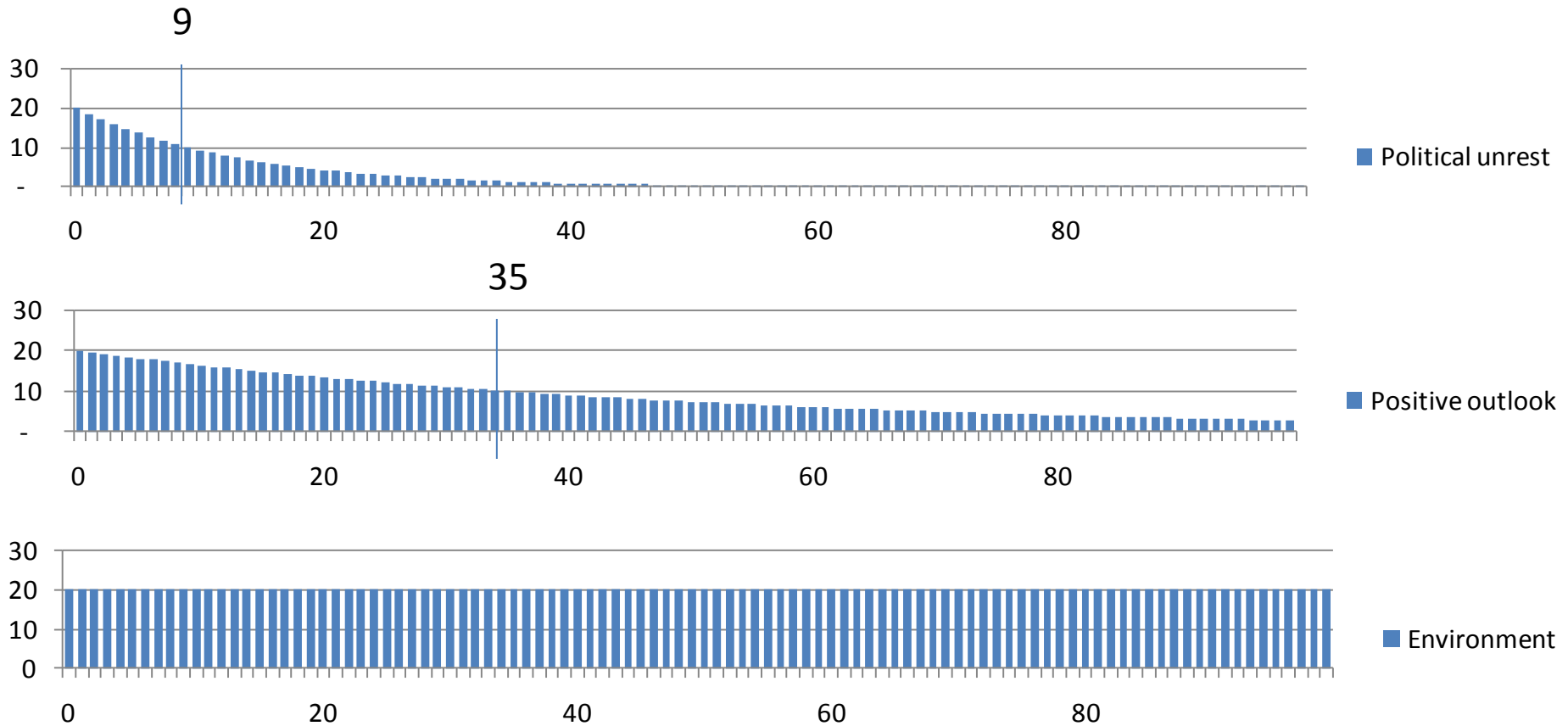
# Discount rate

- Measures the opportunity cost of money
- Typically inflation plus 1%, 2% or 3%
- A function of how confident you are about the future
  - Political uncertainty = high
  - Son taking over = low
  - Environment = zero

