

## Urban encroachment and loss of prime agricultural land

F.M.Kelleher

Centre for Farming Systems Research, University of Western Sydney, Hawkesbury Campus, NSW.

### ABSTRACT

Area and distribution of land by DLWC Land Capability Class (LC) for three NSW local government areas (LGAs) (Hawkesbury, Wollondilly and Mudgee) were determined with MapInfo GIS software. 'Prime' agricultural land (LC 1-3) area was small in both Hawkesbury and Wollondilly, while Mudgee had a greater proportion and total area of each. Subdivision of prime land in Hawkesbury and Wollondilly was not correlated with LC, but reflected rapid urban development on the western fringe of Sydney. LC 1-3 land in Mudgee was less intensively subdivided, reflecting its agricultural value and shire action to preserve them. Potential exists for substantial future land losses from agriculture in each LGA, as large areas currently in agricultural use have been extensively subdivided into smaller lots over a long period. The major agricultural industries in Hawkesbury and Wollondilly are much less dependent on land quality than those in Mudgee and as a result, are less threatened by future threats to prime land.

### KEY WORDS

Subdivision, urban encroachment, land capability, cadastre, MapInfo<sup>?</sup>, land loss, prime land.

### INTRODUCTION

Land loss from Agriculture has been the focus of considerable research in the US and UK, but there has been little discussion or research on it in Australia (1). Loss of agricultural *land* does not necessarily equate to loss of agricultural *industry* (1,2,4), as land productivity is irrelevant in intensive industries such as poultry and mushrooms. Concern has been expressed at the loss of prime land in NSW (6) and has led to legislation in Qld and Vic to prevent its permanent loss through subdivision and urban development (2,4), while other states are considering similar action. Residential subdivision and hobby farm development are often blamed for loss of both prime land and agricultural industry, but the true extent of such loss in NSW is questionable (1). They may in fact foster retention of otherwise non-viable agriculture in a region (1), but carry greater risk of land and environmental degradation (3,7). Changes to agricultural land use with urban and residential encroachment often result in the intensification of agricultural industry and new, financially viable alternative forms of agriculture. Limiting subdivision of agricultural land could thus inhibit the emergence of new forms of agriculture that might contribute significantly to regional socio-economic development (7). Intensive industries are less dependent on land quality (4), but often create undesirable impacts and conflict when co-located with rural residences. Hence the case for preservation of prime land in peri-urban areas solely for its traditional agricultural value cannot be sustained (4). Data on the extent of loss of both prime land and agricultural industry in peri-urban areas is limited (6), but both have been major issues for local government (5). This paper reports research showing that the major threat to agricultural industry in western Sydney is not the subdivision and loss of prime land, but rather the pressures of urban or rural residential encroachment on its major industries poultry and mushrooms, for which land quality is irrelevant. In contrast, agriculture in Mudgee is dominated by traditional, prime land dependent industries, on which land loss impacts would be substantial. Agricultural land appears to be valued largely for its amenity value in western Sydney (5) and its protection appears to be more realistically justified on these grounds.

### METHODS

Distribution and extent of agricultural land use in 1996 was determined for each LGA from Landsat TM imagery, with extensive ground survey. Thematic land use maps were then developed in MapInfo, a GIS (Geographic Information System). Farm gate production value was estimated for all industries using conversion factors developed from industry criteria and production returns (4). Digitised Land Capability

data for the three LGAs from NSW Department of Land and Water Conservation (DLWC) was separated in MapInfo into discrete layers for each LC, enabling distribution and area of each LC to be determined. Subdivision of prime (LC 1-3) land was determined by overlaying cadastre for each LGA on the corresponding composite map of these classes in MapInfo. For each LC, total number and area of individual allotments was then categorised into lot sizes of <1, 1-4, 4-12 and >12 ha within each agricultural land use category. This enabled the extent and intensity of subdivision of each LC to be determined separately for land under each agricultural use. Cadastre was then separated in MapInfo into layers for individual decades of Deposited Plan (DP) registration, using NSW Land Titles Office deposition codes. Each was then overlaid onto composite maps of LC 1 to 3, to determine whether subdivision showed any time trends or concentration on prime land classes.

## RESULTS AND DISCUSSION

### Value of Agricultural Production

Area and estimated value of agricultural output of the three LGAs for 1996 are shown in Table 1. Agriculture in the two western Sydney LGAs is dominated by the intensive, non-land dependent, mushroom and poultry industries, both of which are seriously threatened by urban encroachment (4). The major land dependent industries turf, market gardening and some dairying are largely located on LC 1 and 2 land on the Hawkesbury floodplain. Orchardring in both is located on higher, less productive but flood-free LC 3 and 4 land. In contrast, agricultural industry in Mudgee is largely land dependent and, except for vines, less intensive, with the major industries, grazing and vines, located on Classes 1 to 4 land. Mudgee, the largest of the LGAs, has the greatest proportional land area devoted to agriculture (Table1) but the lowest value of agricultural production.

