Department of Science, Information Technology and Innovation

Land Use Summary 1999–2015

for the Atherton Tablelands

Remote Sensing Centre

May 2017

Queensland Government

Prepared by

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May 2017

Executive Summary

The Queensland Land Use Mapping Program (QLUMP) (DSITI, 2017) has produced land use mapping for the Atherton Tablelands (defined by catchment and locality boundaries) for 1999 and 2015 compiled from the 2015 Wet Tropics NRM region (DSITI, 2016a) and the 2015 Northern Gulf NRM region (DSITI, 2016b) land use mapping products. Land use is classified under the Australian Land Use and Management (ALUM) Classification Version 7 (ABARES, 2011a).

Grazing native vegetation, nature conservation and *production forestry* are the dominant land use classes. *Grazing native vegetation* accounted for 66% (556,352ha) of the Atherton Tablelands project area in 1999, reducing to 63% (530,668ha) in 2015. The *production forestry* land use class accounted for 15% (123,585ha) in 1999 reducing to 5% (41,974ha) in 2015. *Nature conservation* represented 3% (22,212ha) in 1999 and increased to 13% (111,107ha) in 2015.

Analysis of the **net** land use changes between 1999 and 2015 shows:

- *Nature conservation* increased by 88,895ha or 400%. This is the result of the establishment and expansion of conservation estates throughout the region.
- *Managed resource protection* increased by 22,430ha or 359% with the establishment of new forest reserves and nature refuges.
- *Grazing native vegetation* decreased by 25,654ha or 5%, the largest losses were associated with the establishment of The Bluff State Forest north-east of Ravenshoe, and the expansion of Hann Tableland National Park north-west of Mareeba.
- *Production forestry* decreased by 81,611ha or 66% mainly associated with the conversion of state forests to national parks.
- Irrigated perennial horticulture increased by 3,271ha or 36% including 46 new mango, 8 banana and 11 avocado tree crop features located west of Mareeba and around Dimbulah.
- Within the intensive uses land use class intensive animal production increased by 255ha or 82%, residential and farm infrastructure by 2,177ha or 12% and mining by 346ha or 57%.

Land use change mapping products are derived at the secondary level of the ALUM classification. For the 1999–2015 period, the total area of land use change within the Atherton Tablelands is **156,958ha or 19% of the area.** Of this, 125,864ha (80%) is mapped as a decrease in land use intensity, whilst 31,095ha (20%) is an increase.

For the 2015 land use mapping, QLUMP added a ‘commodity’ attribute to specifically map avocado, banana, macadamia and mango orchards. The addition of the commodity attribute field allows for the classification of tree crops from other horticultural crops (apples, pawpaw, etc). Sugar has always been mapped to commodity level. Summary statistics from the five commodities mapped in 2015 show:

- 18,188ha of *sugar* (129 features)
- 2,774ha of *mango* orchards (197 features)
- 2,387ha of *banana* crops (55 features)
- 1,292ha of *avocado* orchards (52 features) and
- 117ha of *macadamias* (3 features)

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Introduction

The Queensland Land Use Mapping Program (QLUMP) is partner of the Australian Collaborative Land use and Management Program (ACLUMP) (ABARES, 2017) coordinated by the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES). ACLUMP promotes nationally consistent land use information.

Land use and land management practices have a profound impact on Queensland's natural resources, agricultural production and the environment. The availability of consistent and reliable spatial information regarding land use is critical for sustainable natural resource management by Australian, Queensland and local governments, Regional Natural Resource Management (NRM) organisations, industry groups, community groups and land managers.

QLUMP has updated the land use mapping in the Wet Tropics and Northern Gulf NRM regions to 2015. This report presents and summarises this mapping, as defined by the Atherton Tablelands project area, including:

- revised 1999 land use dataset including improvements and corrections to the original
- 2015 land use dataset
- land use change dataset between 1999–2015
- summary statistics derived from the above spatial datasets.

Methodology

Mapping is performed in accordance with ACLUMP guidelines. The methodology is accurate, reliable, cost-effective, and makes best use of available databases, satellite imagery and aerial photography.

The mapping scale is 1:50,000 with a minimum mapping unit of two hectares and a minimum mapping width of 50 metres for linear features.

The land use mapping methods used by QLUMP are described in full in the ABARES handbook: Guidelines for land use mapping in Australia: principles, procedures & definitions – Edition 4 (ABARES, 2011b).

Project Area

QLUMP has defined the project area for the Atherton Tablelands using catchment boundaries derived from the Australian Hydrological Geospatial Fabric project, Version 2.1.1 (Bureau of Meteorology, 2014) and the locality boundaries (DNRM, 2016) of Julatten and Kuranda in the north and Butchers Creek, Lake Barine, Lake Eacham, Palmerston, Speewah and Topaz in the south-east. The area includes the towns of Millaa Millaa, Ravenshoe and Mount Garnett in the south to Dimbulah, and Julatten and Kuranda in the north (Figure 1).

The largest towns within the area include Mareeba and Atherton with a population of 10,911 and 10,886 respectively (ABS, 2016). Rainfall ranges from <1000mm per annum in the west to >8000mm per annum in the south-east (Bureau of Meteorology, 2016).

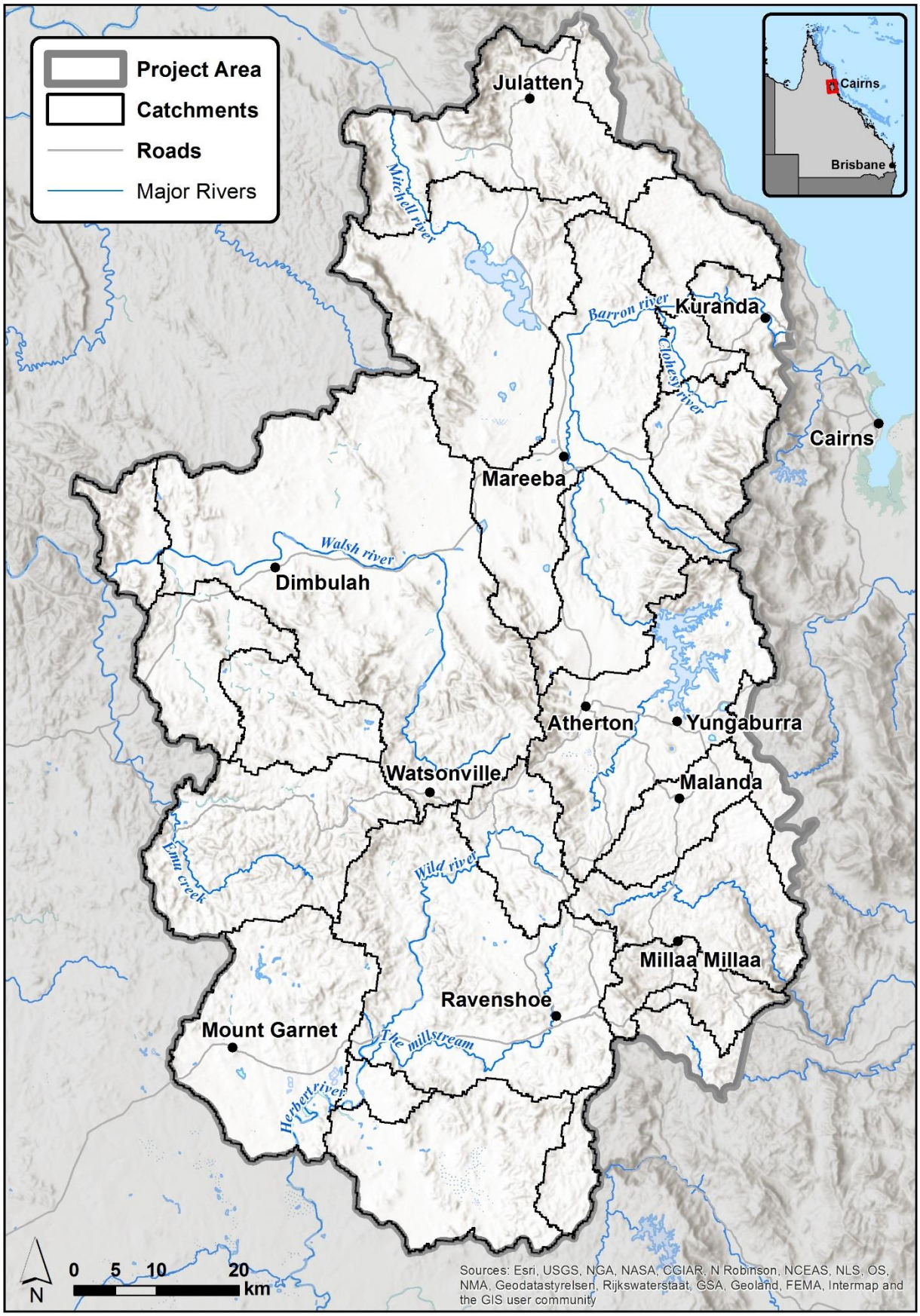


Figure 1: Atherton Tablelands project area

Australian Land Use Management Classification

The Australian Land Use and Management (ALUM) classification (Figure 2) shows five primary classes, identified in order of increasing levels of intervention or potential impact of land use; water is included separately as a sixth primary class. Within the primary classes is a three-level hierarchical structure (ABARES, 2011c). Primary, secondary and tertiary levels broadly describe the potential degree of modification or impact of land use on the landscape. The secondary level in the three-level hierarchical structure is the minimum attribution level for land use mapping in Queensland.