# Picture of discounting

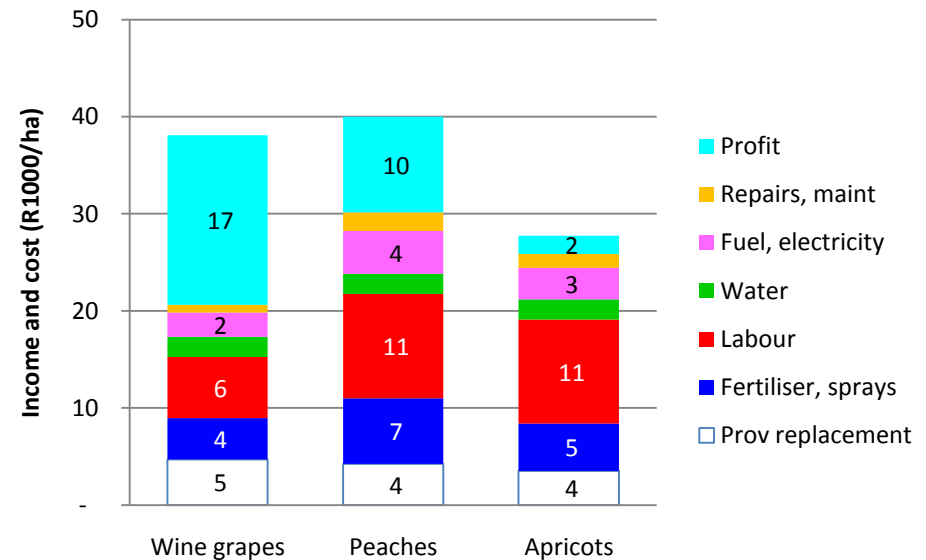
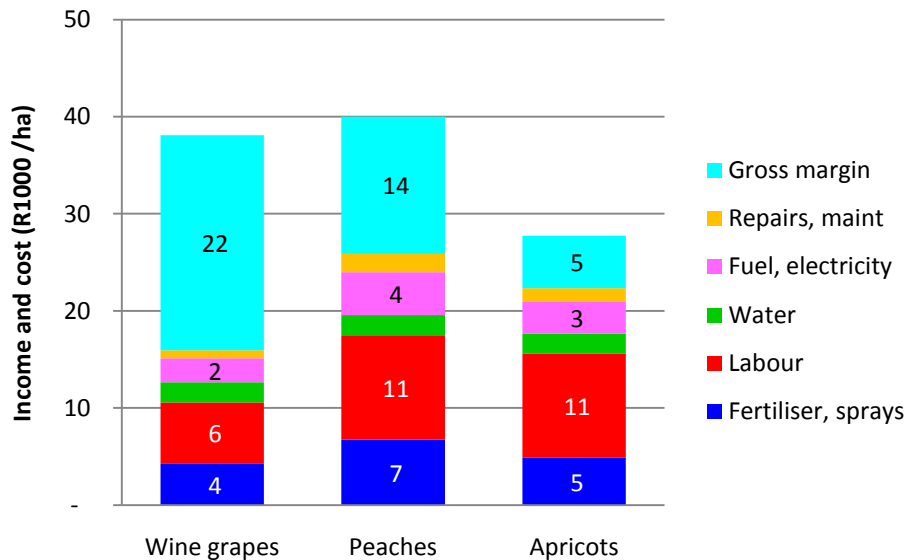


# Effect of the choice of discount rate



# Discounting shortcut

- 20 year productive life => 5% provision for replacement to be included as cost



# **WORKED EXAMPLE**

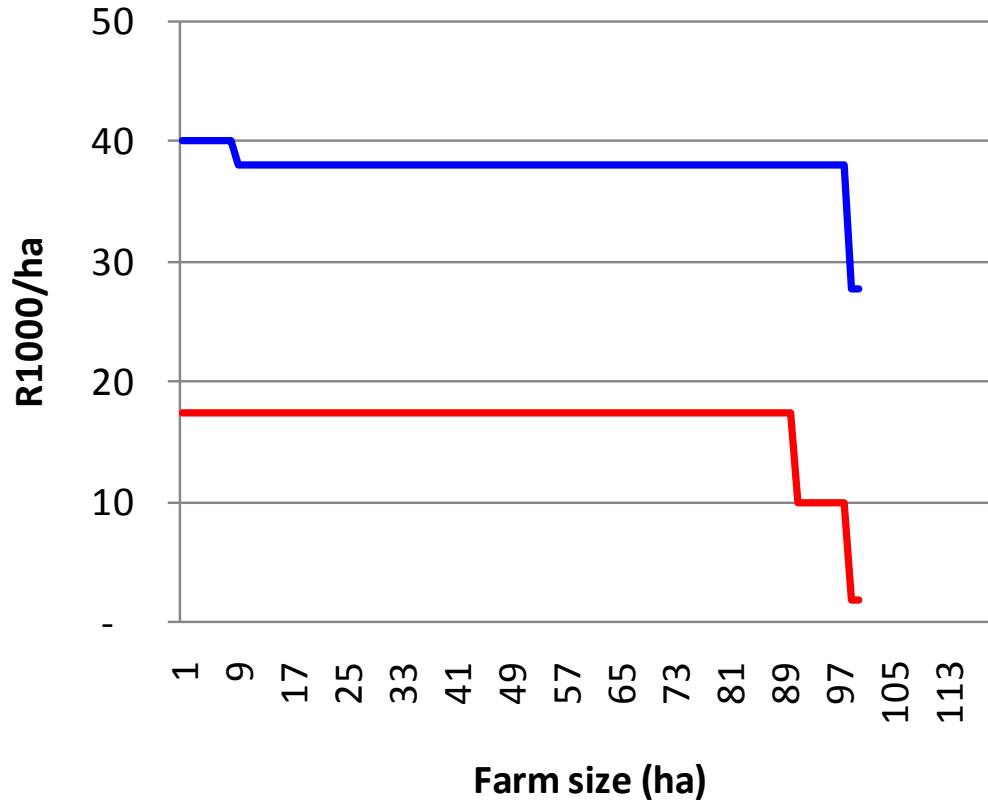
# Worked example

- Jack owns a 200 ha farm
- He farms wine grapes (90%), peaches (8%) and apricots (2%)
- 100 hectares are developed, the rest is untransformed, but he has enough water to develop all of it
- High cost slows down the rate at which he can develop his land
- Jack hopes to have everything done by 2028, when his son Adrian will graduate



<b>Jack's finances</b>					
	Wine grapes	Peaches	Apricots	TOTAL	Notes
Area	90	8	2	100	Jack
Output	1 197	123	28	1 348	Jack
Yield	13	15	14		
Price	2 863	2 597	2 011		Abstract
Gross income /ha	38 077	39 993	27 754		
Total cost /ha	20 639	30 138	25 858		Combud
GM /ha	17 438	9 855	1 896		
Gross income	3 426 930	319 944	55 508	3 802 382	
Total cost	1 857 500	241 104	51 715	2 150 319	
Total gross margin	1 569 430	78 840	3 793	1 652 063	

# Jack's willingness to pay for land



What is the difference between these graphs?