**Table 1 . Estimated area and farm gate value of agricultural industries in Hawkesbury, Mudgee and Wollondilly LGAs, December 1996 (4).**

Local Government Area	Hawkesbury		Wollondilly		Mudgee	
	Area (ha)	Value (\$)	Area (ha)	Value (\$)	Area (ha)	Value (\$)
<i>Land Dependent (LD) Agricultural Industries</i>						
Turf	1,571	31,640,000	209	4,210,500	5	125,000
Orchards	1,529	50,327,000	956	31,000,000	363	9,600,000
Market Gardens	1,634	16,240,000	1,036	9,600,000	38	400,000
Dairying	1,236	10,676,000	5,698	7,307,000	n.a.	200,000
Vines	71	390,500	n.a.	n.a.	2,906	27,000,000
Grain Crops *, **	neg.	neg.	neg.	neg.	75,356	2,000,000

Lucerne	179	480,000	n.a.	n.a.	6,315	4,100,000
Forestry	184	100,000	n.a.	n.a.	n.a.	n.a.
Berries/Nuts	157	1,500,000	n.a.	n.a.	n.a.	n.a.
Grazing	22,445	3,330,615	38,179	5,692,000	256,962	19,300,000
Horses #	3,961	no estimate	3,586	no estimate	5,000	no estimate
Other ##	226	150,000	138	250,000	n.a.	24,000
<i>Total LD</i>	<i>33,193</i>	<i>114,834,115</i>	<i>49,802</i>	<i>58,059,500</i>	<i>346,945</i>	<i>62,749,000</i>

*Non-Land Dependent (NLD) Agricultural Industries*

Mushrooms	30	66,000,000	20	3,000,000		
Poultry	250	30,000,000	1,244	300,000,000		
Pigs					n.a.	400,000
<i>Total NLD</i>	<i>280</i>	<i>96,000,000</i>	<i>1,264</i>	<i>303,000,000</i>	<i>n.a.</i>	<i>400,000</i>
<i>Total All Agriculture</i>	<i>33,473</i>	<i>210,834,115</i>	<i>51,066</i>	<i>361,059,500</i>	<i>346,945</i>	<i>63,149,000</i>
Total LGA Area ('000 ha)	279		256		672	
% Agricultural Land	11.8		21.6		50.3	

\*included in Market Gardens for Hawkesbury and Wollondilly. \*\*Mixed grazing and cropland for Mudgee. #grazing area shared with cattle, value not determined. ##mainly exotic animals (deer, alpacas).

*Land capability*

Limited areas of prime arable land (LC1 to 3) occurred in both Hawkesbury and Wollondilly, with each LGA dominated by LC 7 and 8 land, National Parks, or protected water catchment areas, all of which excluded commercial agriculture. Mudgee had both a higher proportion and greater total area of land in these prime (1-3) classes (Table 2).

*Subdivision by Capability Class*

The great majority of LC 1 to 3 land in Hawkesbury has been extensively subdivided (Table 3) over time, but the flood-prone location of LC 1 land has limited it to relatively large (>12 ha) allotments and had little impact on its availability for agriculture. In contrast, intensity of subdivision (based on lot size) on

LC 2 and 3 land is greater, and imposes a potential threat to its continuing availability for agriculture (4).

**Table 2. Area and percentage of total LGA area by DLWC Land Capability Classes for Hawkesbury, Mudgee and Wollondilly LGAs, December 1996. (4).**

LGA	Hawkesbury		Wollondilly		Mudgee	
	Area (ha.)	% of LGA	Area (ha.)	% of LGA	Area (ha.)	% of LGA
1	3,491	1.25	0	0	3,058	0.46
2	6,088	2.18	3,540	1.38	25,497	3.79
3	10,471	3.75	5,248	2.05	56,329	8.38
4	18,444	6.61	18,552	7.26	148,997	22.17
5	1,262	0.45	3,534	1.37	78,089	11.62
6	8,015	2.87	10,454	4.09	119,328	17.76
7/8	212,608	76.13	50,497	19.77	117,920	17.55
Other *	18,883	6.76	163,842	64.08	122,724	18.26
Total	279,262	100.00	255,667	100.00	671,944	100.00

\*Water, National Parks, urban, mining, State Forest areas not included in Capability Classes

