Chapter 7

Agricultural Priority Scenario

Cattle Sunrise

I know of no pursuit in which more real and important services can be rendered to any country than by improving its agriculture
George Washington

CHAPTER 7 AGRICULTURAL PRIORITY SCENARIO

The previous scenarios have both had a considerable impact upon agricultural land uses throughout the region. Large areas of sugar cane became urbanised in the minimal constraints scenarios. Orchards were similarly affected when environmental constraints were imposed.

A proportionally large loss of area available to a primary industry on a local scale, such as seen in these scenarios, has the capacity to adversely affect local employment, family incomes and community cohesion as well as reduce the viability of some inter-dependent industries and services. The Agricultural Priority scenario presented in this chapter builds upon the minimal constraints scenario, encompassing the restrictions to urban development that were introduced in Chapter 5. In addition this scenario focuses on a landscape design aimed at sustaining specific areas that are recognised as having a high value for agricultural production or have an established significance for agricultural purposes at a state or regional level.

7.1 ORCHARDS

Since the 1980's the area around Lismore through to Ballina and Byron Bay has seen large areas of hillsides, previously used for grazing pasture, reallocated to macadamia and avocado orchards. In the previous

scenarios it was apparent that the growth of these orchard industries will compete for space directly with urban development. Whilst orchards produce high value products, market economies are likely to favour conversion to residential development (Murphy 2002). For the agricultural priority scenarios, the growth of orchards is projected from the trends of 1980-2004 and given priority over urban development by removing potential future orchard areas from potential urbanisation.

7.1.1 ORCHARD EXPANSION CALCULATIONS

Whilst the growth of orchards within the region has been rapid and now incorporates a large area, it is expected that the future growth of this industry will be at a considerably slower rate than what has previously transpired (DIPNR 2007).

Calculating projections for this growth was completed in a similar method to population growth (Chapter 4) by producing a linear trend of the historical (1980-2004) values up to the year 2030. As the rate of growth was expected to decrease over time, the value of for each time period was produced by adding 50% of the projected growth to the previous decades value, expressed in the equation:

$$Vt = Vt\text{-}1 + (0.5 * Vt(trend))$$

Where Vt is the value at that time period, Vt-1 the value of the previous time period and Vt(trend) the value of the trend function for that time period.

As orchards are only present in zones 4 and 5, calculations were only made for this area and are shown in Table 7.1.

TABLE 7.1: GROWTH OF ORCHARDS (25 X 25M CELLS)

Orchards	1980	1990	2000	2010	2020	**2030**
zone 4	0	28241	65685	81339	97761	**114182**
zone 5	0	25065	49422	61837	74192	**86548**

7.1.2 BUILDABLE AREA

For the placement algorithm, areas in zone 4 and 5 that have the potential for development of orchards are the forest, coastal complex, pasture and sugar cane classes of the 2004 LULC map. Removal of other classes produced the buildable area shown in Figure 7.1

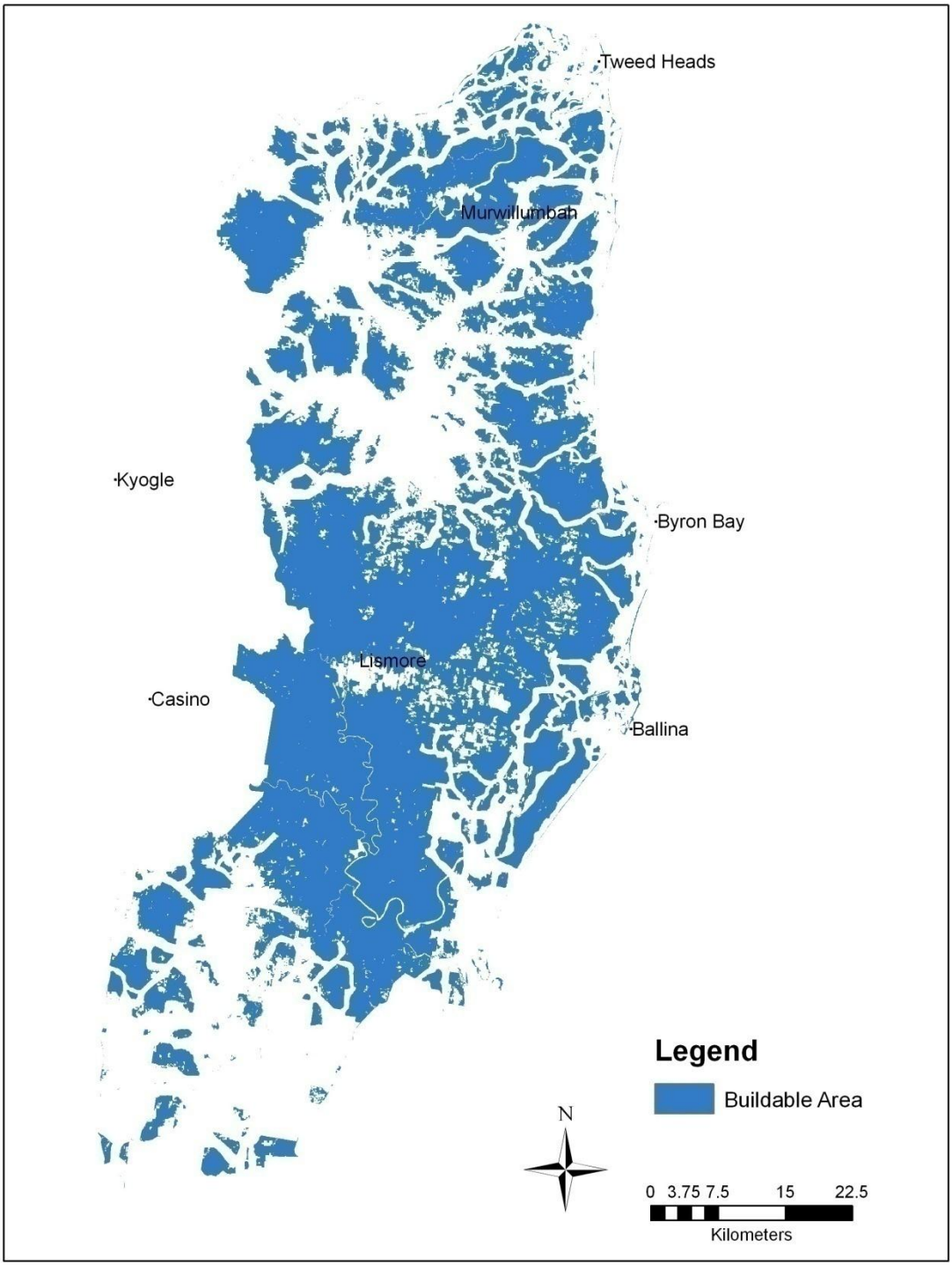

FIGURE 7.1: BUILDABLE AREA FOR GROWTH OF ORCHARDS

7.1.3 RESULTS

Placement of new orchards and merging them into the 2004 LULC produced the map shown as Figure 7.2 and land use changes tabulated in Table 7.2.