What about inflation?

— Gross income  
— Gross margin

How does a change in discount rate affect these graphs?

When does farming stop being worthwhile?

What is Jack's undeveloped land worth?

**What is fair compensation?**

# Opportunity cost of moratorium on development

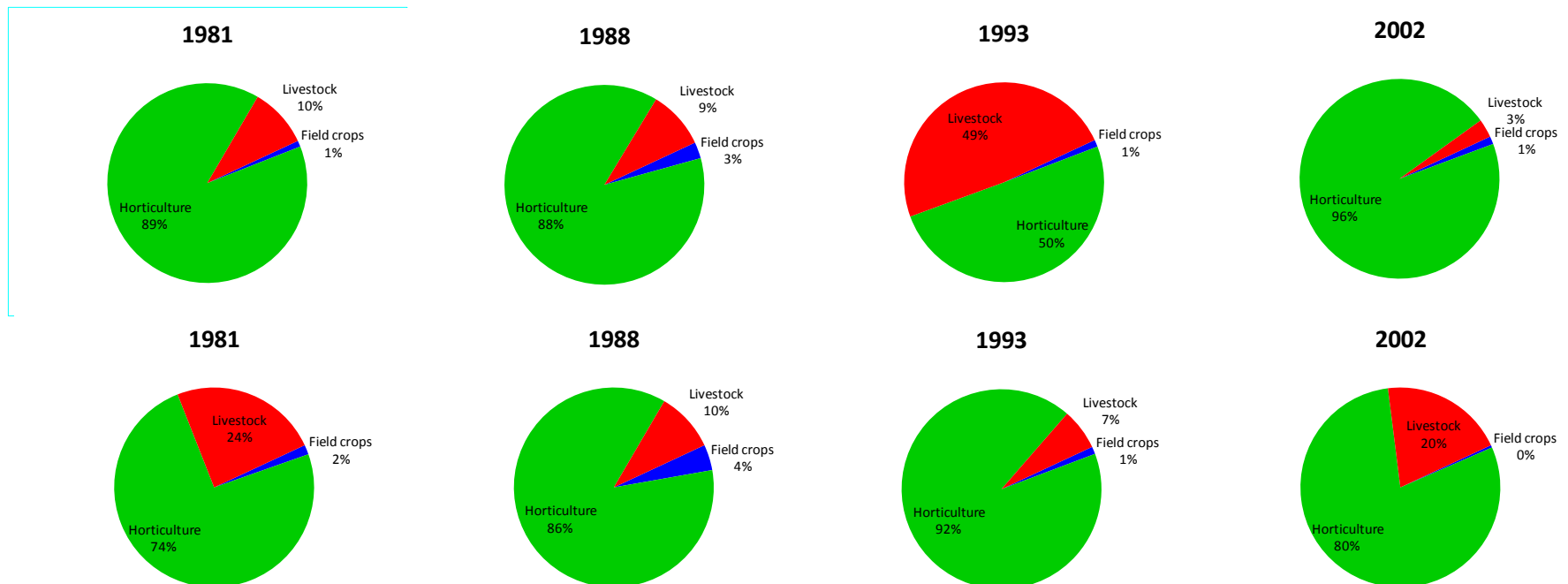
- Current profit /ha
  - Wine grapes = R17,438
  - Peaches = R9,855
  - Apricots = R1,896
- Every hectare which can't be developed, "costs" the profit that could have been made on it
- A profit maximising farmer should be indifferent between farming and leasing his land for that much
- Provided that he doesn't mind becoming a broker

	Current cultivation (ha)				Application
Application (ha)	50	100	150	200	GM (R mil)
25	0.35	0.21	0.15		0.436
50	0.51	0.35	0.26		0.872
75	0.61	0.44			1.308
100	0.68	0.51			1.744
125	0.73				2.180
150	0.76				2.616
Current GM (Rmil)	0.826	1.652	2.478	3.304	
	Grapes	Peaches	Apricots	* Assume expansion in wine	
Gross income	38 077	39 993	27 754		
Cost	20 639	30 138	25 858		
Gross margin	17 438	9 855	1 896		
Crop mix	90%	8%	2%		

# **DISTRICT-LEVEL DEMAND FOR LAND**

# Demand for land at the district level

- Same approach to estimate derived demand from enterprises
- Farm census + Abstract for national prices + COMBUD for costs
- Track demand for land over time



