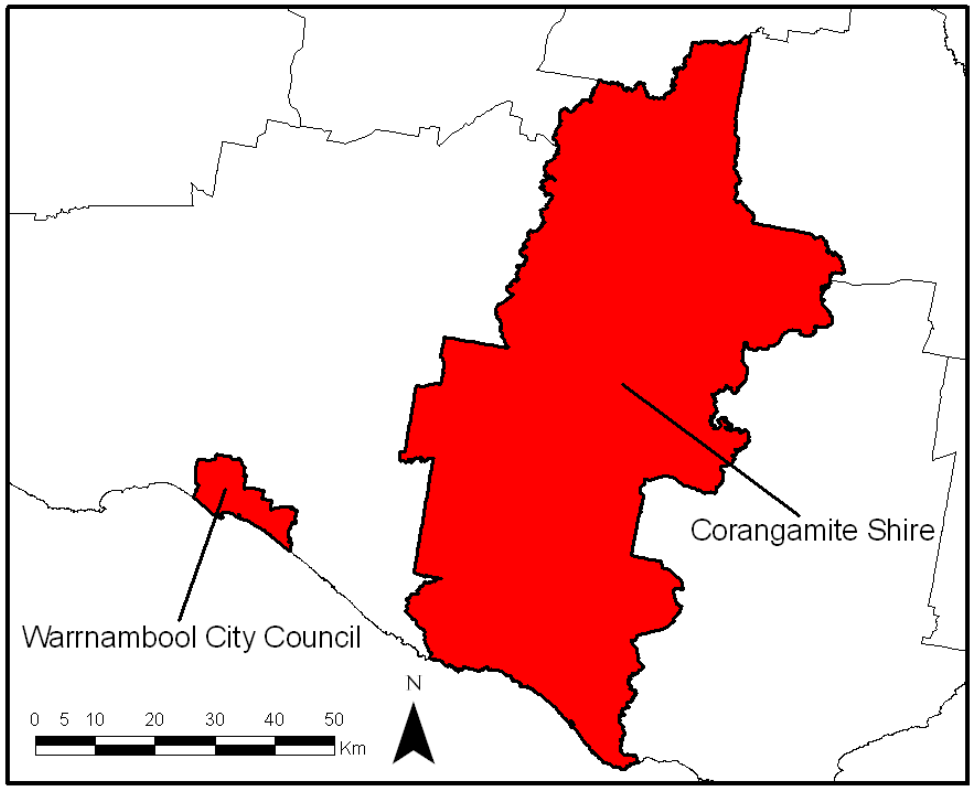
Quantifying the potential impacts of increasing agricultural fragmentation on land value

Vin Versace and Helen Scarborough
Deakin University

Introduction

- Part of land suitability project for Warrnambool City Council (WCC) and Corangamite Shire. Also partly funded by Sustainability Victoria.
- Genuinely interdisciplinary study
- This paper one aspect of larger study

Study areas: Warrnambool and Corangamite



Motivation for project

- Issue in this area reflects global issue
- Fragmentation of agricultural land
- Pressure for multi-functionality from land
- Residential and agricultural use not always compatible

Research questions

- Gradual fragmentation of land in farm zone.

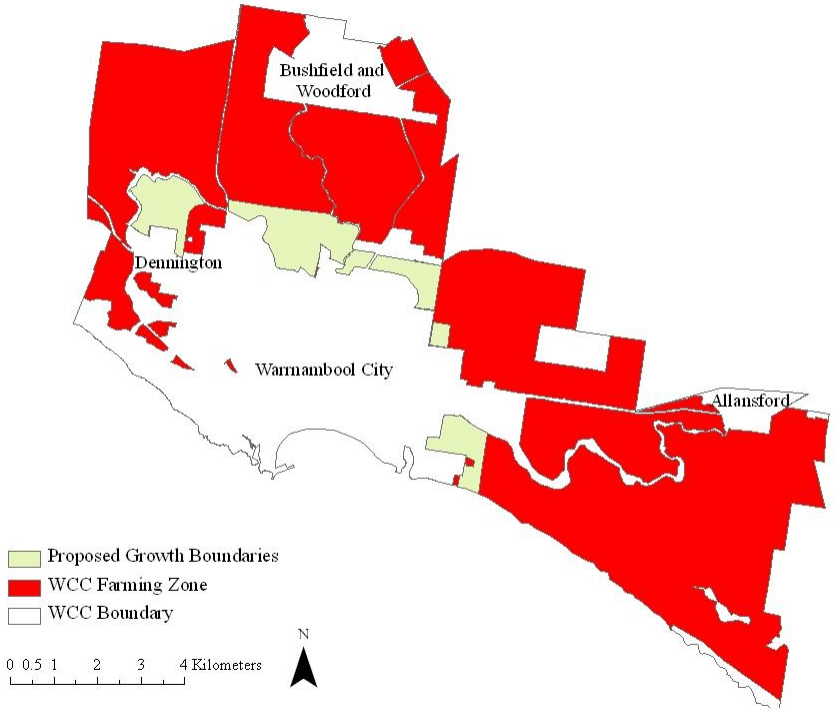
  What do we know about both planned and unplanned land conversion?