Primary and secondary levels relate to land use (i.e. the principal use of the land in terms of the objectives of the land manager). The tertiary level includes data on commodities or infrastructure, for example, crops such as cereals or infrastructure such as urban residential. Where possible, class attribution is performed to the tertiary level. For instance, QLUMP consistently maps land use classes *sugar* and *cotton* (dryland and irrigated) to tertiary level.

For the 2015 land use mapping, QLUMP added a 'commodity' attribute to specifically map avocado, banana, macadamia and mango orchards. They are classified under the secondary land use class of *perennial horticulture* and at tertiary level as *tree fruits* for avocado, bananas and mango or *tree nuts* for macadamia. The addition of the commodity attribute field allows for the classification of tree crops from other horticultural crops (apples, pawpaw, etc). All avocado, banana, mango and macadamia crops have been mapped as irrigated.

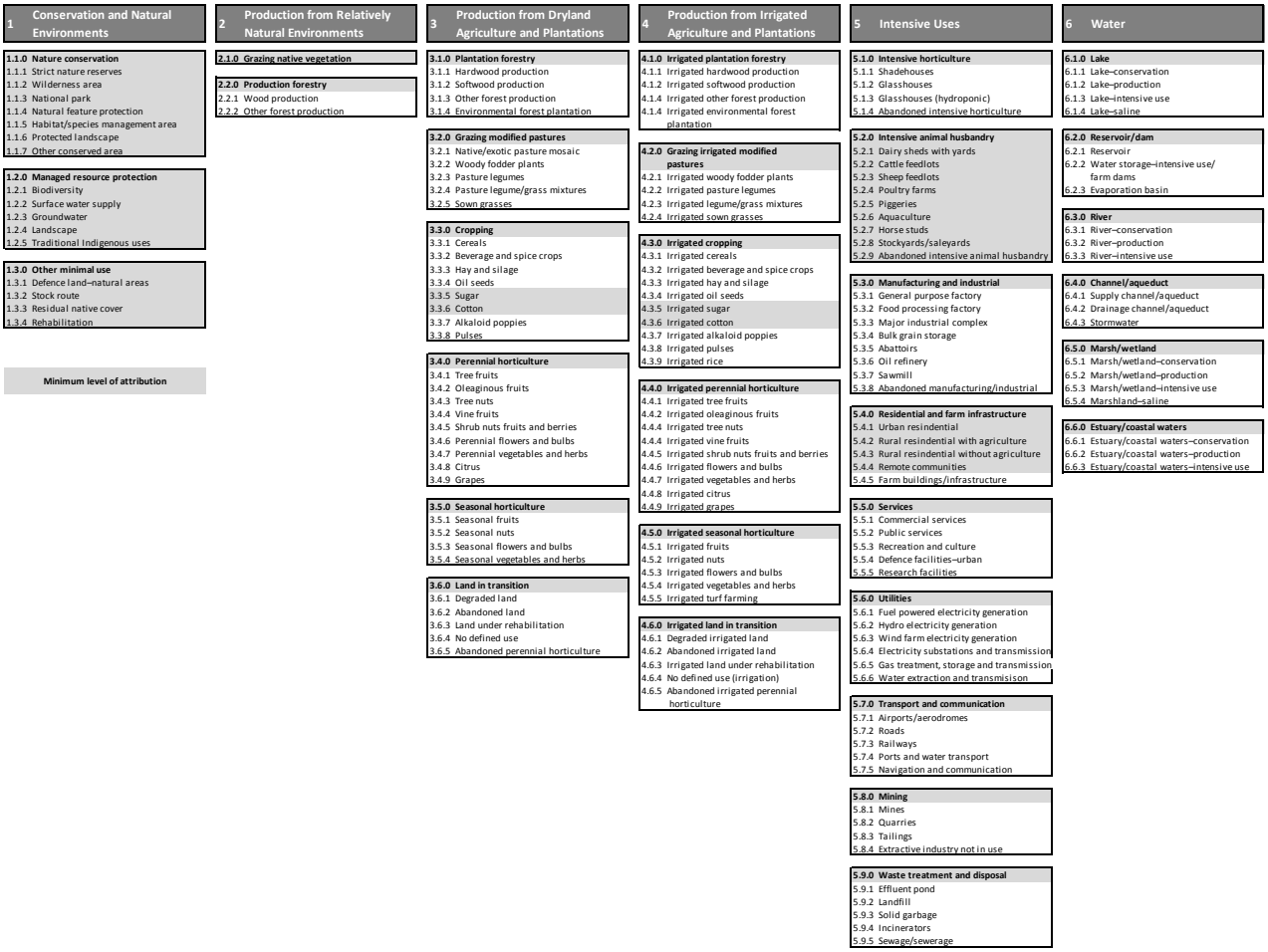


Figure 2: Australian Land use and Management (ALUM) classification, Version 7 (ABARES, 2011c)

Atherton Tablelands Land Use Mapping

The 2015 Atherton Tablelands land use mapping was compiled from the 2015 Wet Tropics NRM region (DSITI, 2016a) and the 2015 Northern Gulf NRM region (DSITI, 2016b) land use mapping products.

The 2015 land use map was largely compiled from SPOT6/7 1.5m pan-sharpened satellite imagery acquired between 16th March 2015 and 26th April 2015 supplemented by high-resolution orthophotography acquired in March and April 2015. An ESRI ArcGIS for Server geodatabase replication environment was used to overlay land use datasets on imagery and digitised or modified areas previously omitted or incorrectly mapped in 1999. Land use change maps were then derived (at the secondary level of the ALUM classification) for the period 1999–2015.

The 1999 land use map was revised with Landsat 7 Enhanced Thematic Mapper Plus (ETM+) satellite imagery (30m) acquired in winter. This was also supplemented by scanned aerial photography where available.

In addition to imagery, several ancillary datasets aided in the classification of land use including:

- Digital Cadastral Database (DCDB)
- Queensland Valuation and Sales (QVAS) database
- Protected Area Estates
- Animal husbandry datasets (piggeries, aquaculture, feedlots & poultry farms)
- Cotton gins, sugar mills and saw mills
- Mining lease areas
- Nature refuges
- Queensland Forestry plantations
- Public Recreation Lands
- Queensland Wetlands

Some land uses are difficult to differentiate using satellite imagery and existing databases, for example, dryland and irrigated agriculture. Therefore, local expert knowledge provided by state government regional staff, natural resource management groups, agricultural industries and landholders was an important component of the mapping methodology. Field surveys were also undertaken to verify areas of uncertainty.

Within the Atherton Tablelands, the major commodity producing area is serviced by irrigation infrastructure from the Mareeba-Dimbulah irrigation scheme, established in the late 1950s to supply reliable irrigation for the cultivation of tobacco. The scheme now supports a range of horticultural tree crops and sugarcane, all of which have increased in area from 1999 to 2015 (Sunwater, 2016).

Data Limitations

Land use features that are linear, such as creeks, roads and railways, are not mappable at a scale of 1:50,000 with a specified minimum mapping width of 50 metres. As a result, the area estimates of these **linear features** represent only a small proportion of the actual area within the following land use classes: (Figure 3a).