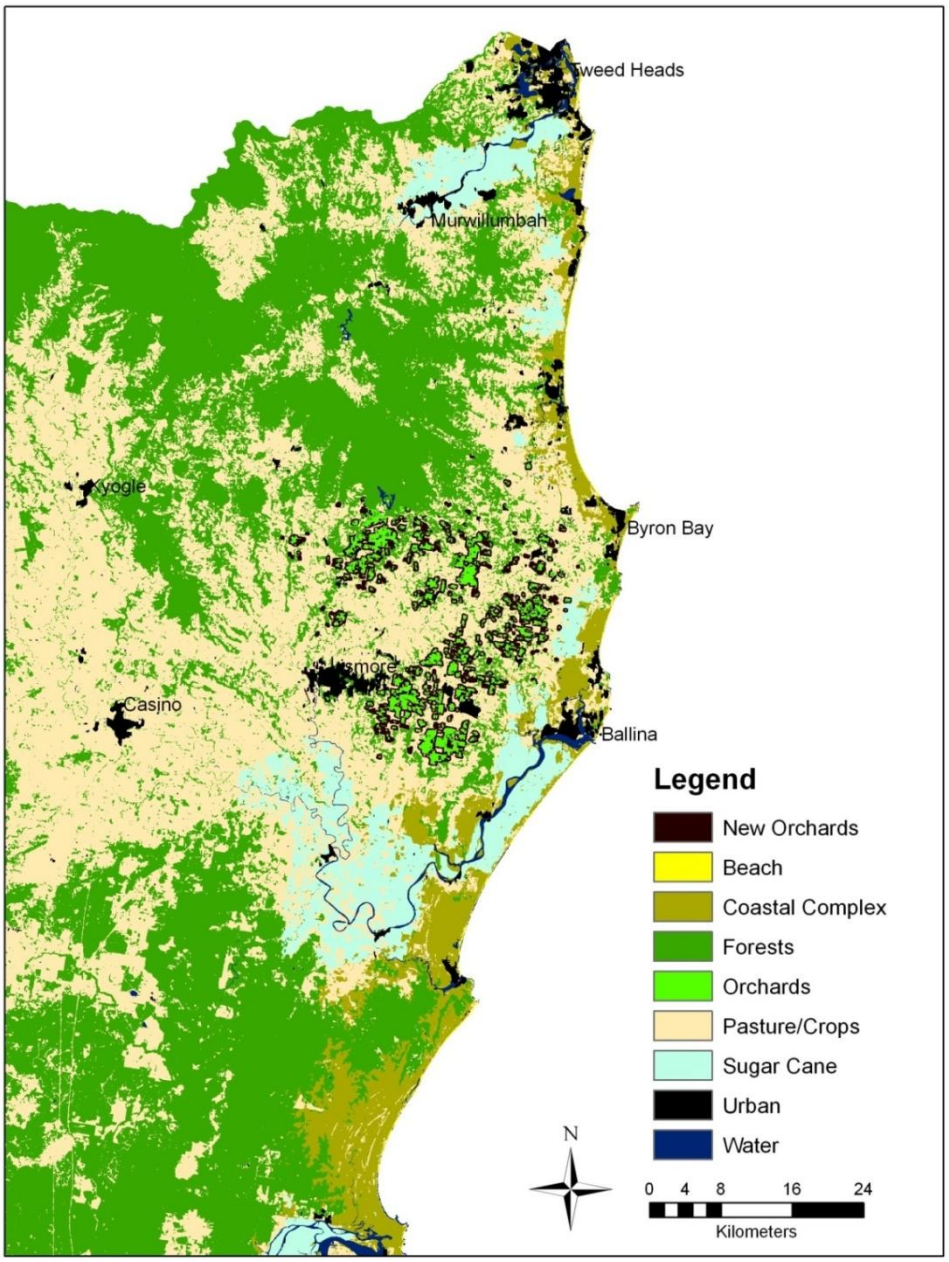

FIGURE 7.2: PROJECTED ORCHARDS MERGED WITH LULC 2004

TABLE 7.2: LAND USE CHANGE FOR PROJECTED ORCHARDS

Land Use / Population	2004	Orchards		
	Total ha	Total (Ha)	Change (ha)	% change
Coastal Complex	67563	67556	-6	0.01%
Forests	1205414	1202063	-3352	0.28%
Pasture/Crops	713725	704737	-8988	1.26%
Orchards	8730	21120	12390	141.94%
Sugar Cane	56069	56025	-44	0.08%

Overall, the orchard expansion scenario produced a 141.94% growth in the area of orchards LULC class. This predominately occurred through the conversion of pasture and crops.

7.2 CONSTRAINTS

The new orchards have been removed from potential urban development. Additionally spatial data was supplied by the NSW Planning Department which specified the agricultural areas that are protected as significant agricultural holdings under the 'The Northern Rivers Farmland Protection Project' (DIPNR 2005). At the time of the current research only properties for priority agricultural land in the northern part of the study area had been identified and mapped under this scheme. The spatial data supplied by NSW Planning Department included the proposed areas for protection within the southern part of the study area; therefore, the combined areas were included as a constraint to the agricultural scenario model. The combined areas are shown in Figure 7.3.

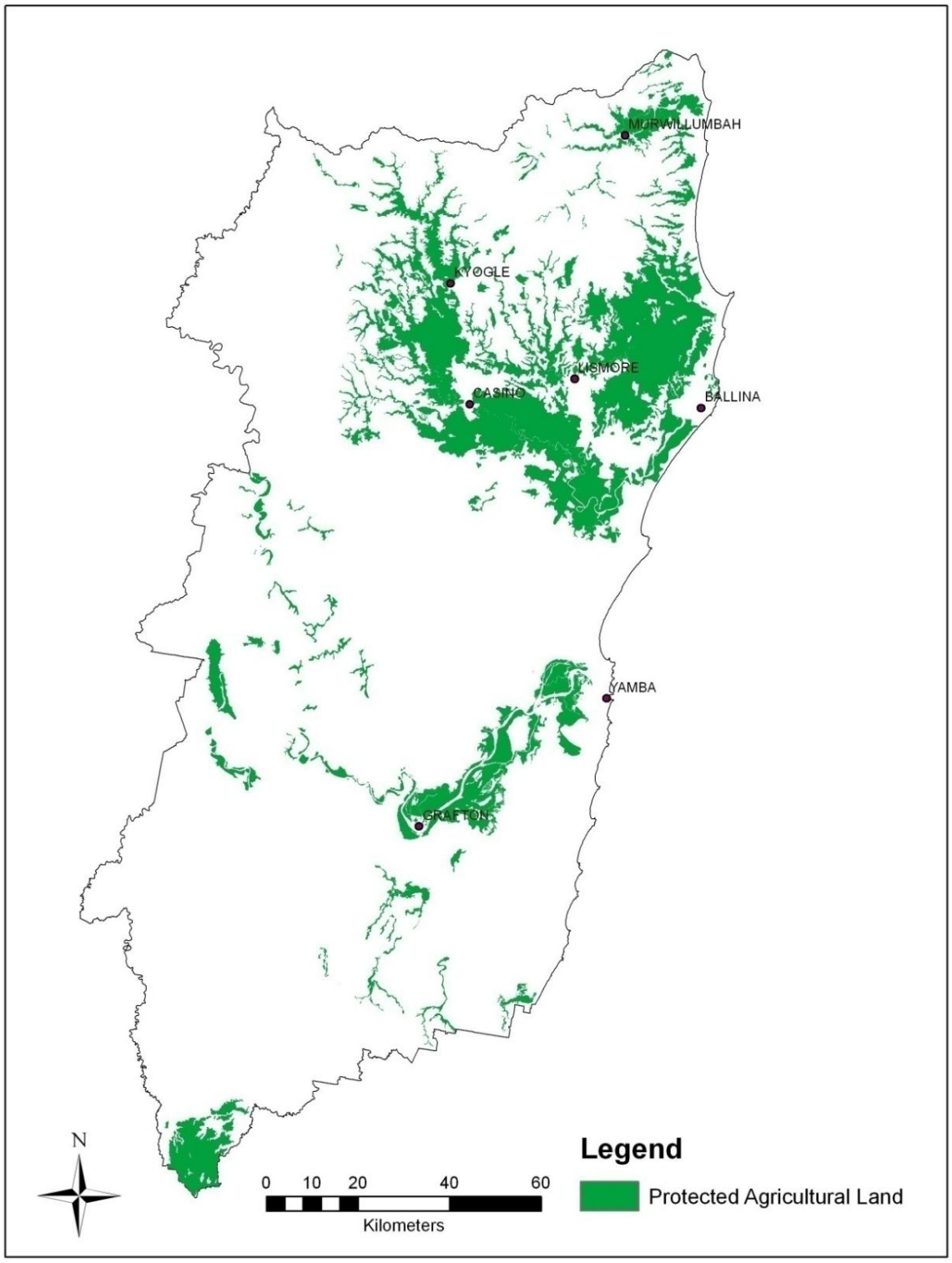

FIGURE 7.3: PROTECTED AGRICULTURAL LAND CONSTRAINT

7.3 POPULATION

This agricultural priority scenario used the same zoning, population growth and urban settlement density as the minimum constraints scenario. The levels of growth and the number of cells to be added for each zone by the placement algorithm were presented in Tables 5.1, 5.4, 5.7 and 5.10 in Chapter 5.

7.4 RESULTS

The new urbanised areas for each population level were compared then merged with the 2004 Land Use Land Cover Map and are shown with extracts of the Far North Coast area in Figures 7.4-7.10 respectively.