- What is optimal allocation of land in farm zone of WCC between competing residential and agricultural demands?

Background to region

- Southwest Victoria
- 12,072 ha
- Population approx 35,000
- Fertile land with good rainfall
- Traditionally a farming community
- Experiencing pop and economic growth
- Major industries dairy, meat processing, tourism, health and construction
- Energy sector growth area

Figure 1: WCC



- **Figure 1.** The Warrnambool City Council study area showing localities of the city and surrounding townships. The Farming Zone is the focus of the analyses. The proposed growth boundaries are for illustrative purposes. All areas in white comprise zoning and overlays other than Farming Zone.

Planned land conversion

Table 1. Cross-tabulation zone transition matrix for 1999 (t_1) and Planned Conversion >2009 (t_2).

Persistence of the zones can be read along the diagonal. All values are percentages.

	Urban	Flood/Water	Conservation	Farmland	Total 1999
Urban	29.63	0.05	0.00	0.03	29.72
Flood/Water	0.17	2.64	0.00	0.02	2.83
Conservation	0.01	0.00	3.22	0.02	3.25
Farmland	5.52	0.12	0.03	58.54	64.20
Planned Conversion >2009	35.32	2.82	3.25	58.61	

Table 2. Summary of zone transitions for 1999 (t_1) and Planned Conversion >2009 (t_2).

All values are percentages.

	Gain	Loss	Total Change	Swap	Absolute Value of Net Change
Urban	5.69	0.09	5.78	0.17	5.61
Flood/Water	0.17	0.19	0.36	0.35	0.01
Conservation	0.03	0.03	0.06	0.06	0.00
Farmland	0.07	5.66	5.74	0.15	5.59
Total	5.97	5.97	11.94	0.73	11.21

Unplanned Land conversion

- Currently Schedule for Farming zone in WCC allows subdivision to min lot size of 15 ha and construction of a dwelling without a permit on lots of the same size in the absence of any other overlays.

- Hence unplanned land fragmentation is also an issue. What is the potential extent of unplanned fragmentation?

Data

- Rates database using 2010 valuation supplied by WCC
- Rateable parcels extracted using ArcGIS 9.3
  - 349 parcels of land covering 84.56% of farming zone
  - $A per m^2
- Values by two categorisations
  - Australian Valuation Property Classification Code (AVPCC)
  - Sub-Market Group (SMG)

Analysis

- Assessment of relationship between parcel size and parcel value using linear regression
- Coefficients used to predict change in land value under scenario of increased subdivision
- Had to be parcels over 30ha for potential subdivision