- *transport and communication*
- *rivers*

- *channel/aqueduct*

Similarly, land uses that fall under the QLUMP minimum mapping area of two hectares are not explicitly mapped but aggregated into the surrounding land use class. This will have the effect of over-estimating the area of some land use classes. For example, *grazing native vegetation* where roads, drainage lines, and small dams are included (Figure 3b).

Livestock grazing occurs on a range of pasture types including native and exotic species as well as mixtures of both. Identifying and separating these pasture types using imagery, aerial photography and field observation is difficult and unreliable. Therefore, the ALUM classification secondary land use classes of *grazing modified pastures* and *grazing irrigated modified pastures* have not been mapped explicitly from the *grazing native vegetation* class. The modified pasture classes have been mapped with the benefit of field verification to identify, for example, dairy pastures and fodder crops. Areas of pasture which appeared to be harvested for fodder or grazed were mapped as *cropping*. This may contribute to an over-estimation of cropping in the region. The appearance of these can be highly variable therefore classification may not be consistent.

The distinction between (dryland) *cropping* and *irrigated cropping* was not always evident and it is likely there is some misclassification in these classes. QLUMP undertook field surveys and together with local knowledge confirmed areas of irrigation where possible. An area's proximity to water sources (watercourse or dam) was also used. In addition, areas mapped as *irrigated cropping* are potentially only irrigated on a supplementary basis and may not have actually been irrigated in 1999 or 2015 (Figure 3c and d).

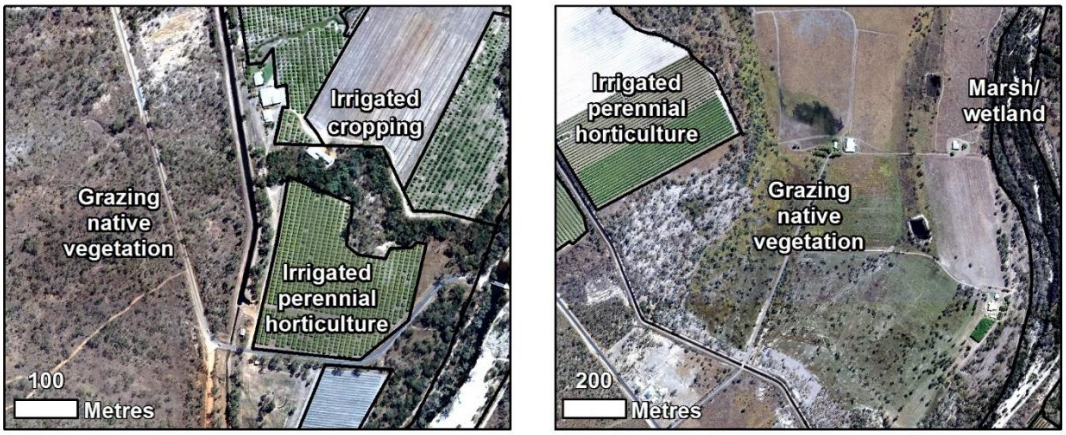
Through fieldwork, QLUMP found some misclassification (thematic error) in the mapping of the banana plantations (at commodity level)—with pawpaw plantations. While many were able to be corrected through verification in the field, the challenge in distinguishing these land uses from each other in 1.5m imagery remains (Figure 4). This may contribute to an over-estimation (commission error) in the area of banana plantations.

The *rural residential* land use class is a source of possible thematic error. Properties on the fringes of suburban settlements, hobby farms and subdivisions in isolated localities with comparatively small lot sizes were mapped to this class. The use of the Queensland Valuation System (QVAS) was helpful in mapping this class, based on whether or not the land owner was classified as a primary producer. Residential features greater than 0.2 hectares and less than 16 hectares were mapped as rural residential. This class may be misclassified with *grazing native vegetation* and *other minimal use*, especially on larger properties.

The Queensland Herbarium's wetlands (DSITI, 2013) datasets provided the basis for mapping *marsh/wetlands*, *lakes*, *rivers* and *reservoir/dams*. The ephemeral nature of many of these water features can lead to confusion as they may be present in one image and either absent or different in subsequent or earlier dated imagery. As a result, there may be errors, omissions and disagreement in the mapping of features such as farm dams, reservoirs, lakes, wetlands and other water features. The mapping of all *water* land use class features was greatly aided by the interpretation of 2015 Landsat 8 OLI satellite imagery.

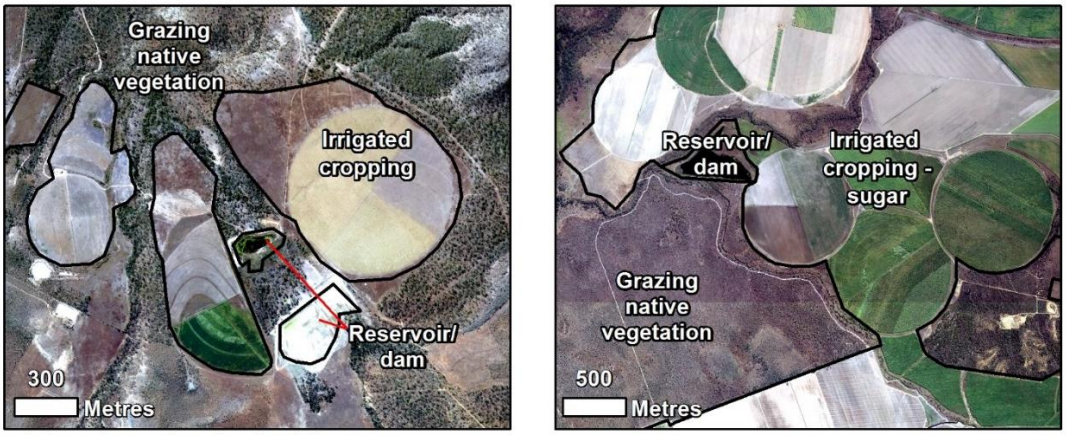
The 1999 and 2015 land use datasets are a snapshot of what was interpreted as the primary land use in these years. However, effort was made to distinguish between an actual land use change and a rotation. For example, an area that is usually cropped, but is not used for that particular purpose in the year of interest, was still mapped as *cropping* even though no crop was present in that year. This was not considered an actual land use change, but rather a rotation, as the primary land use for that field would still be *cropping.*

The 1999 land use mapping has been revised and improved through the interpretation of the most suitable imagery available. On occasion this was Landsat (30m), which raises some uncertainty in respect of accurately classifying the intensive land use classes. The minimum mapping unit (2ha) also contributes to the uncertainty through the aggregation of otherwise individual land use features, particularly at cadastral parcel level. These limitations may therefore lead to omission and commission errors in the classification of the intensive land use classes in earlier mapping products and the land use change products from which they are derived.



a. Transport and aqueduct land use – linear features not mapped

b. Drainage, road and small dam features are aggregated into the surrounding land use



c. Irrigated cropping showing infrastructure – central pivot irrigation

d. Irrigated cropping - Sugar

Figure 3: Examples (a–d) of land use features

Figure 4: An example of banana, pawpaw and sugar land use commodities.

Products

1999 and 2015 land use datasets

Land use datasets for the Atherton Tablelands are presented at the secondary level of the ALUM classification (Figure 2) in:

- 1999 land use dataset — Figure 5
- 2015 land use dataset — Figure 6

Summary statistics for each are presented in:

- 1999 land use — Table 1
- 2015 land use — Table 2

All statistics presenting the area of land use classes are reported in hectares (ha).

Table 1 and Table 2 shows that within the Atherton Tablelands project area the *grazing native vegetation* land use class accounted for 66% (556,352ha) in 1999 falling to 63% (530,668ha) in 2015. The *production forestry* land use class accounted for 15% (123,585ha) in 1999 and decreased to 5% (41,974ha) in 2015. *Nature conservation* represented 3% (22,212ha) in 1999 and increased to 13% (111,107ha) in 2015.

Analysis of the specific land use changes from one secondary class to another for 1999–2015 is presented in the section on page 20.

