## APPENDIX 1. FERTILIZER USAGE IN BASINS ADJACENT TO THE GREAT BARRIER REEF MARINE PARK

Basins are listed by place and number in order from north (Daintree-108) to south (Mary-138).

Details are provided for each basin, as follows:

- latitude and longitude
- area
- mean annual rainfall and run-off (see table 1; page 11)
- description of the catchment
- land use
- fertilizer usage, including comments on trends in nutrient applications (see tables 2, 3, 5 and 6 for details).

Some fertilizer products such as urea, ammonium phosphates, superphosphate and rock phosphate are used as nitrogen and/or phosphorus supplements for livestock. These uses have been included in the tables 2, 3, 5 and 6 covering individual basins and groups of basins. In tables 4 and 7, nitrogen and phosphorus utilised as fertilizer products for livestock supplementation are included in the pastures column.

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**DAINTREE** **Basin 108**

**Latitude** 16°10'S **Longitude** 145°20'E

**Area** 2125 $km^2$ - 212 500 ha
820 sq ml - 524 875 acres

**Mean Annual Rainfall** - 2576 mm
**Mean Annual Run-off** - 1675 mm (3 560 000 ML)

**Run-off** - 65% of rainfall

Fifty-five percent of the basin is gauged, with one gauging station on the Bloomfield River, two on the Daintree River and two on Saltwater Creek in the south-east corner.

**Description** The Daintree (100 kilometres long) and Bloomfield Rivers comprise the bulk of the catchment, which extends about 60 kilometres north-south from Bloomfield to Newell and about 35 kilometres from west to east, from the Dividing Range to the sea. The highest peaks are about 1500 metres in the Range in the headwaters of the Daintree River. A coastal peak near Cape Tribulation reaches 880 metres.

**Land Use** The catchment includes a high proportion of the World Heritage Area which is present in the Douglas Shire (182 739 hectares). Most of the south-western area is national park, with rainforest dominating the steeper slopes and the Dividing Range as well as the coastal Bloomfield area.

The Upper Daintree, Stewart Creek and Douglas Creek have been cleared for beef cattle grazing, most being planted to introduced grasses. Setaria and green couch are present on the river terraces, guinea grass and blady grass on the slopes. Spring burning is practised before the onset of the wet season to control blady grass and ingress of woody weeds.

The coastal lowlands between Saltwater Creek and Daintree Village are mainly utilised for sugarcane. These cane areas are drained by small creeks. Barrett Creek flows north from near the Pinnacle under the Dagmar Range and into the Daintree estuary.

Bamboo Creek flows south on the western edge of the Dagmar Range and joins Whyabee Creek which meets Saltwater Creek from the west at Miallo. Small areas of tropical fruits are grown. About 6800 hectares of land are used for crops and livestock, about 30% of the total catchment.

**Fertilizer Usage** No separate figures are available for this catchment as distinct from the Douglas Shire, of which it forms the northern part. The early history of the Shire was associated with dairying as well as sugarcane growing, there being 87 dairy farms in the Shire in 1939, with a butter factory at Mossman. The dairy industry had disappeared by 1963.

The northern Daintree has the bulk of the cattle and improved pastures in the Shire, and for the more recent years, the Shire data for improved pastures have been ascribed to the Daintree catchment.

Precise information on the proportion of sugarcane in the northern part of the Shire is not readily available. It has been assumed that about one-third of the cane is now being grown in the Daintree - Newell area, this being a higher proportion than in the earlier years, when dairying was more popular.

Less than 1% of the catchment is used for cultivation, so that fertilizer usage has been concentrated on a small proportion of the catchment.

Pre-1963, nitrogen usage was at a low level, increasing at a linear trend rate of three tonnes per year, largely due to small increases in the area of sugarcane receiving fertilizer as the total area expanded in the Douglas Shire. In 1963 there was a 22% expansion in cane area, which led to further increases in nitrogen usage from the 110 tonnes in 1962 to 150 tonnes in 1963. Continuing increases in area grown and, up to 1980, increases in the rate of application, have increased nitrogen usage to 420 tonnes nitrogen in 1988, a linear trend of 12 tonnes per year. Recent usage has declined, due largely to low sugar prices.

Nitrogen rates on cane were below 100 kg N/ha until the mid-1950s. Rates increased during the 1960s and 1970s, with application of about 170 kg N/ha on plant cane and 180 kg N/ha on ratoons. About 85% of the area is ratoon cane.