Figure 3: Current parcel sizes

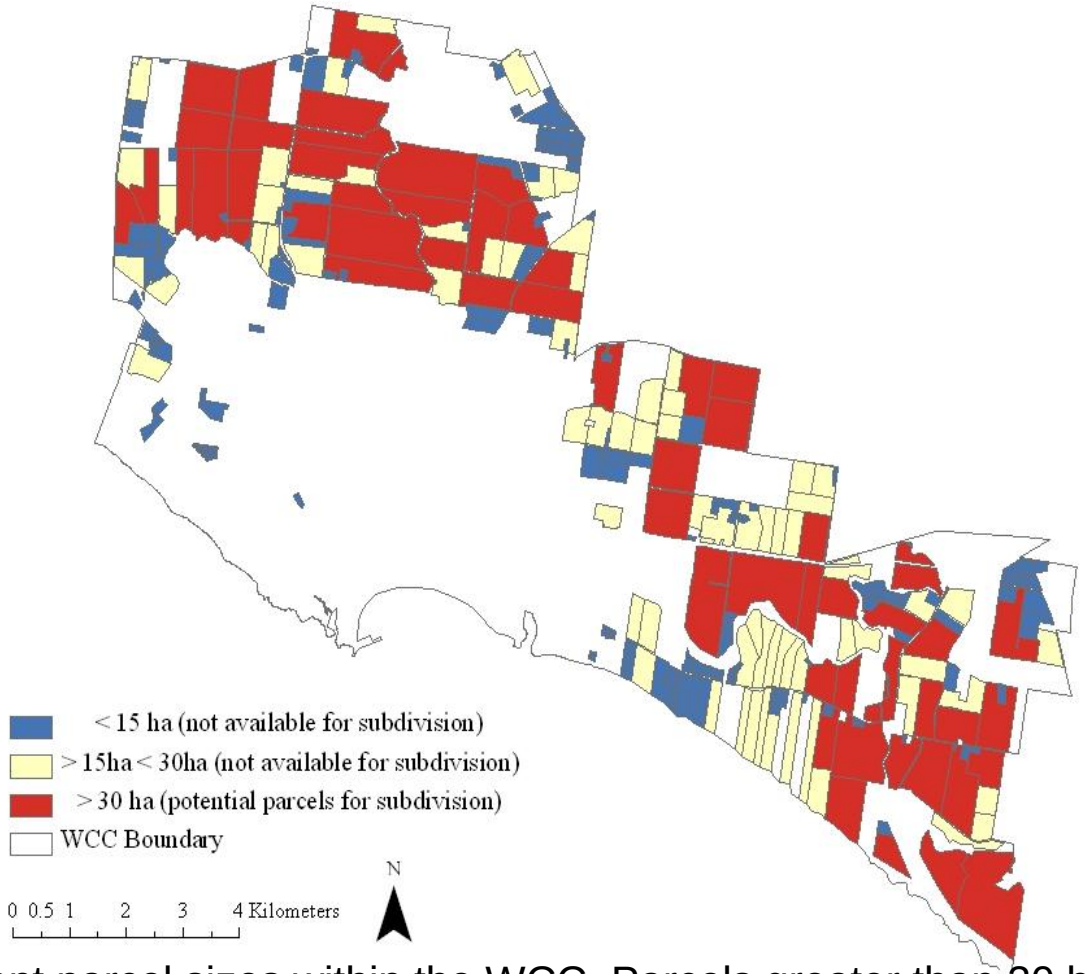


Figure 3. Current parcel sizes within the WCC. Parcels greater than 30 ha are potential candidates for subdivision according to Farming Zone Schedule.

Potential value of unplanned subdivision of farm zone within existing guidelines

- Of 349 parcels 58 exceeded 30 ha and if subdivided to full potential become 201 parcels.
- Current site value approx $A66,343,000
- Using regression equations would increase to $A84,975,000 or $A78,855,000. Either a 28% or 19% depending on model.
- Current unrealised potential gain within current planning provisions is between $A18.6 and $A12.5 million