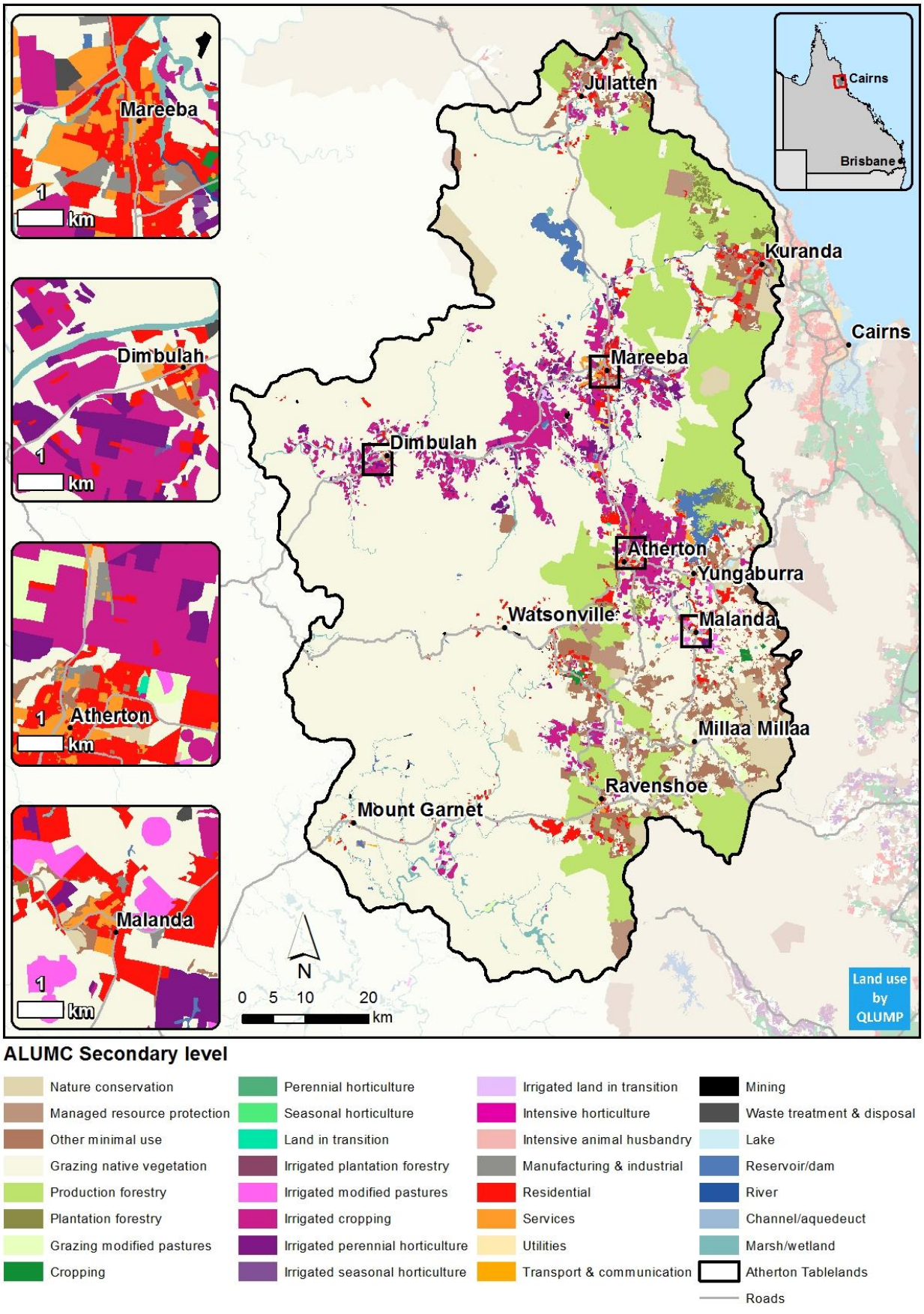


Figure 5: 1999 land use map for the Atherton Tablelands

Table 1: Summary statistics of land use in 1999 in the Atherton Tablelands

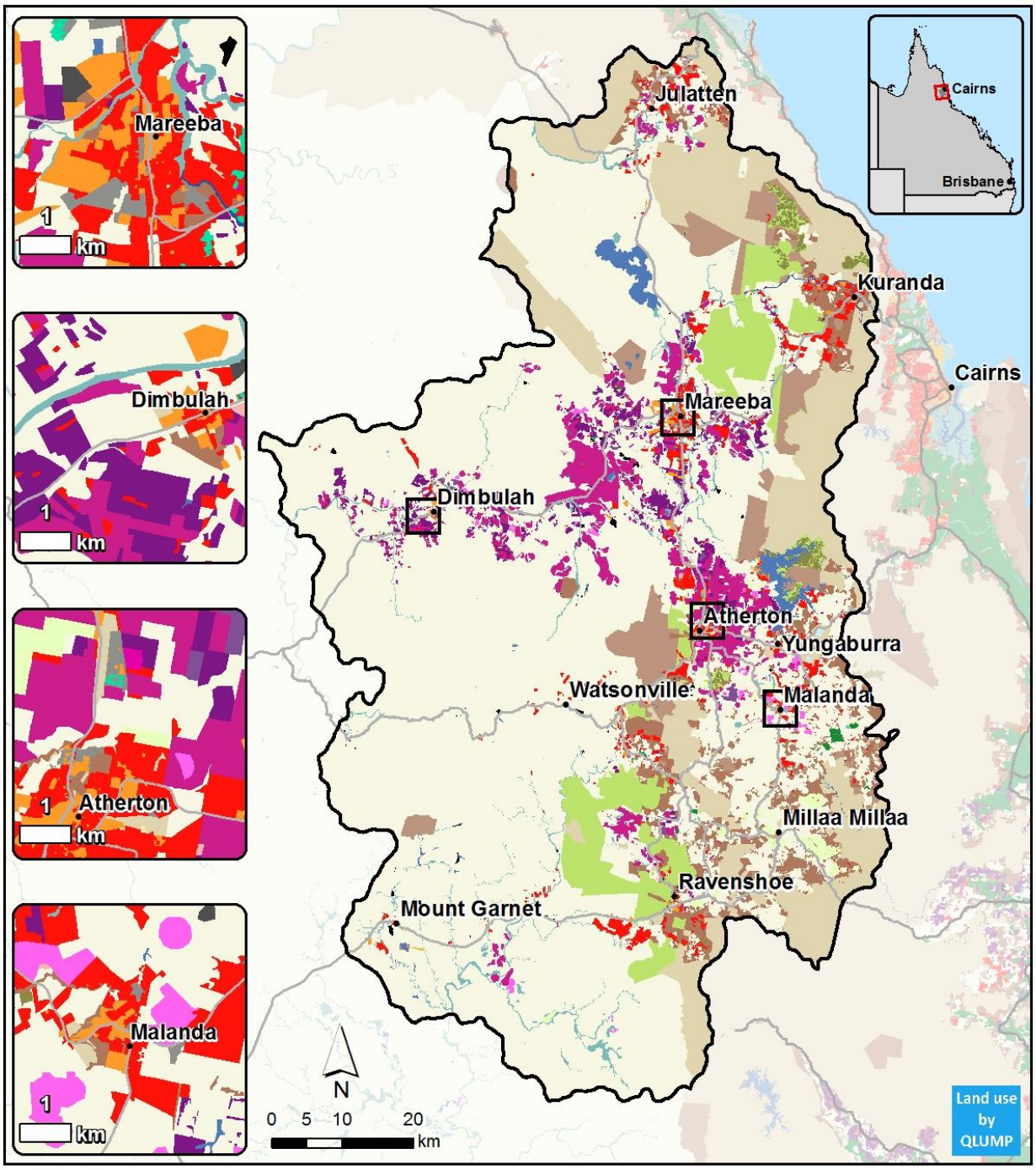
Land use code	Land use class	Area[4] (ha)	Area[4] (%)
1	**Conservation and natural environments**	**67,798**	**7.99**
1.1	Nature conservation	22,212	2.62
1.2	Managed resource protection	6,245	0.74
1.3	Other minimal use	39,341	4.64
2	**Production from relatively natural environments**	**679,937**	**80.15**
2.1	Grazing native vegetation[1]	556,352	65.58
2.2	Production forestry	123,585	14.57
3	**Production from dryland agriculture and plantations**	**9,711**	**1.14**
3.1	Plantation forestry	3,770	0.44
3.2	Grazing modified pastures[2]	4,875	0.57
3.3	Cropping	940	0.11
3.3.5	Cropping – Sugar[3]	2	<0.01
3.4	Perennial horticulture	9	<0.01
3.5	Seasonal horticulture	17	<0.01
3.6	Land in transition	100	0.01
4	**Production from irrigated agriculture and plantations**	**49,678**	**5.86**
4.1	Irrigated plantation forestry	1	<0.01
4.2	Irrigated modified pastures[2]	1,304	0.15
4.3	Irrigated cropping	37,959	4.47
4.3.5	Irrigated cropping – Sugar[3]	15,238	1.80
4.4	Irrigated perennial horticulture	9,067	1.07
4.5	Irrigated seasonal horticulture	1,088	0.13
4.6	Irrigated land in transition	259	0.03
5	**Intensive uses**	**22,246**	**2.62**
5.1	Intensive horticulture	42	<0.01
5.2	Intensive animal production	312	0.04
5.3	Manufacturing and industrial	268	0.03
5.4	Residential	18,492	2.18
5.5	Services	2,183	0.26
5.6	Utilities	31	<0.01
5.7	Transport and communication	187	0.02
5.8	Mining	604	0.07
5.9	Waste treatment and disposal	128	0.02
6	**Water**	**18,985**	**2.24**
6.1	Lake	229	0.03
6.2	Reservoir/dam	7,694	0.91
6.3	River	387	0.05
6.4	Channel/aqueduct	14	<0.01
6.5	Marsh/wetland	10,660	1.26
	Total	**848,356**	**100.00**

