FERTILIZER INDUSTRY FEDERATION OF AUSTRALIA, INC.

Registration No. A0025290C ABN 71 395 757 876

16 September 2002

The Great Barrier Reef Team
Great Barrier Reef Study
Productivity Commission
LB2, Collins Street East
Melbourne Vic 8003

Dear Sir/Madam

The Fertilizer Industry Federation of Australia (FIFA) welcomes the opportunity to present this submission as part of your research study examining the economic and social importance of the main industries in the Great Barrier Reef lagoon and the costs/benefits of on-ground actions to address declining water quality entering the lagoon.

The Great Barrier Reef is a national asset of world importance. We recognise the public's growing concern about increasing levels of nutrients and their effects in the Great Barrier Reef lagoon and acknowledge the large body of scientific research which points to land-based runoff from agriculture as a contributing source.

FIFA is an industry association of Australia's fertilizer manufacturers, importers, distributors and retailers. FIFA members market more than 95% of the 5.5 million tonnes of fertilizer used in Australian agriculture each year.

FIFA includes among its members Incitec Fertilizers, Pivot Agriculture and Summit Fertilizers, the three major fertilizer suppliers in Queensland.

One company in particular, Incitec Fertilizers, has had more than 80 years' involvement in Queensland agriculture. This submission draws in part upon that company's extensive experience and research data in compiling its conclusions.

FIFA's Environment and Food Safety Strategy recognises eutrophication as the major environmental issue of concern to the industry. In 2001, FIFA published *Cracking the Nutrient Code*, a guide to developing nutrient management codes of practice for catchments, industries and individual enterprises. The strategy will result in further

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initiatives in this area over the next two years as the industry develops a national environmental product stewardship program.

Sugar cane is the largest crop grown in river catchments draining into the GBR lagoon and the largest user of fertilizer. Our submission discusses fertilizer management in sugar cane and how it might be improved, including the use of predictive tools such as soil and leaf analysis.

FIFA members are committed to assisting the sugar industry to identify and adopt practical measures which improve effective and efficient use of fertilizers. Improving efficiency of use has direct commercial impact on the sugar industry's commercial viability and in reducing the risk of environmental impact.

FIFA is committed to involvement in public policy debate as a responsible and credible voice for the Australian fertilizer industry. Our strategy recognises the importance of environmental issues, particularly eutrophication, and our members understand that the catchment of the Great Barrier Reef is of particular public concern. We welcome the opportunity to contribute to any initiatives that will improve the management and protection of this great natural asset.

If we can be of any further assistance to the Great Barrier Reef Study or to initiatives or activities that arise from it, please do not hesitate to contact me.

Yours sincerely,

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Foreword

Why is fertilizer essential in productive agricultural systems?

Australia's soils are geologically old and with the exception of a few basaltic and alluvial soils, are inherently infertile by world standards.

Consequently, farmers need fertilizers in productive agricultural systems to improve and maintain soil fertility.

Nutrients are removed in farm produce, and unless the soil is very fertile, these have to be replaced to ensure a sustainable agricultural system.

In high yielding crops such as sugar cane, an appreciable part of the above ground vegetative material, the millable cane, is removed at harvest, placing a considerable demand on the soil for nutrients.

In addition, some nutrients, both naturally occurring and applied as fertilizer, are inevitably lost off-site to air and water. This is unavoidable in a biological system, particularly in areas of high rainfall.

The challenge for those involved in agriculture is to minimise these losses, and to maximise crop recovery of applied nutrients, which reduces the risk of nutrients impacting on the environment.

As one of its initiatives to help achieve this balance, FIFA has developed a Nutrient Management Code of Practice designed to help farming industries to maximise the efficient use of nutrients in their systems which will in turn:

- Minimise environmental impact, and
- Increase production efficiency.

A set of guidelines to help individual industries and regions develop their own specific Nutrient Management Codes of Practice is available on our website at www.fifa.asn.au.

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1. The economic and social importance of the fertilizer industry in Queensland

In 1999-2000, the Australian fertilizer industry contributed $8 billion to GDP (approximately 1.3%), according to Quirke and Vincent, Centre for International Economics, 2001. (Published in the proceedings of the Fertilizers in Focus conference, 23-30 May 2001, FIFA.)