In comparison to the minimal constraints scenario, there is little difference at the population 403839 level and the most noticeable change is some increased urbanisation around Ballina and Byron Bay. At higher population levels, protection of the sugar cane belt that extends from Murwillumbah to Tweed Heads has seen increased urban development to the north and south of this area. Together with the protection of orchards and other areas to the immediate south, the new area of urban sprawl has significantly increased in its extent in a westerly direction north of Byron Bay.

As the orchards were only located in zone 4 and 5, their exclusion has not had an impact on other parts of the region. Protection of various agricultural lands to the south has had little impact elsewhere.

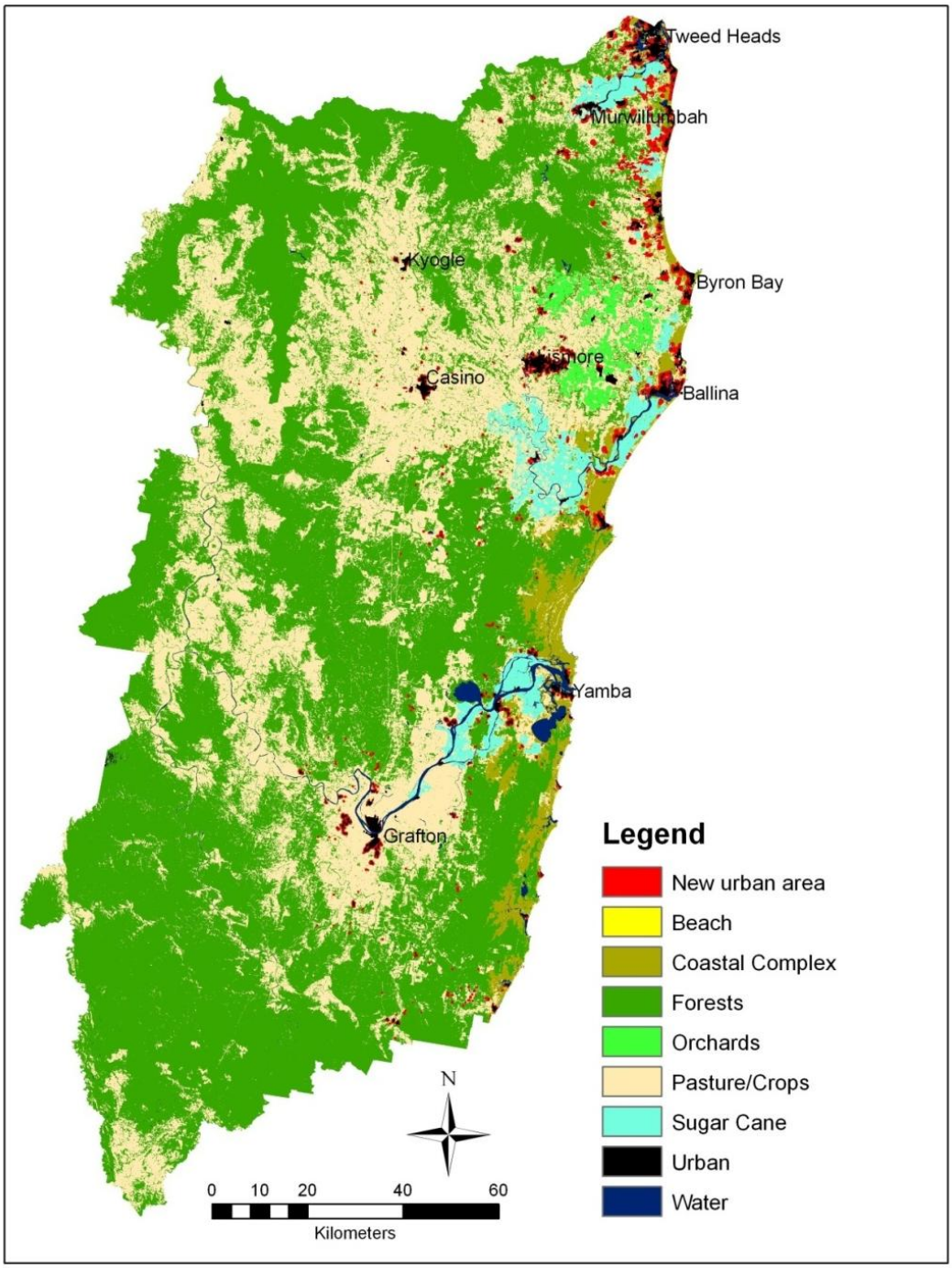

FIGURE 7.4: AGRICULTURAL PRIORITY SCENARIO FOR POPULATION 403839

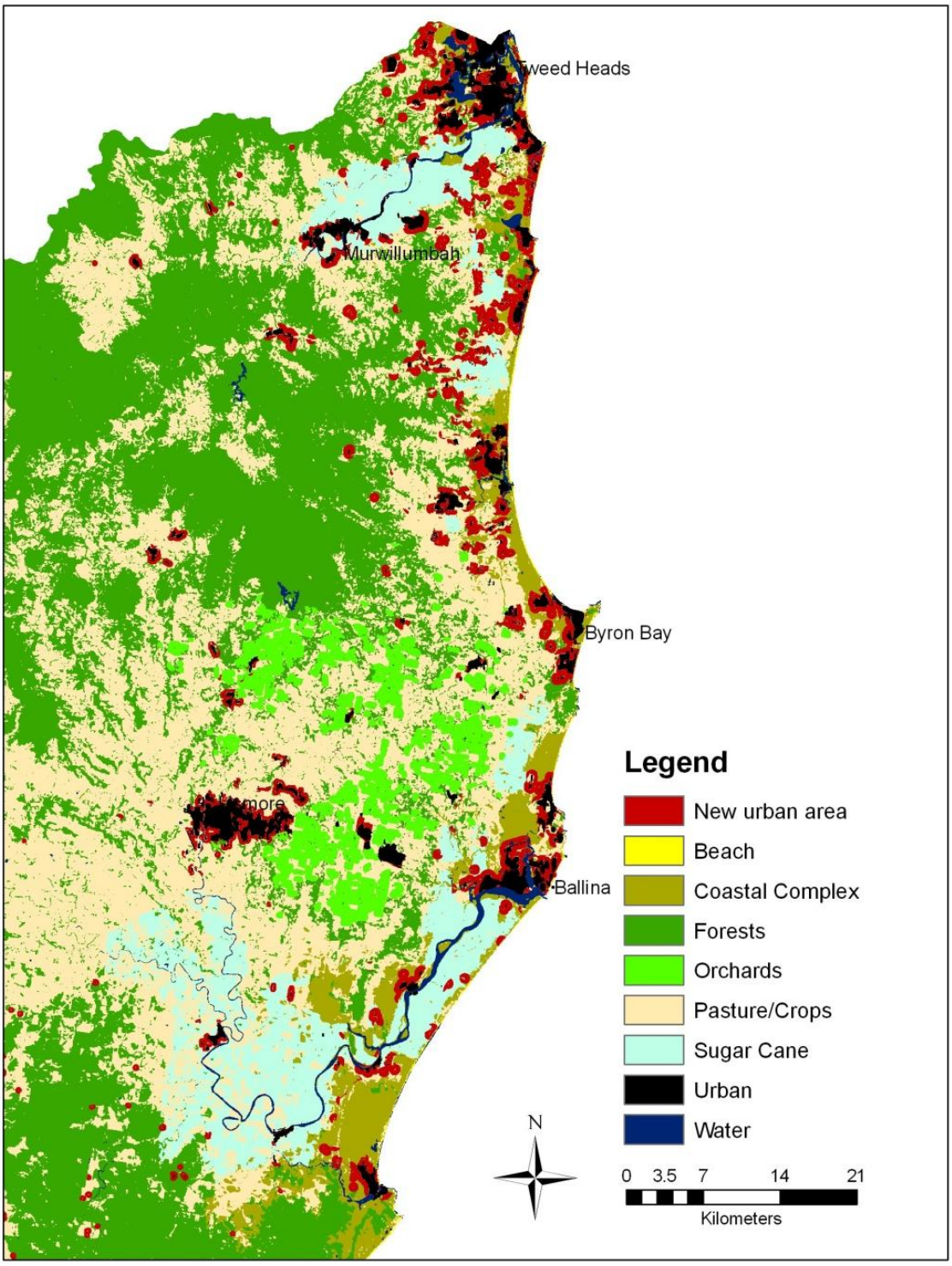

FIGURE 7.5: AGRICULTURAL PRIORITY SCENARIO FOR POPULATION 403839, FAR NORTH COAST PORTION

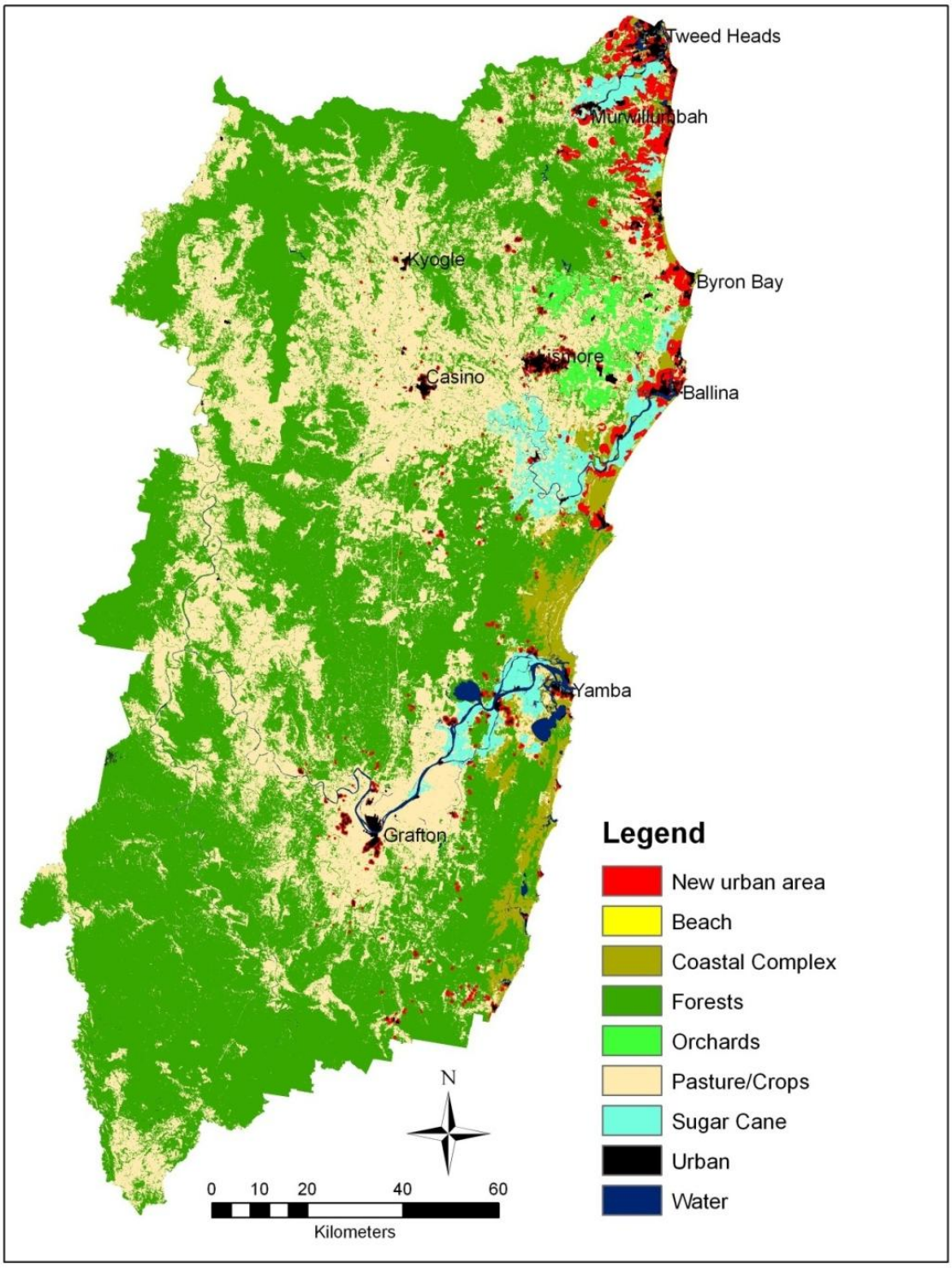

FIGURE 7.6: AGRICULTURAL PRIORITY SCENARIO FOR POPULATION 558911

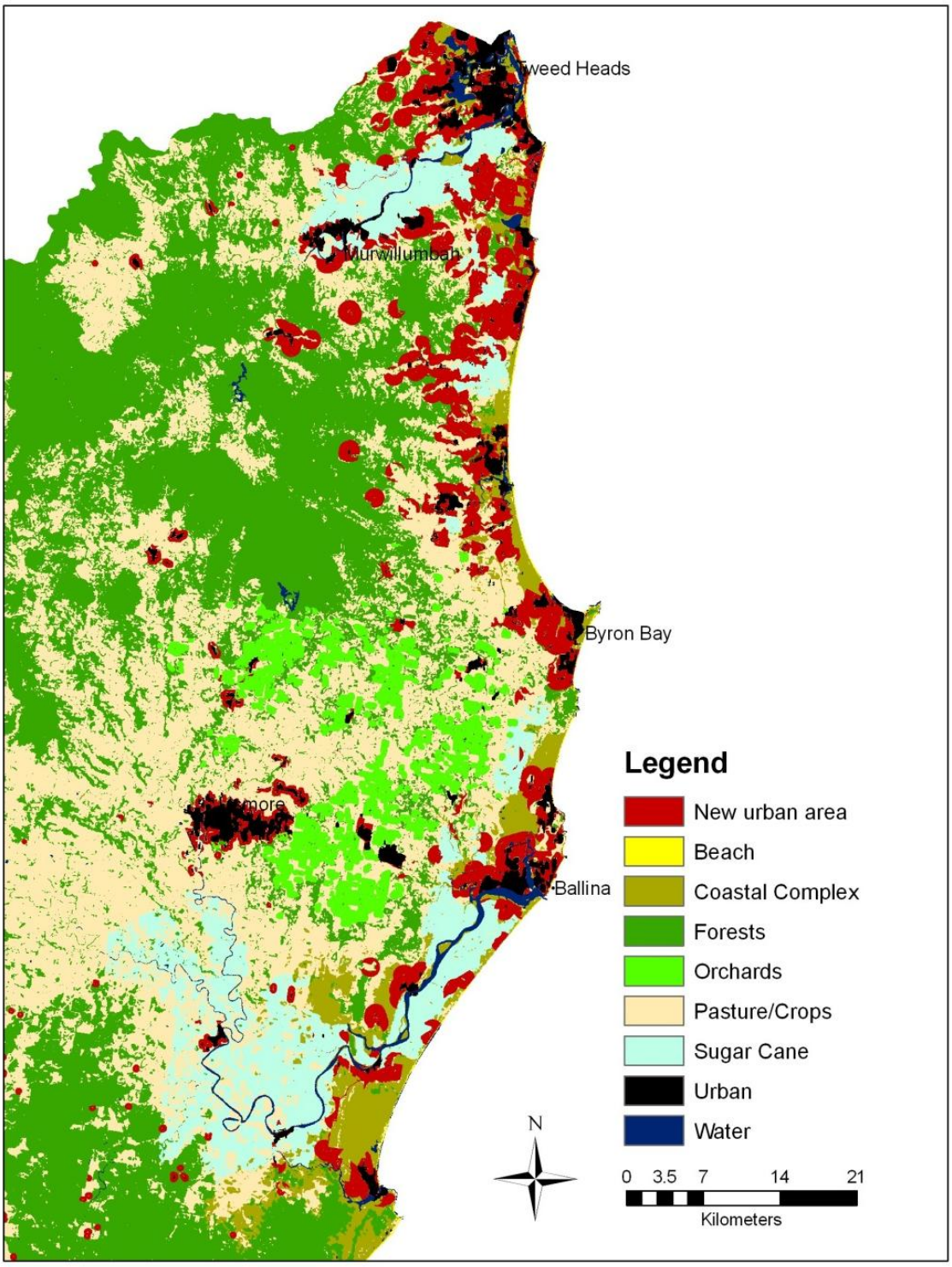

FIGURE 7.7: AGRICULTURAL PRIORITY SCENARIO FOR POPULATION 558911, FAR NORTH COAST PORTION

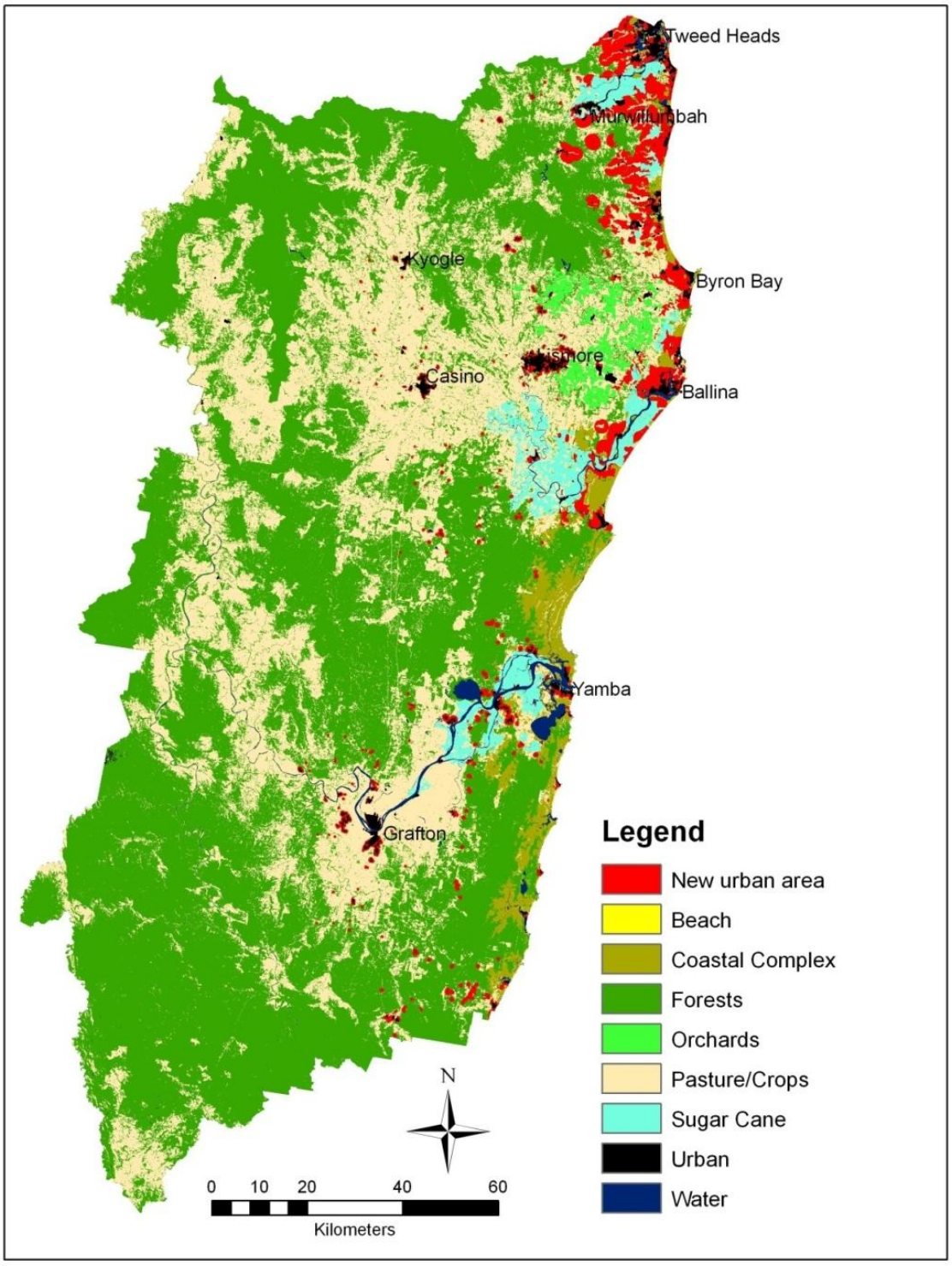

FIGURE 7.8: AGRICULTURAL PRIORITY SCENARIO FOR POPULATION 727657

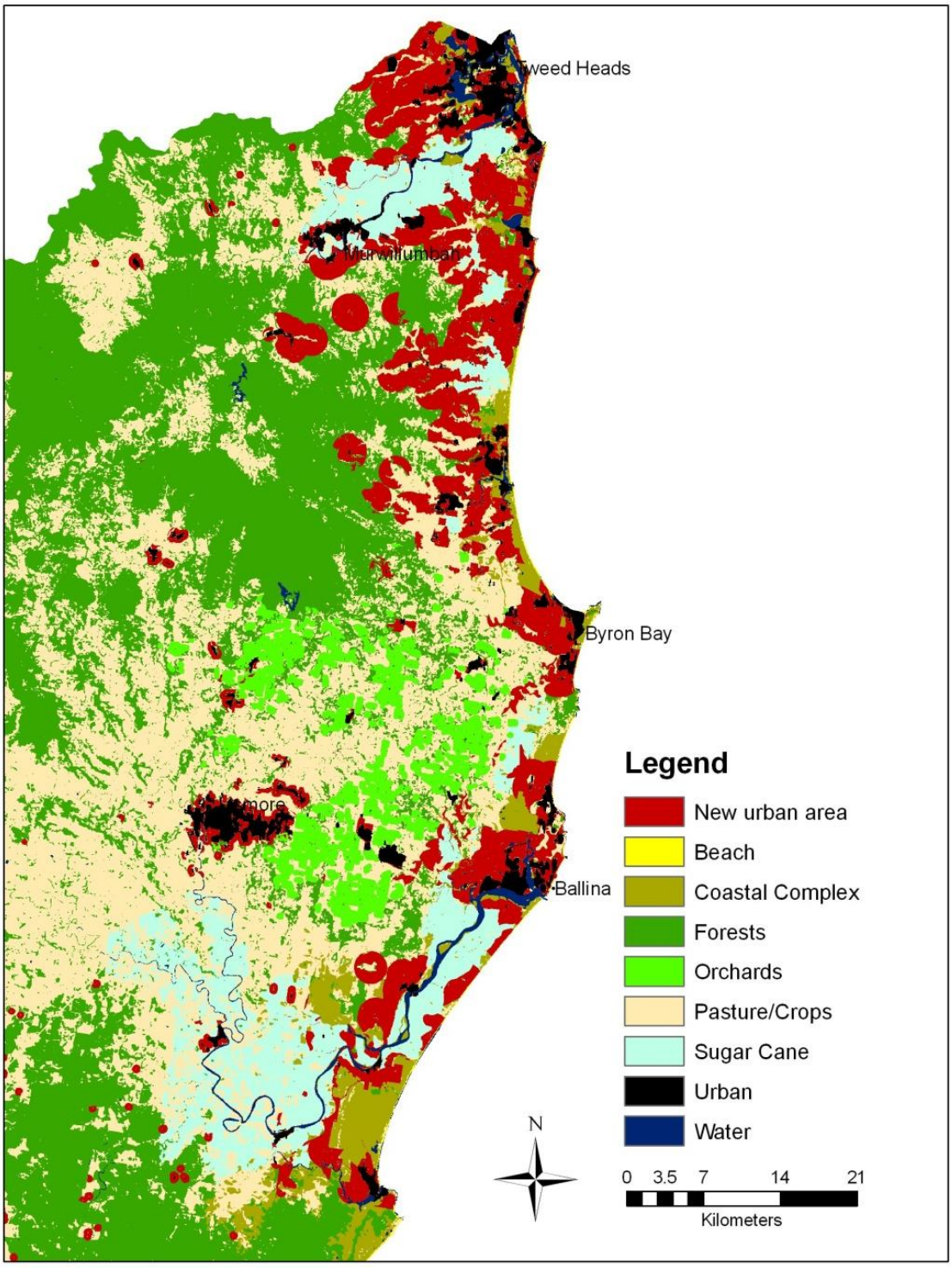

FIGURE 7.9: AGRICULTURAL PRIORITY SCENARIO FOR POPULATION 727657, FAR NORTH COAST PORTION

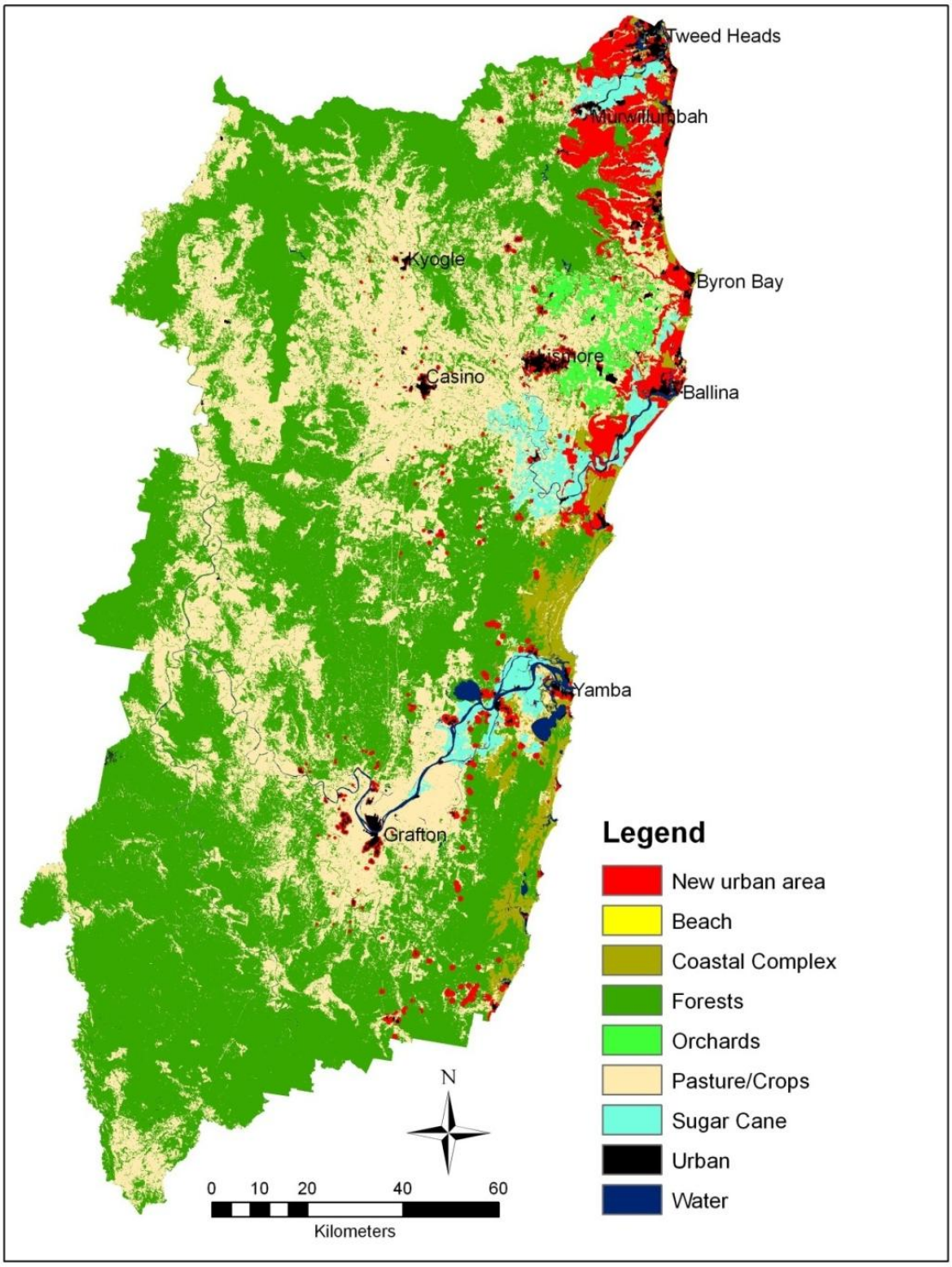