[1]*grazing native vegetation* includes all pastures (modified and unmodified). No distinction is made in respect of tree cover.

[2]*grazing modified pastures and irrigated grazing modified pastures* are not mapped explicitly. In this case the areas mapped are generally dairy pastures.

[3]the area of land use at or below the tertiary level are shown as a subset of the total area at the secondary level.

[4]total figures for primary land use class may contain rounding errors.



ALUMC Secondary level

Nature conservation	Perennial horticulture	Intensive horticulture	Waste treatment & disposal
Managed resource protection	Land in transition	Intensive animal husbandry	Lake
Other minimal use	Irrigated plantation forestry	Manufacturing & industrial	Reservoir/dam
Grazing native vegetation	Irrigated modified pastures	Residential	River
Production forestry	Irrigated cropping	Services	Channel/aquedeuct
Plantation forestry	Irrigated perennial horticulture	Utilities	Marsh/wetland
Grazing modified pastures	Irrigated seasonal horticulture	Transport & communication	Atherton Tablelands
Cropping	Irrigated land in transition	Mining	Roads

Figure 6: 2015 land use map for the Atherton Tablelands

Table 2: Summary statistics of land use in 2015 in the Atherton Tablelands

Land use code	Land use class	Area[4] (ha)	Area[4] (%)
1	**Conservation and natural environments**	**175,231**	**20.66**
1.1	Nature conservation	111,107	13.10
1.2	Managed resource protection	28,675	3.38
1.3	Other minimal use	35,449	4.18
2	**Production from relatively natural environments**	**572,642**	**67.50**
2.1	Grazing native vegetation[1]	530,668	62.55
2.2	Production forestry	41,974	4.95
3	**Production from dryland agriculture and plantations**	**9,393**	**1.11**
3.1	Plantation forestry	3,676	0.43
3.2	Grazing modified pastures[2]	4,669	0.55
3.3	Cropping	787	0.09
3.3.5	Cropping – Sugar[3]	53	0.01
3.4	Perennial horticulture	8	<0.01
3.6	Land in transition	253	0.03
4	**Production from irrigated agriculture and plantations**	**46,930**	**5.53**
4.1	Irrigated plantation forestry	1	<0.01
4.2	Irrigated modified pastures[2]	1,955	0.23
4.3	Irrigated cropping	31,123	3.67
4.3.5	Irrigated cropping – Sugar[3]	18,135	2.14
4.4	Irrigated perennial horticulture	12,337	1.45
4.5	Irrigated seasonal horticulture	1,470	0.17
4.6	Irrigated land in transition	45	0.01
5	**Intensive uses**	**25,100**	**2.96**
5.1	Intensive horticulture	67	0.01
5.2	Intensive animal production	568	0.07
5.3	Manufacturing and industrial	303	0.04
5.4	Residential	20,669	2.44
5.5	Services	2,184	0.26
5.6	Utilities	31	<0.01
5.7	Transport and communication	199	0.02
5.8	Mining	950	0.11
5.9	Waste treatment and disposal	129	0.02
6	**Water**	**19,060**	**2.25**
6.1	Lake	223	0.03
6.2	Reservoir/dam	7,770	0.92
6.3	River	387	0.05
6.4	Channel/aqueduct	14	<0.01
6.5	Marsh/wetland	10,666	1.26
	Total	**848,356**	**100.00**

[1]*grazing native vegetation* includes all pastures (modified and unmodified). No distinction is made in respect of tree cover.

[2]*grazing modified pastures and irrigated grazing modified pastures* are not mapped explicitly. In this case the areas mapped are generally dairy pastures.

[3]the area of land use at or below the tertiary level are shown as a subset of the total area at the secondary level.

[4]total figures for primary land use class may contain rounding errors.

2015 Commodity level Land Use Mapping

Figure 7 shows the location and extent of commodity land use features within the project area, specifically showing avocado, banana, macadamia and mango orchards; and sugar crops for 2015. Summary statistics show sugar was the dominant commodity covering an area of 18,188ha. Mango orchards accounted for 2,774ha, bananas 2,387ha, avocado 1,292ha and macadamia 117ha.