Usage of nitrogen on bananas and perennial tree crops is at a higher rate than on sugarcane but contributes less than 2% of the total use.

Most of the 5000 hectares of sown pastures in Douglas Shire is in the northern part of the Daintree catchment. New plantings and a small proportion of the Brachiaria planted since the 1970s is fertilized with nitrogen to maintain beef cattle, using rates of 50-100 kg N/ha on about 200 hectares.

Usage of phosphorus was at a low level, less than 10 tonnes annually, prior to 1950. During the 1960s and 1970s there has been an increase, generally in line with the area of sugarcane, reaching about 120 tonnes of phosphorus in 1981, with stability or a slight decrease in recent years. Usage in plant cane is about 60 kg P/ha, about three times the rate used on ratoons. Some ratoons may not be fertilized with phosphorus every year, so that the average rate for the whole cane area grown is 18 kg P/ha.

Ten to fifteen tonnes of phosphorus are applied to pastures, with year to year variations depending on seasons and the size of areas planted. Rates are in the 20-30 kg/ha range, being

upstream it flows generally northwards, draining low-lying country at Waugh Pocket. Babinda Creek (25 kilometres) from the eastern side of Bartle Frere joins at Palma, 15 kilometres from the junction with the Mulgrave. Much of the Babinda-Woolanmaroo area is low-lying. The Bruce Highway crosses the Russell River south of Mirriwinni, 32 kilometres from the mouth.

Many streams flow north from Gordonvale and north-west from the Murray and Malbon Thompson Ranges into Trinity Inlet north of Cairns. Another system draining the east side of Bisley Hills and Mount Sheridan (600 metres) drains the Hambledon Mill area.

Most of the catchment is in Mulgrave Shire; the southern boundary of the Shire is also the basin boundary.

The Lamb Range in the northern half of the catchment is also the Shire boundary. The western section of the Mulgrave River and the upper reaches of the Russell River are in Eacham Shire; about one-third of Eacham Shire is in this basin.

**Land Use** The World Heritage Areas of Mulgrave and Eacham Shires, totalling almost 117 000 hectares, are in the Mulgrave-Russell basin; i.e. about 58% of the basin is reserved as forests.

The agricultural area is a north-south strip along the Bruce Highway about eight kilometres wide in the south around Mirriwinni, only two kilometres wide from Bellenden Ker to Aloomba, but widening again to 10 kilometres around Gordonvale. The total area of holdings is about 75 000 hectares of which 30 000 hectares are cropped, mainly with sugarcane. Pasture areas support 5000 head of beef cattle.

**Fertilizer Usage** The agricultural area is entirely within the Mulgrave Shire so agricultural census data are relevant to the basin. Prior to 1938-39, statistics were compiled in Petty Sessions districts, the basin including Cairns and Innisfail in the Rockingham Division. The area became Cairns Shire in 1938-39 statistics, with boundaries similar to those of the current Mulgrave Shire. From 1951-52, data are for Mulgrave Shire.

The early history of the shire was associated with production of sugarcane, although about a third of the landholders had some dairy and beef cattle. Almost all of the farm land is now sugarcane, with less than 100 hectares of fruit crops. Small areas of pasture are found in the lower country unsuitable for cane and higher up the Little Mulgrave, Mulgrave and Russell Rivers and along Babinda Creek.

About one-third of the basin is occupied as agricultural holdings and about half of the farm area is under sugarcane crop. The area regularly fertilized, about 24 000 hectares annually, represents 13% of the basin area.

Current nitrogen use is in the range of 4000 to 5000 tonnes each year, almost totally applied to sugarcane which is fertilized at planting with about 150 kg N/ha. Sugarcane ratoons receive from 160 to 200 kg N/ha, depending on sugar prices. Total nitrogen usage increased until 1980, stabilised until 1985, and declined over the last five years, in response to low prices for sugar and the loss of cane lands to urban development.