This figure includes a conservative estimate of the direct effect on agricultural production that amounts to more than $4 billion per annum.

The fertilizer industry in Queensland is an internationally competitive player with a keen interest in the long-term viability of its customers.

It services more than 80 dealers and agents located in key agricultural areas of the state. These businesses in turn are significant employers of local people and contributors to local economies.

The industry consists of major assets and infrastructure such as manufacturing and export facilities, fertilizer sheds and transportation worth more than $2 billion.

The Queensland fertilizer industry is a mature industry. Its economic importance is likely to be only marginally greater in the years 2010 and 2020 based on current projections.

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2. The principal activities of rural industries that have the potential to change water quality

In the river catchments draining into the Great Barrier Reef Lagoon, beef cattle production accounts for the greatest land use. However, very little fertilizer is applied to beef pastures in North Queensland and soil fertility is slowly declining.

In terms of application rates per hectare and total volumes used, fertilizer use is much greater in intensive agriculture i.e. dairy pastures, grain crops, horticulture and sugar cane.

Of these, sugar cane is the largest crop grown in the river catchments draining to the Great Barrier Reef Lagoon, and accounts for most of the fertilizer used, even though some other crops, such as bananas, are fertilized at higher rates.

According to FIFA statistics, sugar cane is a major consumer of nitrogen and potash, accounting for 8% of the total Australian fertilizer market.

Consequently, this submission focuses on fertilizer management practices in sugar cane.

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3. Briefly discuss the current management approach by the Queensland fertilizer industry and the sugar industry to activities that influence water quality entering the GBR lagoon

The fertilizer industry

A founding member of FIFA and the major fertilizer supplier, Incitec Fertilizers has made a significant contribution to sugar cane agronomy in the area of crop nutrition and fertilizer management over 70 years, through:

- its own on-farm research programs.

- co-operative research programs conducted jointly with organisations such as the BSES, SRDC and the CRC for Sustainable Sugar Production. A senior technical advisor with Incitec Fertilizers is a current member of the CRC for Sustainable Sugar Production Advisory Committee.

- active training programs targeted at Incitec staff and Dealers in canegrowing regions and covering sugar cane agronomy and nutrition. Dealer agronomists participating in these training programs undergo examinations before they are eligible to become Incitec accredited agronomists. There are 74 of these accredited agronomists in sugar cane growing areas (north of Rockhampton), who have ready access to the company's research work and recommendations through its Nutrient Advantage programs.

- training and on-farm field support for growers.

Programs such as these ensure that canegrowers receive the latest advice on best practice in nutrition and fertilizer management.

Incitec Fertilizers has fostered a close working relationship with the BSES and consults with this organisation in developing fertilizer recommendations. Soil and plant tissue (leaf) interpretation data are regularly updated to reflect the latest research findings.

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The sugar industry

Economically viable production of sugar cane is not possible without the addition of soil nutrients.

The major nutrients applied in fertilizer programs in sugar cane are nitrogen (N), phosphorus (P) and potassium (K).

Of these, nitrogen and phosphorus attract the most public attention, as high concentrations of either nutrient in ground or surface water can cause undesirable environmental consequences.

In contrast, potassium is present at comparatively high concentrations in water bodies. Consequently, any loss of potassium from agricultural land has a negligible effect on potassium concentrations in water and is rarely considered significant.

Nitrogen (as nitrate) is highly mobile in the soil and can be leached to groundwater after heavy rain. Nitrogen may also be lost in surface run-off, either in solution or with suspended colloids.

After application, phosphorus is strongly sorbed onto clay and organic particles in the soil and is not subject to leaching. The main way in which phosphorus is lost is through soil erosion, attached to eroded soil particles.

Reducing phosphorus losses

Phosphorus, via soil, losses in sugar cane have been substantially reduced in recent decades by the adoption of trash blanketing and reduced tillage practices.

According to Canegrowers' research, more than 90% of cane growers in North Queensland now use green cane trash blanketing.

Trash left on the soil surface after harvest protects the soil from raindrop impact, slows down the velocity of surface run-off, and suppresses weeds.

Herbicides are now widely used to control weeds, whereas in the past canefields were regularly cultivated for weed control, leaving the soil loose, bare and prone to erosion.