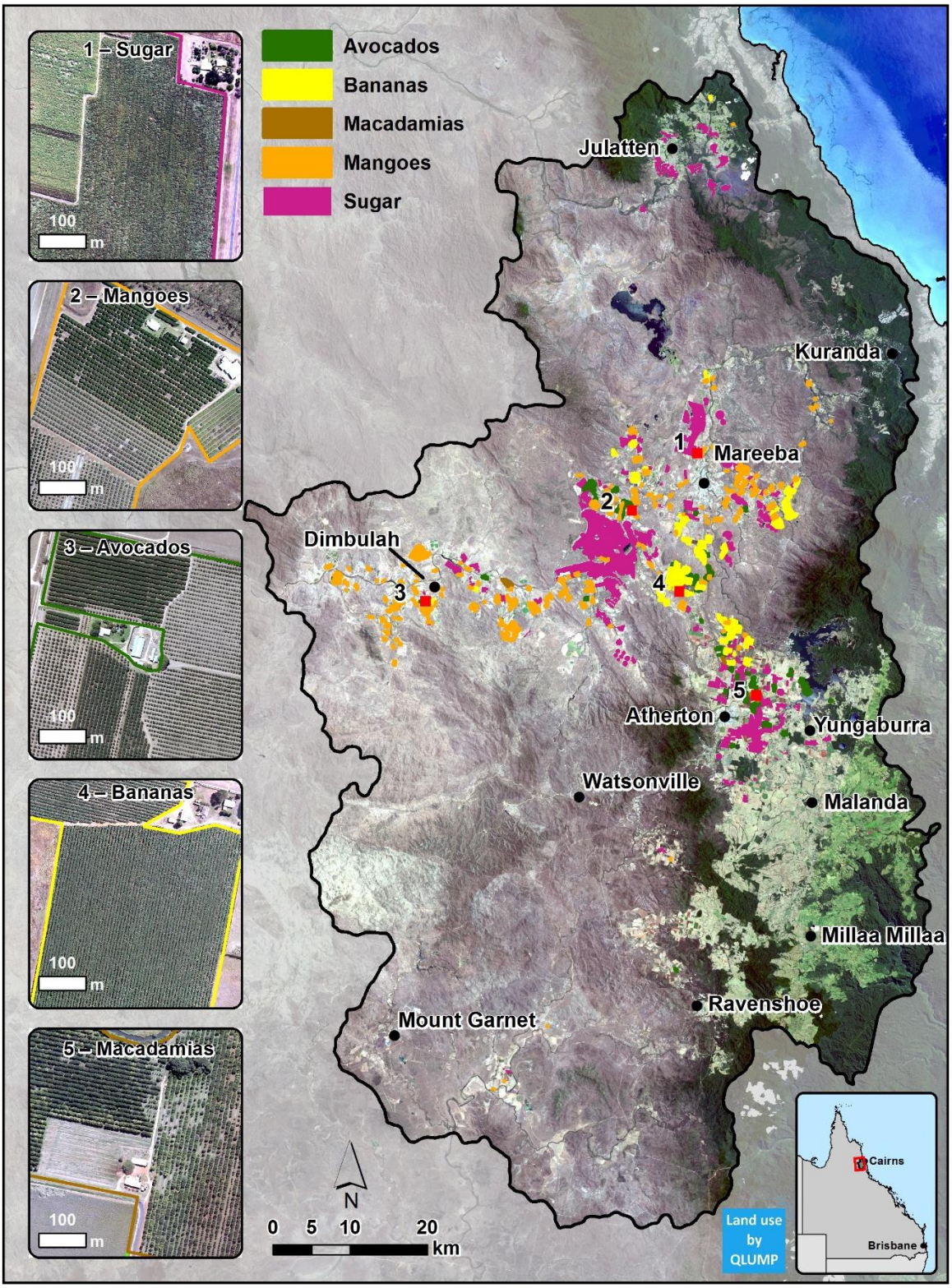


Figure 7: 2015 commodity map for the Atherton Tablelands

Overall (net) land use change

Figure 8 presents the overall (net) changes in land use within the Atherton Tablelands by primary land use class. The chart shows the net reduction or gain between 1999 and 2015, and sums to zero. Note the y-axis is not to scale.

Analysis of the overall (**net**) land use summary for each land use map (1999 and 2015) by **primary land use class** shows that between 1999 and 2015 (Table 3):

- *Conservation and natural environments* increased by 107,432ha or 158%.
- *Production from relatively natural environments* decreased by 107,295ha or 16%.
- *Production from dryland agriculture and plantations* decreased by 319ha or 3%.
- *Production from irrigated agriculture and plantations* decreased by 2,748ha or 6%.
- *Intensive uses* increased by 2,854ha or 13%.
- *Water* increased by 76ha or 0.4%.

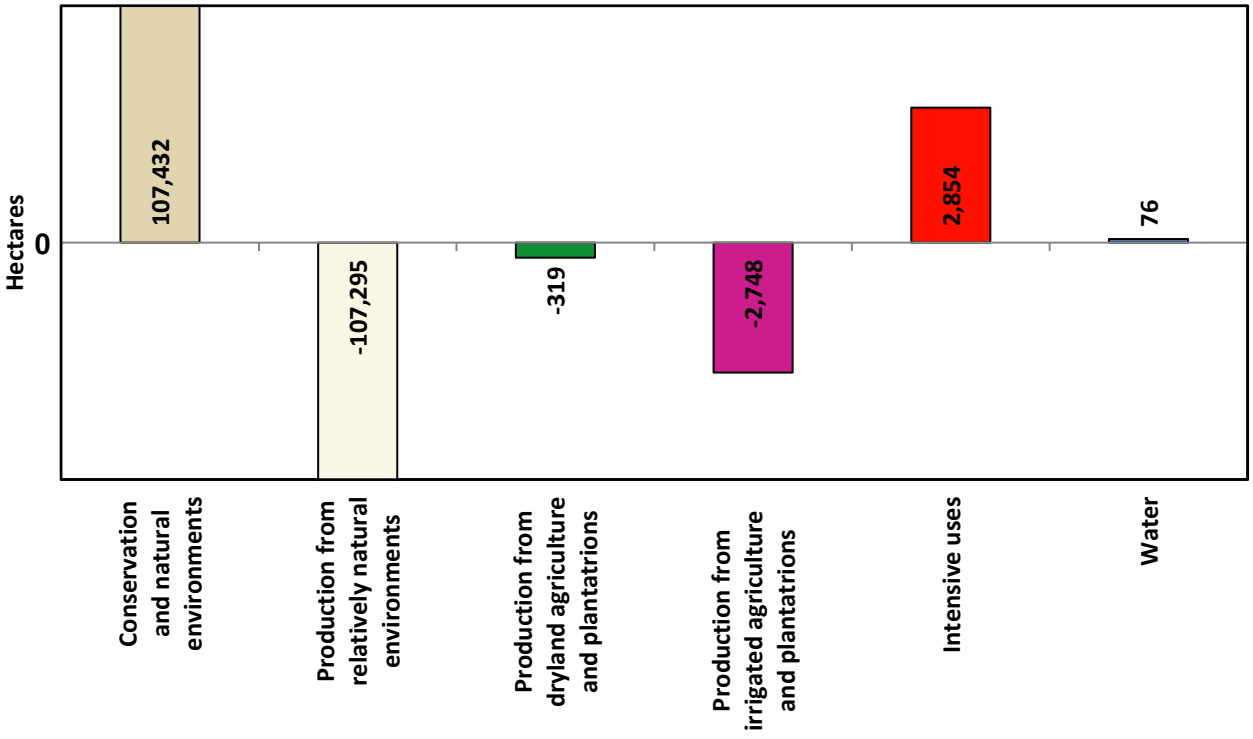


Figure 8: Net land use change by primary class (1999–2015) in the Atherton Tablelands

Further analysis of the **net** land use changes between 1999 and 2015 at the **secondary land use class** level shows (Table 3):

- *Nature conservation* increased by 88,895ha or 400% with the establishment of numerous conservation areas including national parks in the east (Curtain Fig, Danbulla, Dinden, Gadgarra, Hann Tableland, Herberton Range, Koombooloomba, Kuranda, Little Mulgrave, Macalister Range, Malaan, Mount Lewis, Mowbray, Tully Falls and Wooroonooran National Parks), Kuranda West Forest Reserve north west of Kuranda; Herberton Range Regional Park near Watsonville and Brooklyn (west of Julatten) and Mount Quincan Crater (south of Yungaburra) nature refuges.
- *Managed resource protection* increased by 22,430ha or 359% with the establishment of new forest reserves including: Baldy Mountain west of Atherton; Barron Gorge south of Kuranda; Danbulla (West and South) north of Yungaburra; Dinden West east of Mareeba; Kuranda West north-east of Kuranda; and Ravenshoe south of Ravenshoe. Additionally, 40 nature refuges were established including Mareeba Tropical Savanna and Wetland Reserve near Mareeba and Wyndham Sandy Creek north of Mount Garnett.
- *Grazing native vegetation* decreased by 25,654ha or 5%. The largest losses were associated with the establishment of The Bluff State Forest north-east of Ravenshoe, the expansion of Hann Tableland National Park north-west of Mareeba, and the establishment of the Brooklyn Nature Refuge west of Julatten, Mareeba Tropical Savanna and Wetland Reserve Nature Refuge north-west of Mareeba, and the Wyndham Sandy Creek Nature Refuge north of Mount Garnett.
- *Production forestry* decreased by 81,611ha or 66% mainly associated with the conversion of state forests to national parks in the east of the region and between Watsonville, Atherton and Millaa Millaa.
- *Irrigated cropping* decreased by 6,836ha or 18% however *irrigated cropping – sugar* increased by 2,898ha or 19% (throughout the region).
- *Irrigated perennial horticulture* increased by 3,271ha or 36% including 769ha of new mango, 104ha of banana and 239ha avocado tree crop features located west of Mareeba and around Dimbulah.
- *Irrigated seasonal horticulture* increased by 382ha or 35% (throughout the region).
- Within the *intensive uses* primary land use class most of the secondary land use classes increased, including:
    - *Intensive animal production* by 255ha or 82% (throughout the region).
    - *Residential and farm infrastructure* by 2,177ha or 12% (throughout the region).
    - *Mining* by 346ha or 57% (throughout the region).
- New water features were established including 76ha of *reservoir/dams.*

Table 3: Net land use changes in Primary and Secondary land use classes 1999–2015