Phosphorus usage is restricted almost entirely to sugarcane. Application rates are usually about 45 kg P/ha at planting, (more on new land) and 25-30 kg/ha on ratoons. Some ratoons may not receive a phosphorus fertilizer, so that the average phosphorus rate on all cane is slightly below 20 kg P/ha. Total phosphorus usage is about 600 tonnes per year, having declined from the 800 tonnes used annually from 1963 (after the introduction of a price subsidy) until 1984. The

The total cropping area in the basin is about 32 000 hectares, dominated by sugarcane, with 1800 hectares of bananas and 1000 hectares of tea and other horticultural crops. The 35 000 hectares Tableland section which is in rural holdings, is largely grass pasture having varying degrees of productivity, less than one-third being fertilized in any year.

**Fertilizer Usage** Fertilizer usage in the Johnstone Shire has been, until recently, associated with sugarcane production; lately bananas have become of some importance. Nitrogen rates on plant cane are about 140 kg/ha, 160-180 kg/ha on ratoons. Bananas are fertilized eight to ten times a year, most receiving 600 kg N/ha overall. Current annual nitrogen usage on sugarcane is about 4900 tonnes, with 500 tonnes on pastures and 1000 tonnes on bananas - some of the bananas in the Mission Beach area are in the Tully Basin.

In the Eacham Shire portion of the basin, fertilizer use is restricted almost entirely to improved pastures. Usage was of minor proportions until the mid-1960s when a Dairy Pasture Subsidy scheme was introduced, with a State Government subsidy for pasture development.

For a short period about 2000 hectares were being planted annually, largely replacing grassland areas of lower productivity. Nearly 12 000 hectares were fertilized in 1972-73, but declined with the reduction in meat prices and large increases in fertilizer costs in 1975.

The pasture area fertilized gradually increased to peak at 15 000 hectares in 1985-86, declining to 12 000 hectares annually in recent years. Within the Johnstone basin, nitrogen usage on grassland is estimated at 1300 tonnes, consisting of a range of rates varying from nil, over much of the area, to as much as 300 kg/ha on some irrigated rye grass pastures on the Tablelands.

The combined Johnstone Shire and the portion of Eacham Shire in the basin have a total nitrogen use of 7300 tonnes.

Phosphorus application rates for sugarcane depend on soil test values. Most plant cane receives 45-60 kg P/ha; many growers may not re-apply phosphorus until the third ratoon crop.

Bananas are fertilized with 50-60 kg P/ha at the beginning of the plant crop and yearly thereafter. Some growers prefer more frequent applications, using nitrogen, phosphorus and potassium mixtures at monthly intervals throughout the year, except during the cooler months, and during the summer when the ground is too wet to be able to apply fertilizer.

Pastures on the Atherton Tableland in the Eacham Shire are fertilized annually with about 3000 tonnes of superphosphate and 1500-2000 tonnes of ammonium phosphates, containing about 600 tonnes of phosphorus in all.

Total phosphorus usage increased gradually from 1950 to 1980, with periods of stable usage from 1963 to 1968 and from 1970 to 1978. Following the major expansion in 1980, when consumption reached nearly 2000 tonnes of phosphorus, there has been a gradual decline in total annual applications, largely due to a reducing demand for use in sugarcane production and to a lesser extent, a decline in usage of the pastures on the Tableland. Current usage approximates 1700 tonnes of phosphorus.

The average rates of fertilizer application over the whole catchment are 31 kg N and 7 kg P/ha annually. The area which actually receives fertilizer on a fairly regular basis represents nearly 18% of the total catchment size.

growers in 1931. It is supplied from 16 000 hectares of cane grown between El Arish and the Murray River, i.e. three river basins. Fertilizer nitrogen rates are higher than in other sugarcane production areas largely because of the higher rainfall - 220 kg N/ha on plant cane and 280 kg N/ha on ratoons. Phosphorus rates are also generally higher, with some plant cane areas receiving heavy applications of superphosphate, with the intention of building soil phosphorus status to more than 40 mg/kg acid-extractable phosphorus as soon as economically possible. Ratoon cane in high phosphorus soils is often not fertilized with this nutrient - about 70% of the ratooned area receives an average of about 38 kg P/ha. About 77% of the phosphorus is applied to sugarcane.

Bananas around Tully (1735 hectares) and at Mission Beach (364 hectares) constitute 44% of the north Queensland area and 30% of the north Queensland growers. Average annual nutrient use on bananas is in excess of 600 kg N/ha and 50 kg P/ha, applied in up to ten applications over the year. Bananas account for about 20% of the nitrogen and phosphorus used in the Tully catchment.