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Preventing nitrogen losses through precision fertilizing

Nitrogen losses, both per hectare and as a percentage of the amount applied, are greatest when nitrogen is applied in excess of crop requirements.

In plant cane, some nitrogen (about 25%) is applied with phosphorus and potassium at planting.

The balance is applied as a side-dressing later in the growing season.

The fertilizer used at planting and as a side-dressing is applied into and covered by soil.

Sugar cane is a type of giant grass and the second crop grows from the root system left in the ground after the first crop has been harvested.

It is customary to apply fertilizer for this ratoon crop in a single pass soon after harvest.

Commonly, a trash blanket is retained after harvest.

Seventy to 80% of fertilizer is knifed into the soil using a coulter on one side of the stool. In another technique, the fertilizer is banded on either side of the stool through tubes into the undisturbed trash.

Placing the fertilizer through the trash requires special equipment, consumes additional fuel and is a slower operation. In addition, disturbing the trash and soil may encourage weed growth, requiring greater expenditure and reliance on herbicides.

However, the major disadvantage in applying nitrogen to the surface of the trash blanket without incorporation is that nitrogen may be lost to the atmosphere through the volatilization of ammonia gas.

Where irrigation is available, farmers know to eliminate volatilization losses by watering the urea into the soil after application.

Calcium ammonium nitrate is a better alternative to urea where nitrogen is applied to a trash blanket without incorporation. The only deterrent is its greater cost.

In horticultural crops, nitrogen is often split applied to improve the efficiency of utilisation. However, there is no strong evidence to support the practice in sugar cane.

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On the contrary, sugar cane appears to have the capacity to take up and store nitrogen within the plant for later use.

Moreover, the nitrogen applied later in the year as the wet season approaches is at greatest risk of being lost before it has been taken up by the crop, should heavy rain follow its application.

Reducing rates of applied nitrogen

Compared with phosphorus, nitrogen is more mobile in soils and the environment. Nitrogen is much more prone to loss and is more difficult to manage.

Historically, cane growers have often applied higher than recommended rates of nitrogen because of:

- A lack of confidence in the diagnostic tools used to predict nitrogen rates
- As a safeguard against nitrogen losses caused by unusually heavy rainfall events
- In recognition that yield losses through under-fertilizing may prove more costly than applying extra fertilizer. Nitrogen urea costs around $0.75/kg N, so an extra 20kg/ha N will cost $15. If extra nitrogen is not applied, and yields drop by more than a tonne of cane per hectare, the farmer will be out of pocket (except during times of very low sugar prices).

Importantly, the sugar industry's assignment system, in operation for many years, has ensured that the area planted to sugar cane is tightly controlled. This has encouraged growers to apply high rates of fertilizer to maximise yields and farm income because they have not had the option of planting additional land to sugar cane.

Using high rates of fertilizer to increase yields has not only maximised short term profits, but has allowed those farmers who consistently grow over-quota cane to share in the allocation of new assigned land and quotas when the industry has expanded.

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Are nitrogen rates declining?

There is a general consensus within the industry that nitrogen use rates are declining.

Evidence from the field points to a reduction in fertilizer use by those growers who:

- recognise that green cane trash blanketing is recycling nitrogen where it has been practised for two or more crop cycles;
- are striving to reduce production costs wherever possible; and
- are aware of environmental issues, fostered by initiatives such as the Canegrowers' Code of Practice for Sustainable Cane Growing and the adoption of the COMPASS program.

While fertilizer suppliers have recorded increased sales of fertilizer in recent years, this can be attributable to geographic expansion of the industry and an increased assigned area under cane, particularly in the Burdekin.

Preliminary analysis by the fertilizer industry shows that nitrogen use rate is declining by at least 10% per annum. Average rates are 180-200 kg/ha.

According to a senior agronomist at Incitec Fertilizers, nitrogen use rates are likely to decrease by a further 30% over the next 5-10 years through the adoption of improved nutrient management practices.

We are more closely examining available industry data on nitrogen use rates over the next two weeks in order to more precisely define the decline in nitrogen rates.