Land use code	Primary land use class	1999 Area[3] (ha)	2015 Area[3] (ha)	Difference (ha)	Difference (%)
1	**Conservation and natural environments**	**67,798**	**175,231**	**107,432**	**158**
1.1	Nature conservation	22,212	111,107	88,895	400
1.2	Managed resource protection	6,245	28,675	22,430	359
1.3	Other minimal use	39,341	35,449	-3,893	-10
2	**Production from relatively natural environments**	**679,937**	**572,642**	**-107,295**	**-16**
2.1	Grazing native vegetation[1]	556,352	530,668	-25,684	-5
2.2	Production forestry	123,585	41,974	-81,611	-66
3	**Production from dryland agriculture and plantations**	**9,711**	**9,393**	**-319**	**-3**
3.1	Plantation forestry	3,770	3,676	-94	-2
3.2	Grazing modified pastures	4,875	4,669	-206	-4
3.3	Cropping	940	787	-153	-16
3.3.5	Cropping - Sugar[2]	2	53	51	2594
3.4	Perennial horticulture	9	8	-1	-11
3.5	Seasonal horticulture	17	0	-17	-98
3.6	Land in transition	100	253	152	152
4	**Production from irrigated agriculture and plantations**	**49,678**	**46,930**	**-2,748**	**-6**
4.1	Irrigated plantation forestry	1	1	0	0.00
4.2	Irrigated modified pastures	1,304	1,955	650	50
4.3	Irrigated cropping	37,959	31,123	-6,836	-18
4.3.5	Irrigated cropping - Sugar[2]	15,238	18,135	2,898	19
4.4	Irrigated perennial horticulture	9,067	12,337	3,271	36
4.5	Irrigated seasonal horticulture	1,088	1,470	382	35
4.6	Irrigated land in transition	259	45	-214	-83
5	**Intensive uses**	**22,246**	**25,100**	**2,854**	**13**
5.1	Intensive horticulture	42	67	26	62
5.2	Intensive animal production	312	568	255	82
5.3	Manufacturing and industrial	268	303	35	13
5.4	Residential	18,492	20,669	2,177	12
5.5	Services	2,183	2,184	2	0
5.6	Utilities	31	31	0	0
5.7	Transport and communication	187	199	13	7
5.8	Mining	604	950	346	57
5.9	Waste treatment and disposal	128	129	1	1
6	**Water**	**18,985**	**19,060**	**76**	**0.0**
6.1	Lake	229	223	-6	-3
6.2	Reservoir/dam	7,694	7,770	76	1
6.3	River	387	387	0	0
6.4	Channel/aqueduct	14	14	0	0
6.5	Marsh/wetland	10,660	10,666	6	0

[1]*grazing native vegetation* includes all pastures (modified and unmodified). No distinction is made in respect of tree cover.

[2]the area of land use at or below the tertiary level are shown as a subset of the total area at the secondary level.

[3]total figures for primary land use class may contain rounding errors.

Land use change 1999–2015

Table 4 and Figure 9 show the land use changes within the Atherton Tablelands. Figure 9 has been presented relative to the *change in intensity* of the land use at the secondary level of the ALUM classification.

For example, change from 2.1.0 (*grazing native vegetation*) to 3.3.0 (*cropping)* is an increase in land use intensity, whilst change from 2.1.0 (*grazing native vegetation*) to 1.1.0 (*nature conservation*) is a decrease. This is highlighted in the ALUM classification (Figure 2, page 7). Moving down and from left to right through the classification, the level of intervention or potential impact of land use increases.

Between 1999 and 2015, at the secondary level of the ALUM classification, the total area of land use change is **156,958ha** or **19%** of the Atherton Tablelands area**.** Of this, 125,864ha (80%) corresponded to a decrease in land use intensity, whilst 31,095ha (20%) an increase.

Summary statistics presenting the land use change at the secondary level for 1999–2015 are shown in Table 4. This table illustrates the land use changes between 1999 and the updated land use map for 2015. For example, 1,469ha of *grazing native vegetation* in 1999 changed to *irrigated cropping* land use in 2015.

Analysis of the land use change <u>from</u> selected land use classes in 1999 shows:

- 94,952ha of *production forestry* in 1999 changed—including:
    - 73,953ha to *nature conservation* with the establishment of numerous conservation areas including national parks in the east (Kuranda, Wooroonooran, Dinden, Danbulla, Herberton Range, Tully Falls, Mount Lewis, Mowbray, Malaan, Gadgarra and Curtain Fig national parks) and Kuranda West Forest Reserve north west of Kuranda
    - 20,998ha to *managed resource protection* with the establishment of Barron Gorge Forest Reserve south of Kuranda, Baldy Mountain Forest Reserve west of Atherton; Kuranda State Forest and Kuranda West Forest Reserve north east of Kuranda; Dinden West Forest Reserve east of Mareeba, Danbulla Forest Reserve (West and South) north of Yungaburra, Ravenshoe Forest Reserve near Ravenshoe.
- 34,213ha of *grazing native vegetation* in 1999 changed—including:
    - 13,042ha to *production forestry* as a result of the establishment of The Bluff State Forest to the south of Watsonville
    - 10,595ha to *nature conservation* with the expansion of the Hann Tableland National Park north west of Mareeba and the establishment of Brooklyn Nature Refuge west of Julatten
    - 3,199ha to *managed resource protection* resulting from the establishment of seven nature refuges including Mareeba Tropical Savanna and Wetland Reserve Nature Refuge near Mareeba and Wyndham Sandy Creek Nature Refuge north of Mount Garnett
    - 2,594ha to *irrigated cropping* with 1,125ha of which changed to *irrigated cropping – sugar* around Atherton, Mareeba and Dimbulah
    - 1,574ha to *residential and farm infrastructure*

  - 1,279ha to *irrigated perennial horticulture* found mostly around Mareeba to west of Dimbulah including 119ha of mangoes around Dimbulah, 34ha of banana plantations west of Mareeba and 94ha of avocados between Mareeba and Dimbulah.
  - 375ha to *mining*
  - 187ha to *services* mainly around Mareeba to Dimbulah
  - 107ha to *intensive animal husbandry* between Atherton, Mareeba and Dimbulah
  - 27ha to *manufacturing and industrial.*

- 12,784ha of *irrigated cropping* in 1999 changed—including:
  - 4,433ha to *grazing native vegetation*
  - 3,484ha to *irrigated cropping – sugar* mostly around Atherton
  - 3,034ha to *irrigated perennial horticulture* mostly around Atherton, Mareeba and Dimbulah including 581ha of mangoes, 48ha of bananas and 129ha of avocados west of Mareeba and around Dimbulah.
- 2,361ha of *irrigated cropping – sugar* in 1999 changed—including:
  - 909ha to *grazing native vegetation* found west of Mareeba and around Dimbulah
  - 630ha to *irrigated perennial horticulture* found from Atherton to Mareeba and west to Dimbulah including 60ha of mangoes, 22ha of bananas and 8ha of avocados located west of Mareeba and around Dimbulah
  - *irrigated cropping* (526ha) found between Atherton, Mareeba and Dimbulah.

Analysis of the land use change <u>to</u> selected land use classes in 2015 shows:

- 88,917ha of *nature conservation* in 2015 changed—including:
  - 73,953ha from *production forestry* with the establishment of numerous national parks in the east (Kuranda, Wooroonooran, Dinden, Danbulla, Herberton Range, Tully Falls, Mount Lewis, Mowbray, Malaan, Gadgarra and Curtain Fig);
  - 10,595ha from *grazing native vegetation* with the establishment of Hann Tableland National Park and Brooklyn Nature Refuge
  - 3,369ha from *managed resource protection* with Koombooloomba National Park and Herberton Range Regional and National Parks being established.
- 25,799ha of *managed resource protection* in 2015 changed—including:
  - 20,998ha from *production forestry* in the area west of Atherton and to the east and north east of Mareeba;
  - 3,199ha from *grazing native vegetation* north of Mount Garnett (Wyndham Sandy Creek Nature Refuge) and north west of Mareeba (Mareeba Tropical Savanna and Wetland Reserve Nature Refuge)
  - 1,580ha from *other minimal use* found in the south east.
- 13,342ha of *production forestry* in 2015 changed from *grazing native vegetation* in 1999 because of the creation of The Bluff State Forest west of Ravenshoe).

- 8,529ha of *grazing native vegetation* in 2015 changed—including:
    - 4,433ha from *irrigated cropping*
    - 916ha from *irrigated perennial horticulture*
    - 909ha from *irrigated cropping – sugar* found west of Mareeba and around Dimbulah
    - 681ha from *other minimal use* found mainly in the south east of the region
    - 357ha from *irrigated seasonal horticulture*
    - 348ha from *cropping* found mainly south east of Watsonville.