# Crops in order of gross income: Worcester

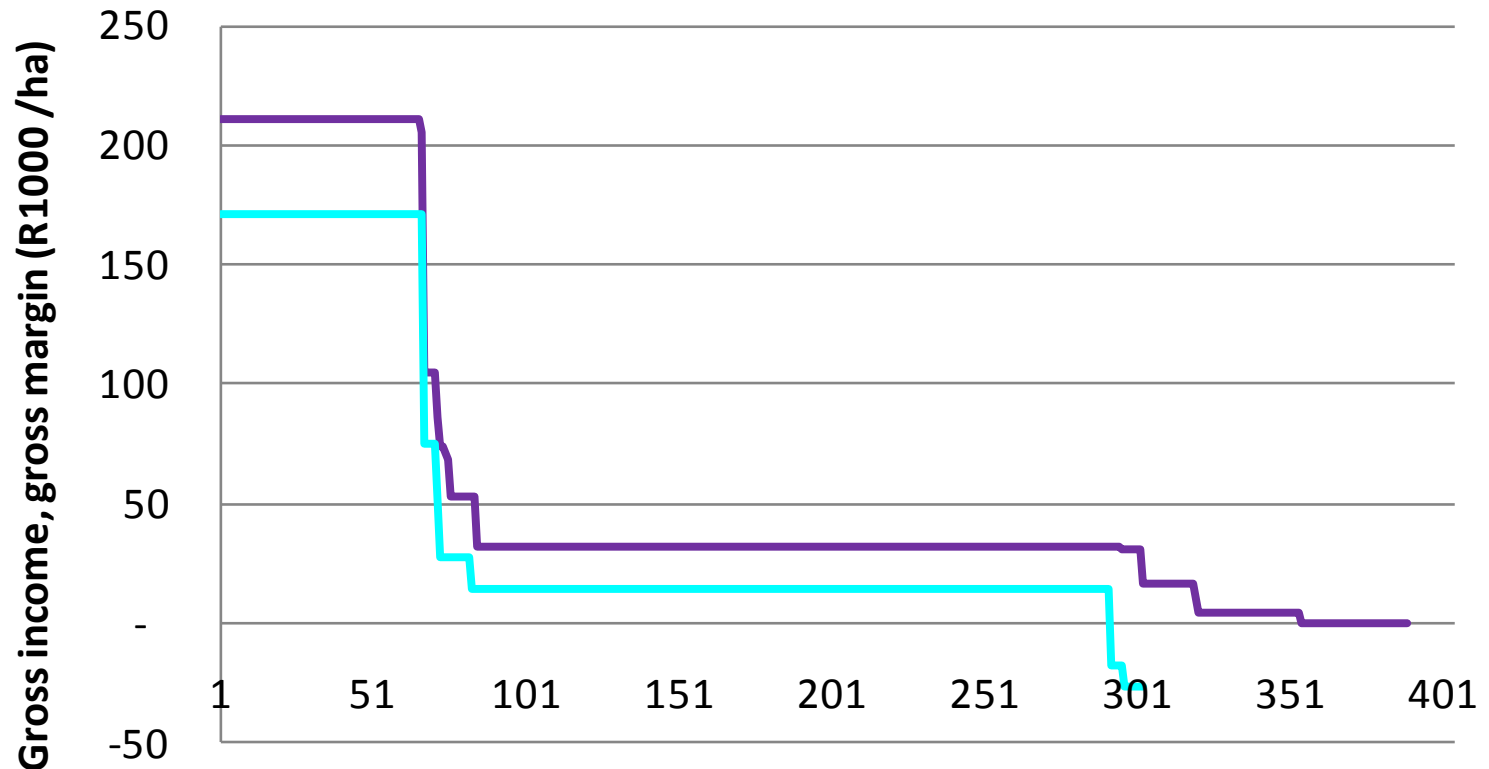
1981	1988	1993	2002	2009
Tomatoes	Table grapes	Table grapes	Table grapes	Table grapes
Table grapes	Tomatoes	Tomatoes	Tomatoes	Tomatoes
Plums	Onions	Plums	Plums	<b>Pears</b>
Potatoes	Potatoes	Onions	<b>Pears</b>	Plums
<b>Wine grapes</b>	Plums	Potatoes	Potatoes	Potatoes
<b>Pears</b>	<b>Wine grapes</b>	<b>Pears</b>	Onions	Onions
Peaches	Peaches	<b>Wine grapes</b>	Peaches	Peaches
Onions	Apricots	Peaches	<b>Wine grapes</b>	<b>Wine grapes</b>
Apricots	Wheat	Lucerne	Citrus	Citrus
Wheat	Lucerne	Citrus	Wheat	Lucern
Citrus	<b>Pears</b>	Apricots	Lucerne	Apricots
Lucerne	Citrus	Wheat	Apricots	Wheat

# Crops in order of gross income: Robertson

1981	1988	1993	2002	2009
Tomatoes	Table grapes	Table grapes	Table grapes	Table grapes
Table grapes	Tomatoes	Tomatoes	Plums	Tomatoes
Onions	<b>Peaches</b>	<b>Peaches</b>	Tomatoes	Plums
Pears	Onions	Onions	Pears	Pears
Apricots	<b>Wine grapes</b>	Apricots	Citrus	Onions
<b>Wine grapes</b>	Potatoes	Pears	Onions	Citrus
<b>Peaches</b>	Apricots	<b>Wine grapes</b>	<b>Peaches</b>	<b>Peaches</b>
Potatoes	Lucerne	Potatoes	<b>Wine grapes</b>	Potatoes
Plums	Wheat	Lucerne	Potatoes	Apricots
Lucerne	Apples & pears	Wheat	Apricots	<b>Wine grapes</b>
Wheat	Plums	Plums	Lucerne	Lucerne
Citrus	Citrus	Citrus	Wheat	Wheat