Subdivision of the limited area of LC 2 and 3 land in Wollondilly is substantially less than in Hawkesbury, reflecting past planning policies and its use for medium scale dairy farming, now considered under threat (4). Hawkesbury and Wollondilly have large numbers of allotments of < 4 ha, under a range of land uses (Table 4). In Mudgee, high proportions of LC 1 to 3 land had been subdivided, but less intensively than in the western Sydney LGAs, and it was not seen to be under threat of loss from agriculture. The main population centres, Mudgee and Gulgong, are on LC 3 land, with LC 2 land adjoining. LC 1 land on the Cudgegong floodplain adjacent to Mudgee township is under mounting pressure for subdivision and development (4). Two waves of subdivision, pre-1920 and post-1960, were evident in each, reflecting early settlement in Hawkesbury and Wollondilly and, particularly, the gold rush period in Mudgee. Most subdivision occurred in the post-1960 wave in each. Patterns of subdivision in Hawkesbury indicated that land quality was largely irrelevant as a development constraint, as all LC 1 to 3 classes show the same trends over the entire period, suggesting other factors such as infrastructure and services dominated decision making on land development.

**Table 3. Subdivision (total area [ha] per decade) of prime agricultural land by decade of plan deposition for Hawkesbury, Wollondilly and Mudgee LGAs (4).**

LGA	Hawkesbury			Wollondilly			Mudgee		
	DLWC Land Capability Class								
Period	1	2	3	1	2	3	1	2	3
Pre 1920	110	204	381	-	43	283	182	556	967
1921-30	36	29	104	-	0	25	201	103	518
1931-40	4	1	90	-	59		2	37	37
1941-50	144	21	96	-	20	52	9	87	3
1951-60	116	52	373	-	45	33	58	471	545
1961-70	432	679	1,852	-	166	478	105	992	869
1971-80	616	1,030	1,833	-	311	442	239	2,612	3,124
1981-90	608	1,500	1,333	-	132	518	623	2,189	3,905
Post 1991	25	149	268	-	40	64	146	249	387
Total	2,092	3,664	6,332	-	817	1,893	1,565	7,296	10,355
Other**	1,175	1,788	2,764	-	346	924	1,109	15,316	37,865
Total Area	3,267	5,453	9,096	n.a.	1,163	2,817	2,674	22,612	48,220
Total Class Area	3,491	6,088	10,471	0	3,540	5,248	3,058	25,497	56,329
% Subdivided	94	90	87	n.a.	33	54	87	89	86

\*\* includes all non-private land use- roads, easements etc



Poultry	3	6	5	9	6	54	27	26				
Total NLD	4	7	7	9	6	54	27	26	0	0	0	0
Bushland	423	232	700	630	662	480	443	665	578	342	599	1676
Rural Residential	1,962	726	489	70	1061	1441	482	56	163	122	450	105

## CONCLUSIONS

Agriculture in Hawkesbury and Wollondilly is moving towards industries that are less, rather than more, dependent on prime quality land. LC 1 and 2 land in Hawkesbury has already been extensively subdivided, but its inherent flood liability will prevent urban encroachment and ensure its short term retention in agriculture. Wollondilly retains much of its Class 2 and 3 land in agricultural use, but future industry viability and subdivision pressures suggest its eventual loss to agriculture, notwithstanding Wollondilly Shire Council's specific planning policies to retain it. The case for prime land retention for agriculture in these LGAs is undermined by the economic domination of non-land dependent industries and the poor viability of land dependent industries (4). Economic pressures to subdivide land may in fact spawn new, high value agricultural industries, but these can thrive only when local government planning precludes barriers to their viable operation. Future, intensified, industries are likely to be even less dependent on land quality and the case for protection of prime land is likely to be stronger when based on its community amenity, rather than its agricultural, value. Rural residential development may do more to retain traditional industries than large scale retention of financially marginal operations (4). In contrast, agriculture in Mudgee seems likely to remain based on traditional industries which require quality land and the threats of prime land loss to the regional agricultural economy appear much more serious (5).

## Acknowledgments

Financial support for this research by RIRDC is gratefully acknowledged

## REFERENCES

1. Bowie, I.J.S. 1993. *Urban Policy and Research* **11** : 217-229.
2. Houston, P. 1994. *Proceedings Agriculture and Rural Industries on the Fringe Conference, Melbourne*, p 103.
3. Jones, E., Jones, P.R., Horsfall, W. and O'Dwyer, P. 1992. *Australian Planner* **30** : 4-44.
4. Kelleher, F.M., Chant, J.J. and Johnson, N.L. 1998a. RIRDC, Canberra, publication 98/15, 234 pp.
5. Kelleher, F.M., Chant, J.J and Johnson, N.L. 1998b. [Proceedings 9th Australian Agronomy Conference, Wagga Wagga](#), p 617.
6. Kennedy, A. 1993. *Country Towns and Rural Areas Planning and Development Conference : The Agenda for the 90's , Bendigo*, p 33.
7. Musgrave, W.F. 1986. *Rev. Mark. Agric. Econ.* **54** : 70-74.