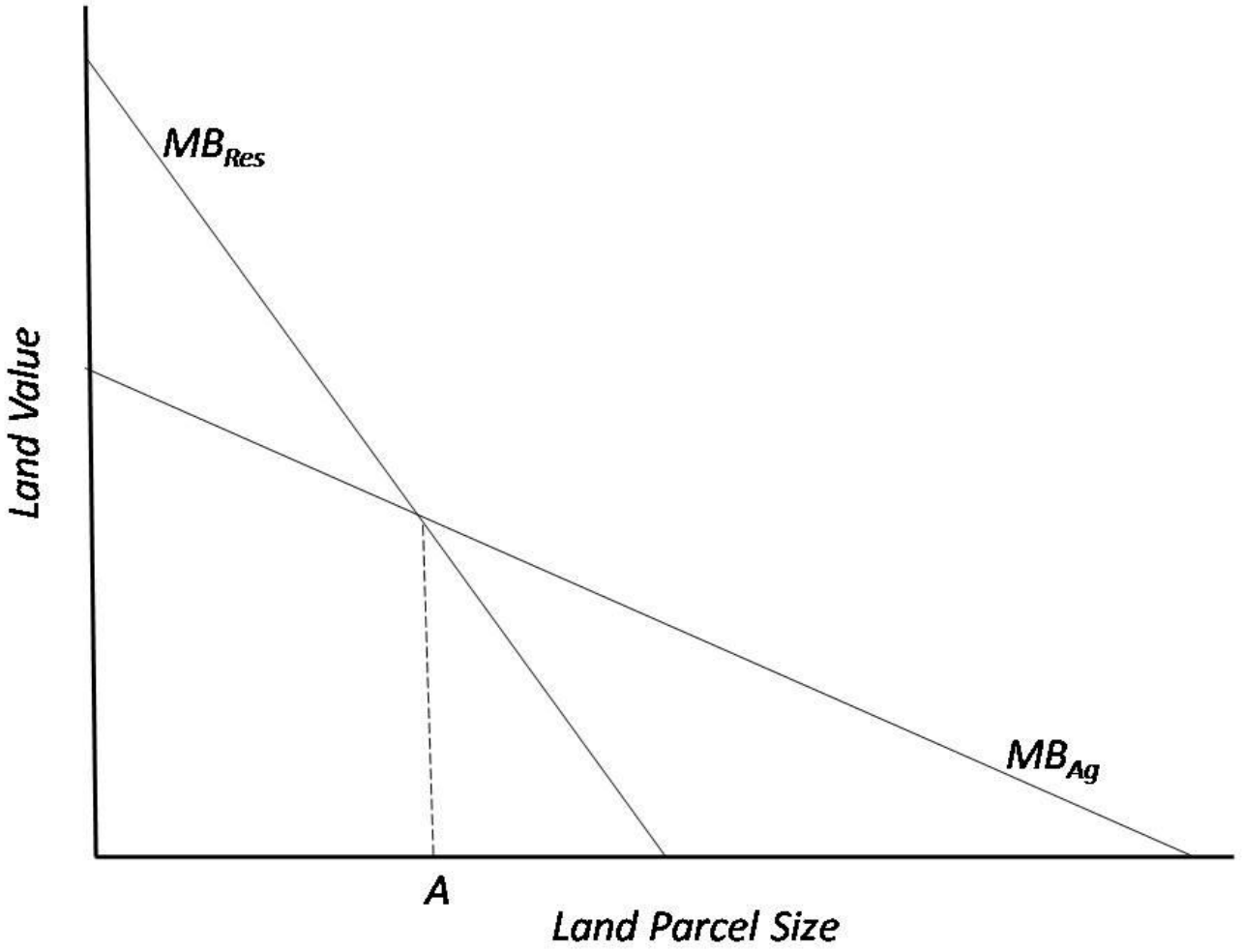
Unplanned land fragmentation

- Market pressure for unplanned fragmentation is significant.
- In neighbouring shires and Victorian state planning scheme 40 ha is minimum
- Is 15ha minimum good policy?
- What should minimum be and how is it determined ?

Pure economic approach

- Land, like all resources, should be allocated to highest marginal benefit use.
- For smaller land parcels:
  - Residential MB>Agricultural MB
- For larger land parcels
  - Agricultural MB>Residential MB
- Interested in point of intersection

Figure 2: Efficient allocation of land



Unplanned conversion: Two markets

Table 3. Summary statistics of parcel data categorised by AVPCC

Description	No. of Parcels	Mean Area ha (Std Dev.)	Mean Value/m^2 (Std Dev.)
Vacant Residential Home Site/Surveyed Lot	25	4.73 (6.42)	14.39 (14.60)
Detached Home	171	2.98 (3.92)	19.34 (15.77)
Miscellaneous Building on Residential Rural Land	1	1.06	21.97
Member Club Facility	1	4.73	6.23
Livestock Production-Dairy Cattle	2	102.49 (50.39)	1.56 (0.32)
Mixed Farming and Grazing	148	32.69 (24.72)	3.55 (2.21)
Vineyard	1	17.52	3.08

*Outlier of 84 ha removed from analysis.

Relationship between parcel size and land value

Table 5. Summary of regression equations

Data categories	Variable	β (std error)	*T*-value (sig)	*F*-value (sig)	Adjusted R^2 (*n*)
All	Constant	8.980 (0.139)	64.419 (<0.001)	2588.01 (<0.001)	0.881 (349)
	ln(area)	-0.636 (0.013)	-50.872 (<0.001)		
100; 110; 151	Constant	10.569 (0.215)	49.260 (0.001)	1385.644 (<0.001)	0.877 (197)
(Residential)	ln(area)	-0.802 (0.022)	-37.224 (0.001)		
525, 530, 561	Constant	8.046 (0.527)	15.281 (<0.001)	173.784 (<0.001)	0.535 (151)
(Farming)	ln(area)	-0.555 (0.042)	-13.183 (0.001)		
1301; 1302;1303; 1304	Constant	10.675 (0.207)	51.614 (<0.001)	1534.851 (<0.001)	0.898 (177)
(Residential)	ln(area)	-0.817 (0.021)	-39.177 (<0.001)		
1401; 1402	Constant	8.417 (0.504)	16.689 (0.001)	208.902 (<0.001)	0.574 (155)
(Farming)	ln(area)	-0.584 (0.040)	-14.453 (0.001)		

Optimal land size for conversion?

- Solving two equations permits estimation of land size below which residential marginal value is > agricultural marginal value
  - 2.730 ha for AVCC model
  - 1.617 ha for SMG model
- Analysis from pure market approach suggests possible welfare gains from allowing subdivisions below 15ha minimum.

Discussion

- Both unplanned and planned fragmentation occurring
- Analysis only partial- only one region. Doesn't address broader issue of food production
- Cumulative national and global impact of local decisions. Ultimately landscape influenced by series of regional decisions
- Results suggest 15ha minimum is achieving neither prevention of land fragmentation nor functioning land market

Conclusions

Either

- 40 ha minimum and local council maintains control of subdivision

-or reduce minimum and allow market to function.

15ha achieves neither objective?

Limitations

- No external costs and benefits or market failure considered
- Accuracy of valuation data in reflecting marginal benefits
- Broader issues beyond region
- Cumulative impact of land fragmentation
- Irreversible nature of land fragmentation