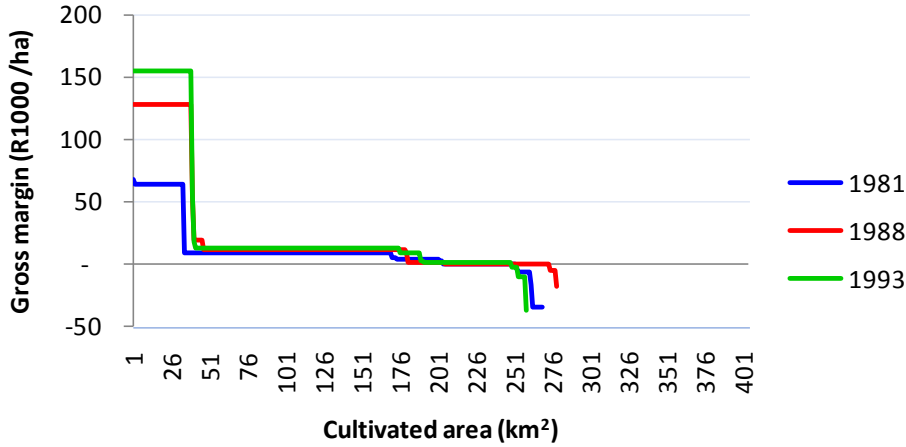
# Gross margin vs. gross income

## Worcester 2009

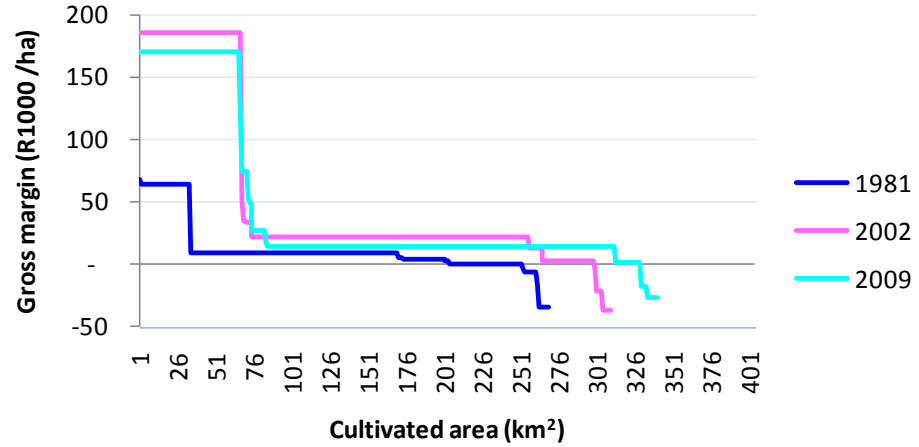


# Gross margin

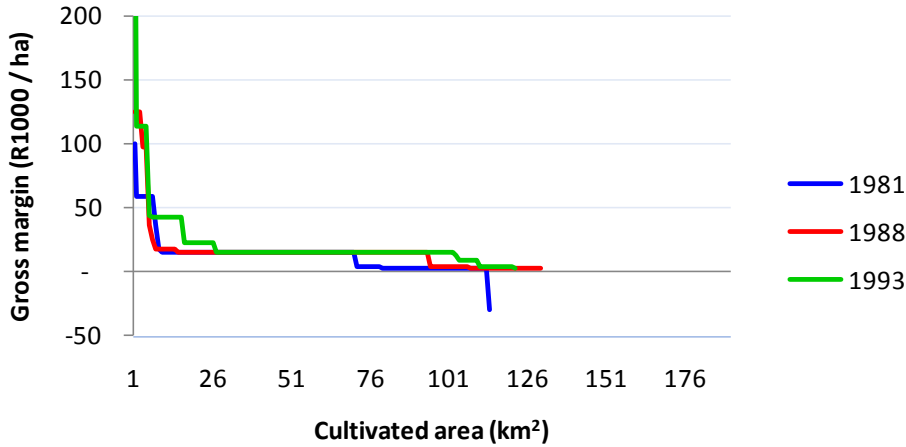
## Worcester



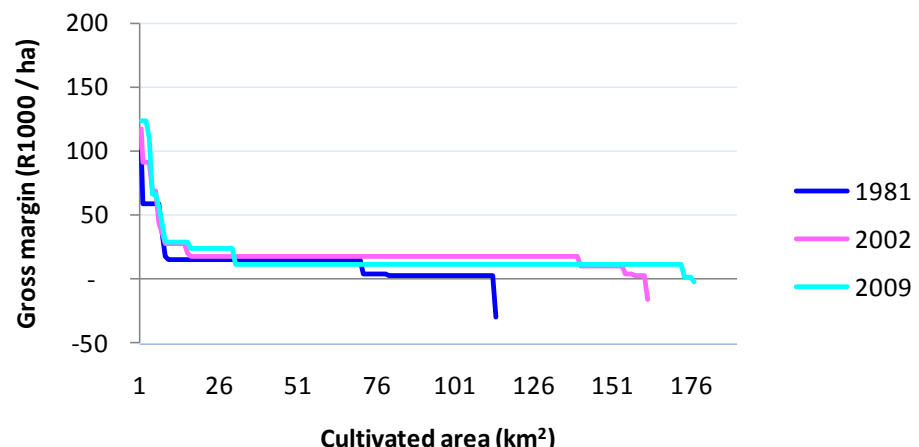
## Worcester



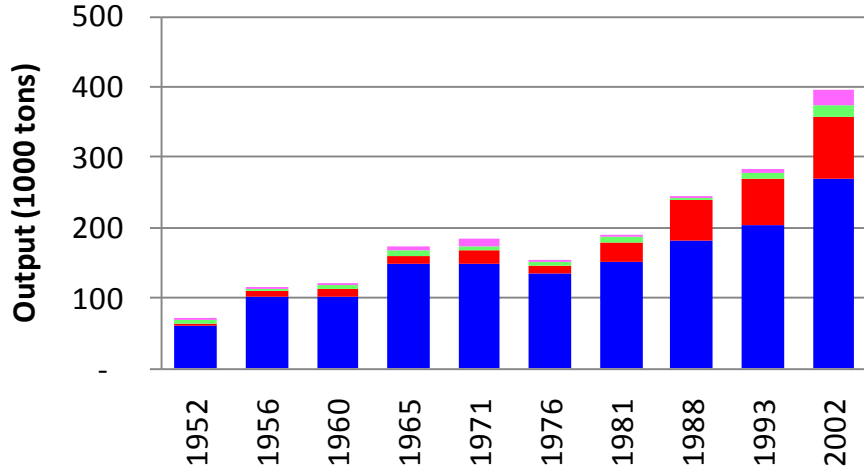