FIGURE 7.10: AGRICULTURAL PRIORITY SCENARIO FOR POPULATION 955497

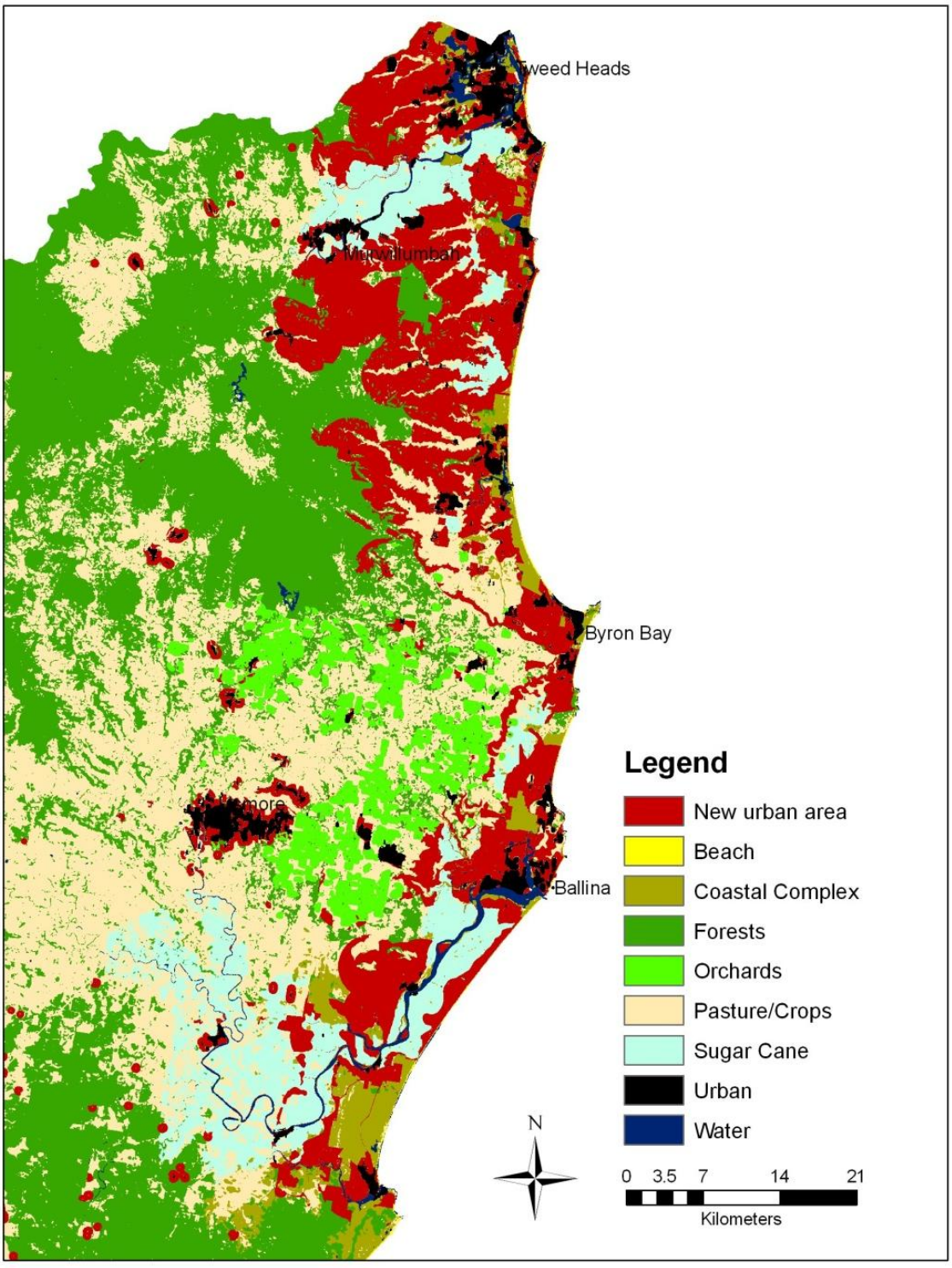

FIGURE 7.11: AGRICULTURAL PRIORITY SCENARIO FOR POPULATION 955497, FAR NORTH COAST PORTION

7.4.1 CHANGE TABLES

The change in land use for each population level is presented below in Table 7.3

TABLE 7.3: LAND USE CHANGE FOR AGRICULTURAL PRIORITY SCENARIO

Land Use / Population	2004	Population 403839			Population 558911			Population 727657			Population 955497		
	Total ha	Total ha	Change (ha)	% Change	Total ha	Change (ha)	% Change	Total ha	Change (ha)	% Change	Total ha	Change (ha)	% Change
Coastal Complex	67563	61969	-5593	-8.28%	58182	-9380	-13.88%	55378	-12185	-18.03%	53000	-14562	-21.55%
Forests	1205414	1195922	-9493	-0.79%	1190492	-14923	-1.24%	1182902	-22512	-1.87%	1169836	-35578	-2.95%
Pasture/ Crops	713725	688519	-25206	-3.53%	680713	-33013	-4.63%	672652	-41073	-5.75%	662882	-50843	-7.12%
Orchards	8730	21120	12391	141.94%	21120	12391	141.94%	21120	12391	141.94%	21120	12391	141.94%
Sugar Cane	56069	54661	-1408	-2.51%	53510	-2559	-4.56%	52314	-3754	-6.70%	50987	-5082	-9.06%
Urban	20148	49488	29340	145.63%	67670	47522	335.87%	87333	67185	433.46%	113917	93769	565.41%

The area attributed to urban settlement in the agricultural priority scenario is the same as in the minimal constraints scenario reaching a total area of 113917 hectares. As orchards expansion was projected and then protected from urban development, orchards have grown considerably and are a factor in the land use change for other classes.