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4. Overcoming limits to the adoption of precision fertilizer application

Determining appropriate nutrient rates

In the 1930s, cane growers became the first farmers in Australia to use soil tests, when the industry's research and extension organisation, the Bureau of Sugar Experiment Stations (BSES) commenced its service.

The fertilizer industry, namely Incitec Fertilizers, began offering commercial soil testing services in the 1960s.

Soil tests are used to monitor changes in soil fertility and to adjust fertilizer rates. They are used to predict application rates for phosphorus and potassium and soil ameliorants such as lime and gypsum.

The fertilizer industry offers a nitrate nitrogen soil test developed by the BSES for use in a plant cane crop where the ground has been fallowed previously.

However, soil nitrate testing, which is extensively used elsewhere in annual crops, is not suitable for use in ratoon sugar cane. Nitrate, which is formed from the mineralisation of soil organic matter, accumulates in the soil while the land is being fallowed and no crop is being grown to take it up. In sugar cane ratoon crops, there is no build-up of nitrate in the soil and it is pointless testing for it.

The potential for leaf testing

Leaf tests also have limited application in sugar cane, because the crop is fertilized before the leaves appear. Instead other techniques are used to predict nitrogen requirements.

However, there will still be circumstances in some blocks and seasons, where heavy rain soon after nitrogen has been applied, results in its loss before the crop has had the chance to properly utilise it.

In these circumstances, the crop will develop nitrogen deficiency and yield will be lost if additional nitrogen is not applied.

In these cases, an in-field test, such as a leaf test, is needed for growers to identify those situations where nitrogen is in short supply, so that additional nitrogen can be side-dressed.

Clearly, this will not need to be done in every block or every year. However, growers require a safety valve such as this if they are to substantially reduce the amount of nitrogen applied to plant cane or to ratoon cane in their routine fertilizer management practices.

Improving analytic tools

Incitec Fertilizers, in consultation with the BSES, has developed a computer-based decision support tool, known as "LiNk Sugar", to help determine appropriate nitrogen rates.

LiNk Sugar takes into account factors such as the crop class (plant, replant, ratoon), fallow management, use of mill mud, expected yield, variety, soil type, rainfall and irrigation, fertilizer choice, placement and timing.

LiNk Sugar is available to growers through Incitec Fertilizers Dealers and BSES staff.

While soil and leaf testing services and decision support tools such as LiNk Sugar are available, growers have been slow in showing a degree of confidence in them which would encourage them to change their existing fertilizer programs dramatically.

Many farmers continue to choose to err a little on the high side as an insurance against yield loss.

The interpretative data used for soil and leaf tests and in LiNk Sugar will continue to be fine tuned, but the adoption of changed management practices and reduced fertilizer rates may well be contingent on other developments.

One positive development in recent years has been the use of on-line Near Infra Red (NIR) spectrophotometry in the sugar mills to check nitrogen levels in cane at the start of the milling process.

In tree crops, leaf tests are used once a year, to check on the adequacy of the existing fertilizer program. Then, if necessary, the fertilizer program is adjusted for the coming year.

In sugar cane, NIR shows the promise of being able to be used in the same way.

If proven to be a reliable diagnostic tool, the use of NIR will allow all cane growers to be provided with feedback on the adequacy or otherwise of their existing nitrogen fertilizer program, in all blocks.

Using NIR, growers or agronomists are not required to take samples in the field, a drawback to the use of conventional leaf tests.

In addition, once the mills are set up, the ongoing cost of wet chemistry laboratory analysis is eliminated.

Once growers find they can use NIR with confidence, backed by tools such as LiNk Sugar to support their decisions, nitrogen rates applied by growers should decline.

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Conclusion

FIFA, through member organisations such as Incitec Fertilizers, has available a range of valuable diagnostic tools and robust agronomic advice based on decades of research to enable cane growers to become more precise in applying fertilizer efficiently and cost-effectively.

Adoption of these practices will also continue to see declining nitrogen use rates.

New tools are becoming available which will increase growers' confidence in the value of the science to both their hip pockets and to their productivity.

The bottom line will be the continuing sustainability of the sugar industry as a productive, high yielding industry generating many millions of export dollars for Australia annually.

No less important will be the benefits flowing from improved fertilizer management practices to the catchments adjoining the Great Barrier Reef.

Ends

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