## Robertson



## Robertson

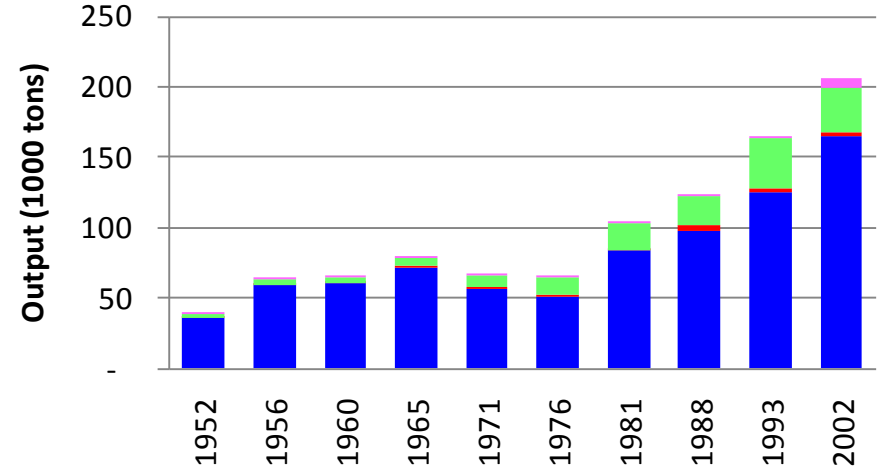


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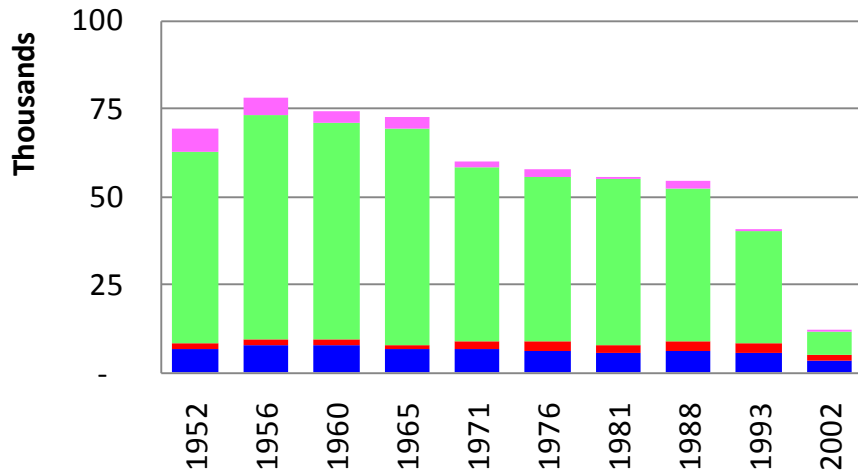
■ Wine grapes ■ Table grapes ■ Peaches, apricots ■ Other

## Robertson



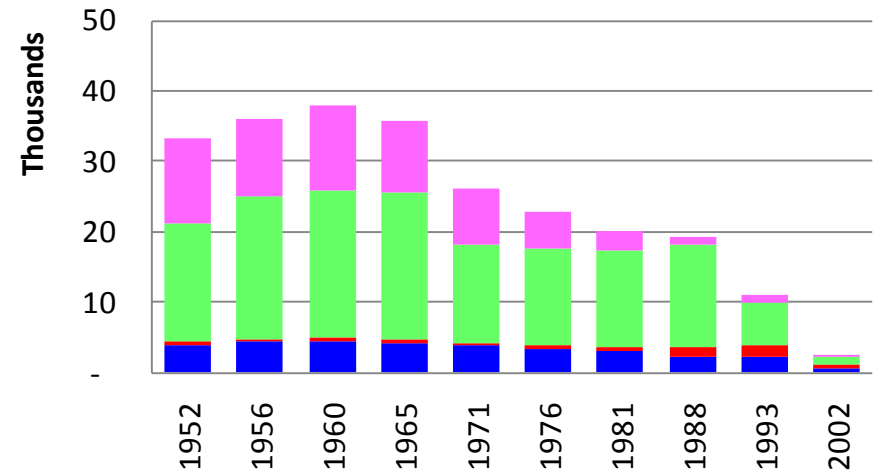
■ Wine grapes ■ Table grapes ■ Peaches, apricots ■ Other