The amount of sugar cane production was reduced by 9.06% (5082 hectares) which is less than a third of the reduction in area under the minimal constraints scenario, and 2.42% less than the environmental priority scenario. The pasture and crops class lost 50843 hectares which was an increase in area lost compared to the minimal constraints scenario (43809 hectares). However, the difference of 7034 hectares is less than half of the increase in orchards which displaced almost 9000 hectares of pasture and crop land in their allocation.

Overall, forests were reduced by 35578 hectares which was almost double the projected loss in the minimal constraints scenario. Most of the loss occurred in the area around Murwillumbah. Additionally the amount of coastal complex was reduced by a further 1680 hectares compared to the area lost under more the minimal constraints scenarios. Combined, a total of just over 50000 hectares of native vegetation was converted to urban development or to orchards in the population 955497 scenario. A breakdown by ecosystem type is presented in Table 7.4.

TABLE 7.4: LAND USE CHANGE BY ECOSYSTEM TYPE FOR AGRICULTURAL PRIORITY SCENARIOS

			Population 403839			Population 558911			Population 727657			Population 955497		
ECOSYSTEM	STATUS_A	LULC 2004	Total (ha)	Change (ha)	% Change	Total (ha)	Change (ha)	% Change	Total (ha)	Change (ha)	% Change	Total (ha)	Change (ha)	% Change
unclassified		151111	145398	-5713	-3.78%	141796	-9315	-6.16%	137917	-13194	-8.73%	132461	-18650	-12.34%
Baileys Stringybark		31076	30879	-197	-0.63%	30757	-320	-1.03%	30607	-469	-1.51%	30429	-647	-2.08%
Banksia	Rare	1336	1190	-146	-10.91%	1078	-258	-19.31%	1003	-333	-24.94%	883	-454	-33.95%
Casuarina Woodland	Rare	21	11	-10	-48.66%	5	-16	-74.78%	5	-16	-74.78%	5	-16	-74.78%
Central Mid Elevation Sydney Blue Gum		3278	3278	0	-0.01%	3277	-1	-0.03%	3277	-1	-0.03%	3277	-1	-0.04%
Clarence Lowland Needlebark Stringybark		10322	10266	-56	-0.54%	10219	-103	-1.00%	10146	-176	-1.71%	10036	-286	-2.77%
Lowlands Grey Box	Vulnerable	14455	14424	-31	-0.21%	14417	-37	-0.26%	14404	-51	-0.35%	14387	-67	-0.46%
Coast Cypress Pine	Rare	67	63	-4	-5.63%	63	-4	-5.82%	63	-4	-5.82%	62	-5	-6.94%
Coast Range Bloodwood-Mahogany		5177	5153	-24	-0.46%	5129	-48	-0.94%	5102	-75	-1.45%	5060	-117	-2.26%
Clarence Lowlands Spotted Gum		128339	128031	-308	-0.24%	127813	-526	-0.41%	127504	-835	-0.65%	126923	-1416	-1.10%
Coast Range Spotted Gum-Blackbutt	Rare	625	625	-1	-0.12%	622	-3	-0.53%	617	-8	-1.35%	600	-26	-4.14%
Coastal Flooded Gum		8039	8038	0	0.00%	8033	-5	-0.07%	8020	-19	-0.23%	7925	-114	-1.42%
Coastal Sands Blackbutt		2821	2798	-22	-0.79%	2784	-37	-1.31%	2770	-51	-1.82%	2760	-61	-2.17%
Dry Foothills Blackbutt-Turpentine		2704	2695	-9	-0.32%	2688	-16	-0.59%	2676	-28	-1.02%	2669	-35	-1.29%
Dry Foothills Spotted Gum		73800	73797	-3	0.00%	73794	-6	-0.01%	73789	-11	-0.01%	73783	-17	-0.02%

Dry Grassy Blackbutt-Tallowwood		5353	5324	-28	-0.53%	5300	-53	-0.98%	5264	-89	-1.66%	5219	-134	-2.50%
Dry Grassy Tallowwood-Grey Gum		2167	2146	-22	-1.00%	2125	-42	-1.95%	2104	-63	-2.90%	2067	-100	-4.62%
Dry Heathy Blackbutt-Bloodwood		42039	41744	-295	-0.70%	41529	-510	-1.21%	41243	-796	-1.89%	40807	-1232	-2.93%
Dry Heathy Sandstone Blackbutt		16634	16575	-59	-0.35%	16536	-98	-0.59%	16488	-146	-0.88%	16426	-208	-1.25%
Dry open Redgum-Broad Leaved Apple		1129	1129	0	0.00%	1129	0	0.00%	1129	0	0.00%	1129	0	0.00%
Dunns White Gum	Rare	291	291	0	0.00%	291	0	0.00%	291	0	0.00%	291	0	0.00%
Eastern Red Gums	Vulnerable	1774	1774	0	0.00%	1774	0	0.00%	1774	0	0.00%	1774	0	0.00%
Escarpment Redgum		15211	15208	-3	-0.02%	15208	-3	-0.02%	15206	-5	-0.03%	15202	-8	-0.05%
Escarpment Scribbly Gum-Apple		3583	3581	-2	-0.05%	3581	-2	-0.07%	3578	-5	-0.14%	3578	-5	-0.15%
Wet Bangalow-Brushbox	Vulnerable	8312	8248	-64	-0.77%	8126	-185	-2.23%	7890	-422	-5.07%	7494	-817	-9.83%
Foothill Grey Gum-Ironbark-Spotted Gum		39837	39723	-114	-0.28%	39615	-221	-0.56%	39464	-372	-0.93%	39233	-604	-1.52%
Foothills Grey Gum-Spotted Gum		5947	5922	-25	-0.43%	5903	-44	-0.74%	5876	-71	-1.20%	5833	-115	-1.93%
Gorge Grey Gum		697	697	0	0.00%	697	0	0.00%	697	0	0.00%	697	0	-0.02%
Gorge Ironbark-Grey Gum		22685	22684	-1	0.00%	22684	-1	-0.01%	22683	-2	-0.01%	22678	-7	-0.03%
Heath	Vulnerable	8138	7975	-164	-2.01%	7828	-310	-3.81%	7741	-398	-4.89%	7640	-498	-6.12%
Heathy Scribbly Gum		7235	7183	-52	-0.71%	7141	-94	-1.29%	7064	-170	-2.36%	6988	-246	-3.41%
Herbfield and Fjaeldmark	Rare	25	22	-3	-13.22%	21	-4	-17.21%	20	-6	-22.19%	18	-8	-30.17%
High Elevation Open Spotted		42550	42535	-15	-0.04%	42524	-26	-0.06%	42515	-36	-0.08%	42499	-52	-0.12%