Table 4: Summary statistics for land use change at secondary level for 1999–2015 in the Atherton Tablelands

Land use change 1999-2015		2015 land use (ha)																											
		Nature conservation	Managed resource prot.	Other minimal use	Grazing native vegetation	Production forestry	Plantation forestry	Grazing modified pastures	Cropping	Cropping - Sugar	Perennial horticulture	Land in transition	Irrigated modified pastures	Irrigated cropping	Irrigated cropping - Sugar	Irrigated perennial horti.	Irrigated seasonal horti.	Irrigated land in transition	Intensive horticulture	Intensive animal production	Manufacturing & industrial	Residential & farm infra	Services	Transport & comm.	Mining	Waste treatment & disposal	Reservoir/dam	Marsh/wetland	Total
1999 land use (ha)	Nature conservation		22																										22
	Managed resource prot.	3,369																											3,369
	Other minimal use	994	1,580		681	299	12							17	3	5				40	3	301	41		25		1		3,999
	Grazing native vegetation	10,595	3,199	49		13,042	22	213	156			121	387	1,469	1,125	1,279	195		2	107	27	1,574	187	13	375	1	77		34,213
	Production forestry	73,953	20,998																										94,952
	Plantation forestry	6			132															2									139
	Grazing modified pastures				318							7		230	185	9													750
	Cropping			9	348					50		13				4						28							451
	Cropping - Sugar			1												1													2
	Perennial horticulture				4																								4
	Seasonal horticulture				17																								17
	Land in transition																					90							90
	Irrigated modified pastures				111				55					85	33														283
	Irrigated cropping			5	4,433		13	285	20			48	406		3,484	3,034	819	10	20	65	6	118	15				3		12,784
	Irrigated cropping - Sugar			14	909				17				109	526		630	93	2	1	31					30				2,361
	Irrigated perennial horti.			6	916			45		3		18	32	622	267		42	17	3	27		48			2				2,046
	Irrigated seasonal horti.			11	357									46	163	190							0						767
	Irrigated land in transition				199									13		31													243
	Intensive horticulture				2						3																		5
	Intensive animal prod.n				3							14		13								11							41
	Manufacturing & industrial																						4						4
	Residential & farm infra.				1											2			4	23	3		18		3				54
	Services				41									29		133						61							264
	Mining			13	54							22																	89
	Lake																											6	6
	Reservoir/dam				6																								6
	Total	88,917	25,799	106	8,529	13,340	46	543	248	53	3	243	933	3,049	5,258	5,317	1,149	29	30	296	39	2,231	266	13	434	1	81	6	156,958

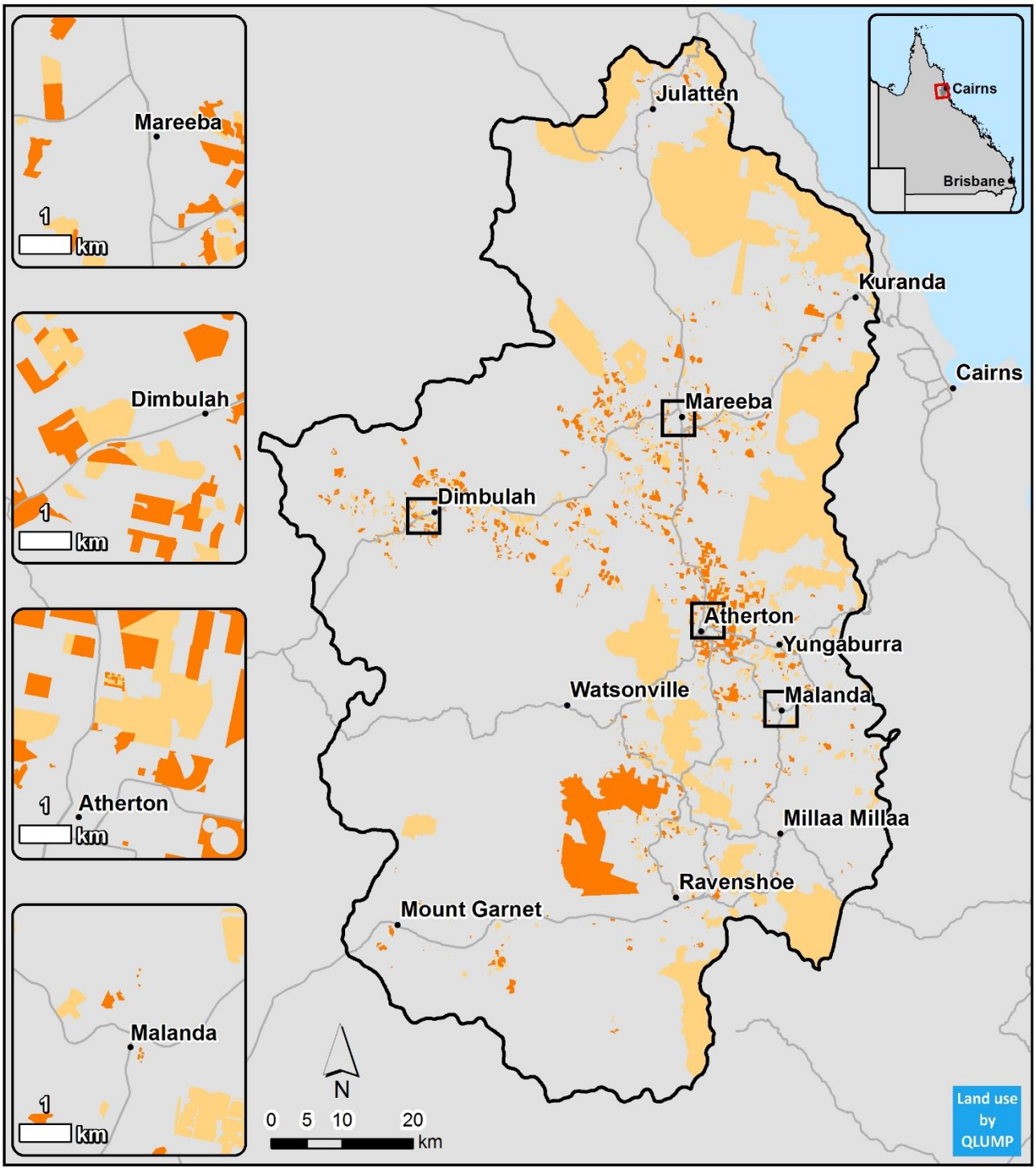


Figure 9: 1999–2015 land use change map at secondary level for the Atherton Tablelands

Data format and availability

Download land use datasets

Use the Queensland Spatial Catalogue (DNRM, 2017) to access land use data sets. Search for **"land use mapping"** in the search term field then refine your results by selecting the **"Planning Cadastre"** filter from the *choose categories* field. Metadata is also available from QSpatial.

For full coverage of the Atherton Tablelands, a combination of the Wet Tropics NRM and Northern Gulf NRM datasets are required. Alternatively, the *Land use mapping – Current – Queensland* contains the latest mapping for the project area.

The dataset comprises an ESRI vector geodatabase (10.3.1) at a nominal scale of 1:50,000. Within this are three feature classes: 1999 improved land use, 2015 updated land use and 1999–2015 land use change. The feature classes are polygon datasets with attributes describing land use. Land use is classified according to the Australian Land Use and Management Classification (ALUMC) Version 7, May 2010. Note: a representation showing land use at secondary level is available when working within a geodatabase. Layer files are also available to present the land use mapping at primary, secondary or tertiary level.

Digital Data is supplied with a licence and by using the data you confirm that you have read the licence conditions included with the data and that you agree to be bound by its terms.

View land use data online

The most current land use web map can be viewed online via the QLUMP website (DSITI, 2017).

Map and feature services

Use the Queensland Spatial Catalogue QSpatial (DNRM, 2017) to access the web mapping services of the state-wide land use layer. Search for "*land use mapping*" in the search term field then refine your results by using then *choose content type* filter and selecting "*Service*"**.**

Request a land use map

It is possible to request a land use map from the QLUMP website based upon a specific location (lot on plan, street address or central latitude/longitude coordinates) in Queensland. The land use maps are emailed in portable document format (PDF).The maps present the most recent land use information available at the secondary level of the ALUMC.

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