## Worcester



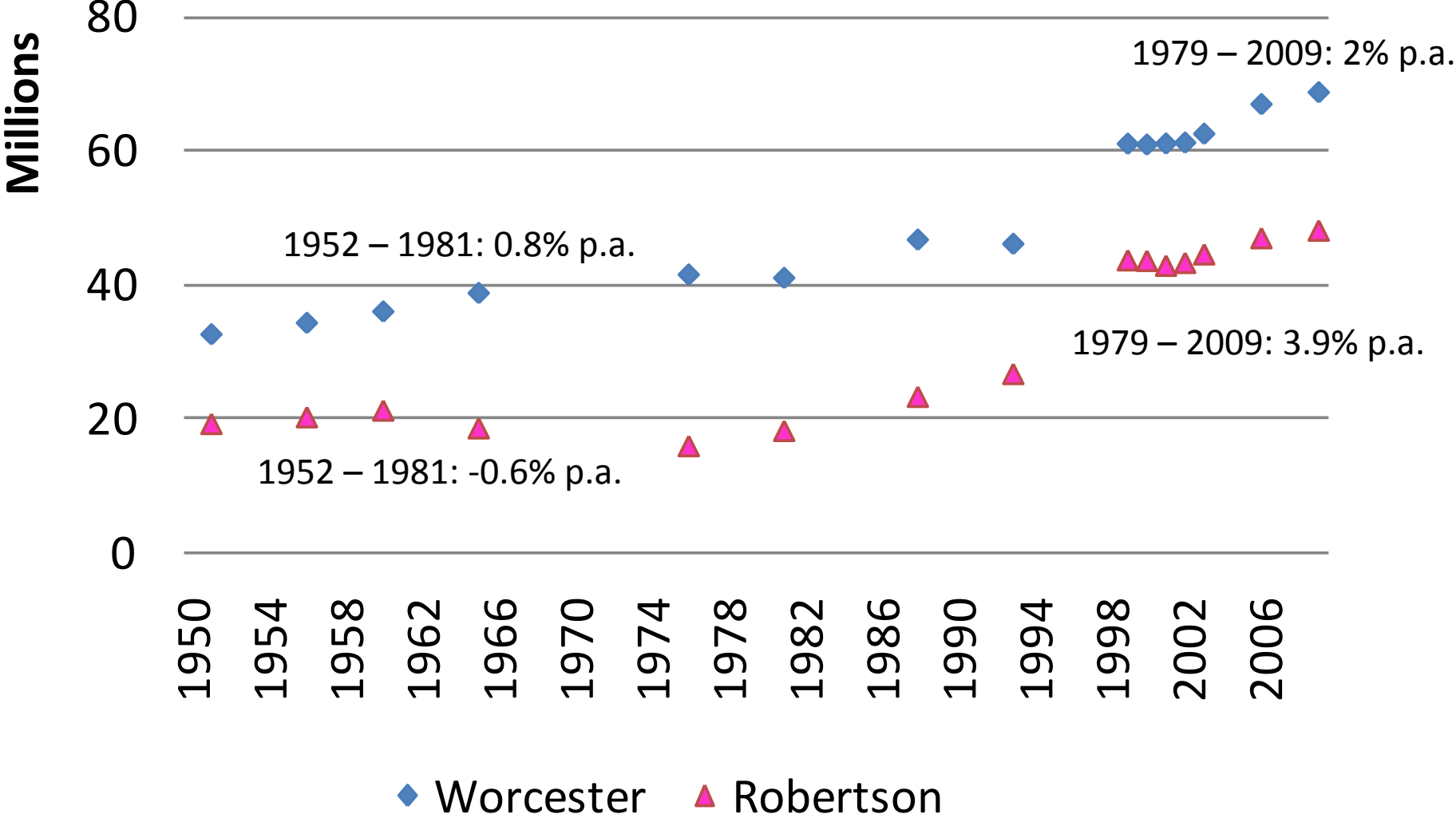
■ Dairy cows ■ Other cattle ■ Sheep ■ Goats