Gum														
Ironbark		5467	5446	-21	-0.38%	5440	-27	-0.49%	5432	-35	-0.64%	5423	-44	-0.80%
Low Relief Coastal Blackbutt	Rare	310	183	-494	-40.94%	626	-937	-101.83%	1209	-1519	-289.43%	1827	-2137	-488.66%
Lowland Red Gum		43876	43817	-59	-0.14%	43748	-128	-0.29%	43647	-229	-0.52%	43512	-364	-0.83%
Lowlands Scribbly Gum	Vulnerable	3204	3188	-15	-0.48%	3181	-23	-0.71%	3171	-33	-1.03%	3159	-45	-1.40%
Lowlands Spotted Gum-Box		15578	15552	-26	-0.17%	15529	-49	-0.31%	15504	-74	-0.47%	15493	-85	-0.54%
Coastal Mallee	Vulnerable	1240	1211	-29	-2.35%	1183	-57	-4.62%	1171	-69	-5.60%	1170	-70	-5.66%
Mangrove	Rare	395	395	0	0.00%	395	0	0.00%	395	0	0.00%	395	0	0.00%
Moist Foothills Spotted Gum		30780	30775	-5	-0.02%	30770	-10	-0.03%	30760	-20	-0.06%	30741	-39	-0.13%
Northern Moist Blackbutt		8700	8665	-35	-0.40%	8571	-128	-1.47%	8352	-347	-3.99%	7663	-1037	-11.92%
Natural Grassland	Rare	270	269	-1	-0.37%	268	-2	-0.79%	266	-4	-1.34%	265	-5	-1.71%
Needlebark Stringybark-Large Fruited Blackbutt		9547	9484	-64	-0.67%	9435	-113	-1.18%	9376	-171	-1.79%	9277	-271	-2.83%
New England Stringybark-Blakelys Red Gum		1067	1066	0	-0.04%	1066	-1	-0.07%	1065	-1	-0.13%	1064	-2	-0.21%
Northern Grassy Sydney Blue Gum	Vulnerable	2856	2856	0	0.00%	2855	-1	-0.04%	2855	-1	-0.04%	2854	-3	-0.09%
Northern Open Grassy Blackbutt		18876	18781	-95	-0.50%	18684	-192	-1.02%	18469	-407	-2.16%	18152	-724	-3.83%
Northern Ranges Dry Tallowwood		19608	19603	-6	-0.03%	19593	-16	-0.08%	19571	-38	-0.19%	19466	-142	-0.73%
Northern Wet Brushbox		10532	10532	0	0.00%	10532	-1	0.00%	10531	-1	-0.01%	10506	-26	-0.25%
Northern Wet Tallowwood-Blue Gum		14647	14646	0	0.00%	14646	0	0.00%	14646	0	0.00%	14633	-13	-0.09%

Open Coastal Brushbox		3440	3419	-21	-0.62%	3398	-43	-1.24%	3366	-74	-2.15%	3305	-135	-3.93%
Open Shrubby Brushbox-Tallowwood		9663	9662	-1	-0.01%	9662	-1	-0.01%	9662	-1	-0.01%	9662	-1	-0.01%
Paperbark	Vulnerable	22405	21587	-818	-3.65%	20654	-1751	-7.81%	20016	-2389	-10.66%	19265	-3140	-14.01%
Red Bloodwood	Rare	207	206	-1	-0.63%	205	-2	-1.12%	203	-4	-1.96%	201	-6	-2.96%
Red Mahogany		1251	1248	-2	-0.19%	1248	-3	-0.21%	1245	-5	-0.43%	1244	-7	-0.57%
Richmond Range Spotted Gum		16415	16407	-9	-0.05%	16406	-9	-0.06%	16398	-18	-0.11%	16380	-35	-0.21%
Richmond Range Spotted Gum-Box		17197	17196	-1	-0.01%	17196	-1	-0.01%	17195	-2	-0.01%	17195	-2	-0.01%
River Oak	Vulnerable	824	823	-1	-0.07%	822	-2	-0.24%	820	-4	-0.45%	819	-5	-0.63%
Rough-barked Apples	Vulnerable	1396	1396	-1	-0.04%	1396	-1	-0.05%	1395	-2	-0.11%	1391	-5	-0.36%
Saltbush	Rare	9	9	-1	-7.95%	8	-2	-18.54%	7	-2	-25.17%	6	-3	-31.79%
Sandstone Spotted Gum-Blackbutt		3870	3861	-9	-0.23%	3857	-13	-0.33%	3849	-20	-0.52%	3841	-29	-0.74%
Sherwood Needlebark Stringybark		8249	8206	-43	-0.52%	8146	-103	-1.25%	8089	-159	-1.93%	8020	-228	-2.77%
South Coast Tallowwood-Blue Gum		2569	2568	-1	-0.04%	2566	-3	-0.10%	2564	-5	-0.19%	2564	-5	-0.21%
Stringybark-Apple		5044	5042	-2	-0.03%	5042	-2	-0.04%	5042	-3	-0.05%	5041	-3	-0.06%
Swamp	Endangered	11569	10872	-698	-6.03%	10387	-1183	-10.22%	10133	-1437	-12.42%	10039	-1530	-13.23%
Swamp Mahogany	Rare	351	304	-46	-13.21%	266	-84	-24.05%	238	-113	-32.26%	226	-125	-35.65%
Swamp Oak	Rare	1946	1765	-181	-9.30%	1669	-277	-14.23%	1579	-367	-18.87%	1530	-416	-21.37%

Sydney Peppermint-Stringybark	Rare	205	205	0	0.00%	205	0	0.00%	205	0	0.00%	203	-2	-0.98%
Tallowwood		3563	3562	-1	-0.03%	3561	-2	-0.05%	3561	-2	-0.05%	3561	-2	-0.05%
Turpentine		2470	2400	-70	-2.82%	2277	-193	-7.83%	2096	-374	-15.13%	1813	-657	-26.60%
Very Wet New England Blackbutt-Tallowwood		434	434	0	-0.03%	434	0	-0.03%	434	0	-0.03%	434	0	-0.03%
Wattle		783	767	-17	-2.11%	747	-36	-4.57%	704	-79	-10.14%	635	-148	-18.87%
Wet Bloodwood-Tallowwood		25677	25618	-58	-0.23%	25481	-196	-0.76%	25239	-437	-1.70%	24623	-1053	-4.10%
Wet Coastal Tallowwood-Brushbox		1526	1516	-10	-0.64%	1500	-26	-1.70%	1490	-37	-2.40%	1474	-53	-3.44%
Wet Flooded Gum-Tallowwood		5399	5316	-83	-1.54%	5136	-263	-4.86%	4797	-602	-11.15%	4170	-1229	-22.76%
Wet Foothills Blackbutt-Turpentine		1014	1014	0	0.00%	1014	0	0.00%	1014	0	0.00%	1013	-1	-0.10%
Yellow Box-Blakely's Red Gum	Vulnerable	38	38	0	0.00%	38	0	0.00%	38	0	0.00%	38	0	0.00%
Forestry Plantations		10325	10294	-30	-0.29%	10224	-101	-0.98%	10194	-131	-1.27%	10153	-172	-1.66%
Improved Pasture and Cropland		507	507	-1	-0.14%	507	-1	-0.14%	507	-1	-0.14%	507	-1	-0.14%
Introduced Scrub		989	989	0	0.00%	988	-1	-0.09%	984	-6	-0.56%	978	-11	-1.15%
Rainforest	Endangered	111641	111352	-288	-0.26%	110996	-645	-0.58%	110460	-1180	-1.06%	109324	-2317	-2.07%
Scrub	Vulnerable	4202	4060	-142	-3.38%	3873	-329	-7.83%	3683	-520	-12.36%	3508	-694	-16.52%
Cleared-Partially Cleared		3118	3096	-22	-0.70%	3088	-30	-0.97%	3082	-37	-1.17%	3071	-48	-1.53%
Camphor Laurel		6159	5858	-301	-4.89%	5480	-679	-11.03%	5015	-1144	-18.57%	4151	-2008	-32.60%

In many cases the effect on native vegetation ecosystem areas has been more detrimental than the minimal constraints scenario. For example, at a population of 955497, the greatest change was experienced by Casuarina woodlands which lost 74.78% of its area, and swamp mahogany which lost 35.65% of the 2004 levels. While this is similar to the minimal constraints situation, the reduction in area for banksias was 33.95%, camphor laurel 32.6%, saltbush 31.79% and the herbfield and fjaeldmark class lost 30.17% of its 2004 extent. The loss in area for the latter classes is considerably greater than the loss projected in previous scenarios.

With the exception of the non native camphor laurel, these ecosystems are all classified as rare and form part of the 12394 hectares of endangered, rare and threatened species that was converted to urban development or growth in orchards. This is approximately 3000 hectares more than minimal constraints scenarios and more than three times the loss expected in the environmental priority scenario.

7.5 SUMMARY

The agricultural priority scenario provided protection to areas of sugar cane production and provided for expansion of orchards within the region. While the protection of pasture and crop lands was less strong, some of the loss within this class was in conversion to a "higher value"

agricultural land use, that of orchards. The constraints did protect what is considered the most important agricultural land within the region ensuring that these holdings were not lost from production.

However the protection of agriculture has been at the expense of native vegetation. In particular, areas of rare and endangered species within the region were converted to urban settlement. The next chapter attempts to draw together protection of both, the environmental and agricultural areas through design constraints aimed at providing a better balance between the priorities of these land uses.