Pastures for beef cattle are a minor user of nitrogen (less than 10%) and phosphorus (about 4%). Occasional large applications of rock phosphate, e.g. in 1980, distort an otherwise fairly static usage of phosphorus in the catchment since 1975.

Overall, nitrogen usage has increased at over 5.5% annually since 1950, largely due to the expansion of sugarcane production and more recently, bananas. Phosphorus usage increased significantly between 1960 and 1972 (more than 18% annual trend), declined in the mid-1970s with higher prices, and has changed little since.

**MURRAY** **Basin 114**

**Latitude** 18° to 18°30'S **Longitude** 145°45' to 146°15'E

**Area** 1140 $km^2$ - 114 000 ha
440 sq ml - 281 580 acres

**Mean Annual Rainfall** - 2485 mm
**Mean Annual Run-off** - 1428 mm (1 628 000 ML)

**Run-off** - 57% of rainfall

14% of the basin is gauged.

**Description** The Murray River (75 kilometres long) drains the northern and western half of the catchment, through the cane areas of Euramo and Bilyana, entering low-lying country 15 kilometres upstream of the mouth into Rockingham Bay.

The Kennedy Creek - Meunga Creek system flows east of the Range through Ellerbeck between Kennedy and Cardwell to the southern part of Rockingham Bay, opposite the northern tip of Hinchinbrook Island.

The narrow southern portion, south from Cardwell to the Cardwell Gap, is low-lying adjacent to Hinchinbrook Channel, east of the Bruce Highway - Northern Railway. The western section forms part of the Cardwell Range with peaks to 1100 metres in the vicinity of Macalister Mountains.

**Land Use** About 25% of the 10 500 hectares of sugarcane grown in the Cardwell Shire is in the Murray River Basin, mostly located from west of Euramo to Tully Heads, south of the Tully River. Pastures and small crops are grown around Murray River, including 460 hectares of bananas. Bananas are also grown near Kennedy (380 hectares) together with mangoes, lychees and papaws.

The Edmund Kennedy National Park extends along the coast north-east of Kennedy. The southern and western mountainous regions of the Cardwell Range are World Heritage Areas.

**Fertilizer** As in the Tully River system, fertilizer usage in the Murray River basin is dominated by sugarcane and, more recently, bananas. Nitrogen usage increased from about 100 tonnes in 1960 to nearly 400 tonnes in 1980 (7.5% annual increase). Since 1985, with the rapid increase in the production of bananas (where rates in excess of 600 kg N/ha are applied each year), tropical tree crops and cucurbit crops, particularly melons, nitrogen usage has trebled.

Phosphorus usage has increased linearly since 1960 to reach 200 tonnes per year, about 60% on sugarcane and 30% on bananas.

As in other sugarcane production areas, and particularly since the advent of green cane trash blanket harvesting methods, the rate of phosphorus application to ratoon cane has decreased.

## HERBERT — Basin 116

**Latitude** 17°30' to 19°S **Longitude** 145° to 146°15'E

**Area** 10 131 $km^2$ - 1 013 100 ha
3910 sq ml - 250 236 acres

**Mean Annual Rainfall** - 1331 mm
**Mean Annual Run-off** - 493 mm (4 991 000 ML)

**Run-off** - 37% of rainfall

87% of the basin is gauged.

**Description** The Herbert River rises as the Wild River, 335 kilometres from its mouth, at about 1260 metres above sea level near Herberton on the Evelyn Tableland in Herberton Shire, flowing south. Tributaries enter from the Mt Garnet area in the Great Dividing Range to the west and from Ravenshoe to the east. At the Herberton Falls (160 kilometres) the river's direction changes to the east, flowing through the Yamanie Falls National Park (leaving the Herberton Shire) adjoining the Gorge Range, which is the watershed of the Burdekin River to the south. Stony Creek with the 305 metre high Wallaman Falls, enters west of Abergowrie (85 kilometres), draining the Seaview Range to the south. Tributaries from the Cardwell Range and Rockingham Bay Range to the north in Cardwell Shire enter below Abergowrie while the Stone River (50 kilometres) drains the southern area west of the highway. From Ingham, 35 kilometres upstream, the Herbert River flows north-east through the Macknade and Halifax cane areas entering the sea through several channels north of Lucinda in the Hinchinbrook Channel.

The south-east, adjoining Halifax Bay, is low-lying swampy land, with extensive mangroves south of Allingham.