## Robertson



■ Dairy cows ■ Other cattle ■ Sheep ■ Goats

# Grape vines

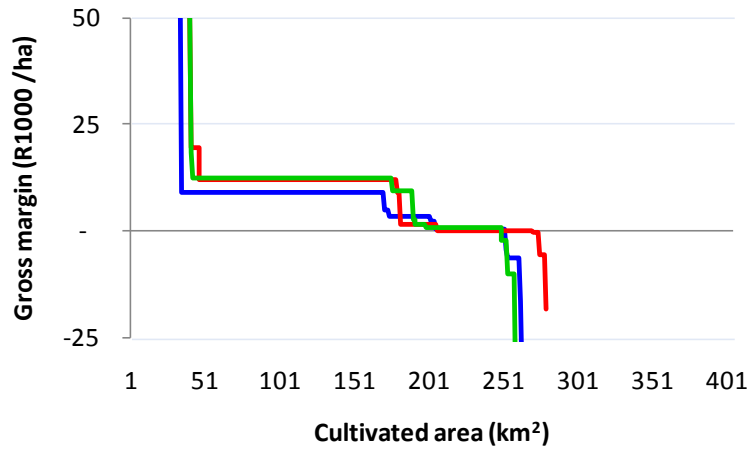


# To summarise

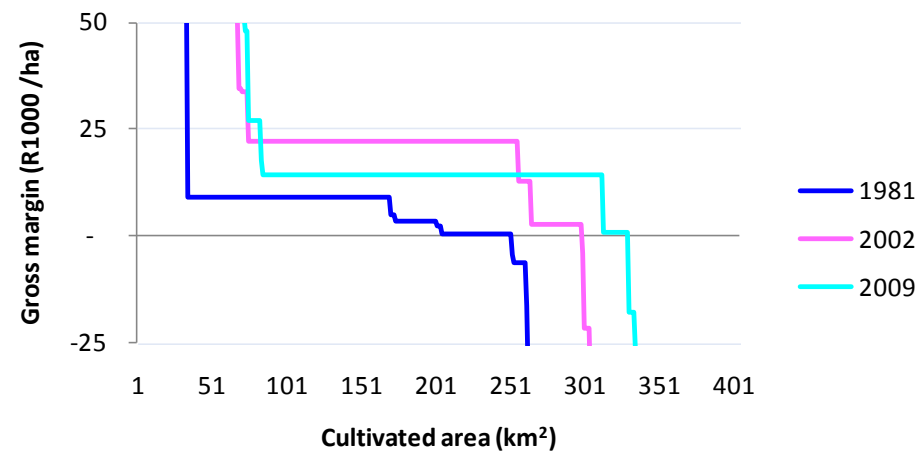
- Demand for land is quite inelastic
- Wine grapes set the reservation price (R32,800 /ha gross)
- Most development since the mid 1970s (sprinkler, drip irrigation)
- Is water a limiting factor?
- Why do all farmers not grow table grapes?

# Zooming in: Differences between districts

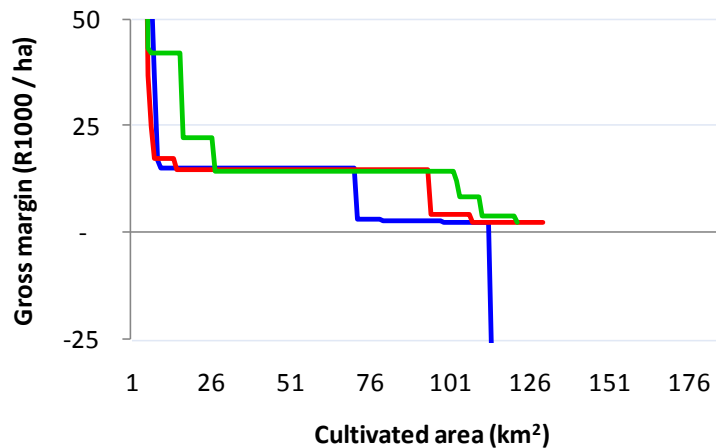
## Worcester



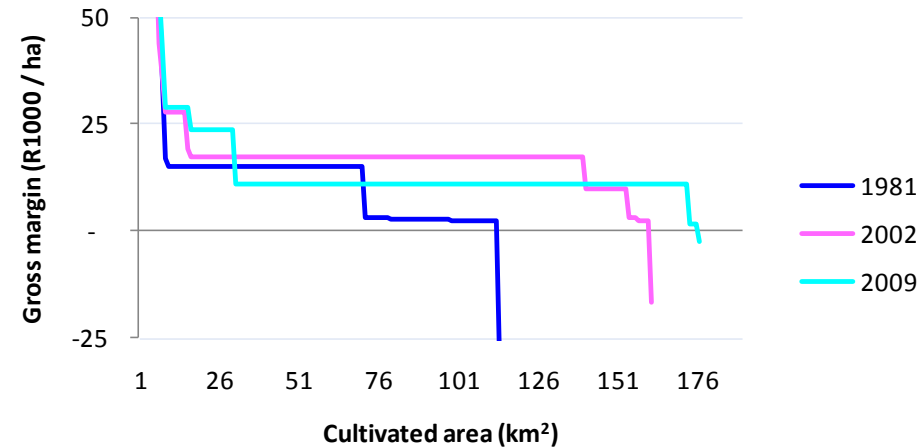
## Worcester



## Robertson



## Robertson



# Gross margin for wine grapes

	Mean	St dev	Two-thirds of observations between	
Worcester	14 006	4 885	9 121	18 890
Robertson	14 437	2 372	12 064	16 809

- Wine estate vs. cooperative
- Marketing strategy
- Cultivar mix
- Farmer's competence
- Soil & micro climate

# Health warning on the data

	<b>Advantage</b>	<b>Disadvantage</b>
Abstract	Annual, incl. prices	National
Farm census	District-level data	Large gaps, significant underreporting, incomplete prices
COMBUD	Only source of detailed costs	Badly outdated, not verified
VINPRO	Current, accurate Farmers trust it	Proprietary

**CONCLUSIONS**

# Conclusions



- Demand curve
  - Useful summary of WtP
  - Easy to compile
  - Overview of development pressure on land
  - Adequate compensation
- Data quality
- All applications of the same size are not the same
- Research into the opportunity cost of conservation