

Optimise nutrient rate and application

The improved management practices to optimise nutrient rate and application include:

1. Regular soil and leaf nutrient testing to inform nutrient application (e.g. bananas pre-plant soil test and paired leaf and soil tests at least annually)
2. Multiple applications timed to irrigation and rainfall, including methods of fertigation, foliar and band application
3. Regular calibration of fertiliser and/or fertigation equipment, particularly by product type

Water quality

1 - Regular soil, leaf and/or sap nutrient testing to inform nutrient application (e.g. bananas pre-plant soil test and paired leaf and soil tests at least annually)

Using fertiliser rates that match crop requirements is beneficial to the environment as well as boosting production and being more economically efficient. To correctly identify your crops nutrient requirements, paired leaf and soil testing needs to be undertaken regularly. Data obtained will help identify the crops requirements and thus guide the fertiliser application program. (7B & 5B)

2 - Multiple applications timed to crop stage, irrigation and rainfall, including methods of fertigation, foliar and band application

Fertiliser programs should match your plants requirements in order to minimise runoff and the leaching of nutrients. To match the plants requirements, fertiliser can be applied by splitting the application across the year. Small regular nutrient applications as opposed to large once-off applications reduce the leaching of nutrients and subsequent pollution of waterways. Nitrogen application is most effective once the root system is well established. To minimise leaching fertiliser applications should avoid periods of heavy rainfall. Fertigation may reduce nutrient loss via runoff and must be timed in consideration of the rainfall. (9B & 12B & 5B)

3 - Regular calibration of fertiliser and/or fertigation equipment, particularly by product type and batch

Equipment must be calibrated to deliver the correct amount of fertiliser as this reduces leaching of nutrients and subsequent pollution of waterways. Wear and tear on machinery affects spreading rates and therefore calibration should be undertaken regularly. (21B & 10B).

Costs and benefits

There were no examples found of the economic impacts (either positive or negative) to a grower of applying granular and liquid fertiliser subsurface. It is anticipated that relevant information may be provided in the near future as further research is undertaken.



Regional studies

Wet Tropics - case study in South Johnstone

Management practices: reduced fertiliser rates and grassed interrows without herbicide. A banana paddock monitoring site located at South Johnstone in the Wet Tropics compared improved management practices with conventional practices.

Fertigation

The improved practice of fortnightly fertigation produced similar yield, fruit characteristics and follower sucker growth when compared with conventional practices. Conventional practices include monthly broadcast fertiliser and bare interrows. Bunch weight was heavier and sucker height higher in the improved practice site compared to the conventional site. Improved practices provided a 40% saving per hectare of nitrogen fertiliser. Some commercial plantations have adopted lower nutrients with no changes in productivity.

During extended periods of wet weather, when flooded irrigation pumps and saturated soil conditions did not allow fertigation to take place, application of targeted broadcast solid fertiliser was used to maintain plant growth and productivity.



Grassed interrows

A banana farming family who for more than 10 years managed grassed interrows reported that the benefits of the practice were greater accessibility, reduced sediment loss and reduced herbicide usage through the mulching effect of the slashed grass. Improvements in plant growth were attributed to this approach (16B).

Case study south of Innisfail

Management practices: a system of improved practices including all nutrient, pest, soil and water management.

A 95ha banana farming property, which adopted improved practices following Severe Tropical Cyclone Larry in 2006, showed an improvement in its financial viability, with benefits extending to the bordering wetlands. The farm's gross margin improved due to increased yields and the savings associated with improved practices. The net present value of the practice change was positive.

The improved practices adopted included:

Nutrient management

- soil and leaf analysis
- matching nutrient application to crop needs
- fertigation and foliar application allowing smaller, more regular doses

Pest management

- targeting chemical application (inject rather than spray)
- reducing chemical use

Soil and water management

- reducing tillage
- longer crop cycles
- minimising traffic in wet season
- monitoring soil moisture
- interrow vegetation
- composting

Capital outlay was required to purchase three harvesters, a slasher and to make changes to the irrigation and fertigation system. The farmer considered this a worthwhile investment due to a 20% reduction in irrigation related costs as well as improvements in soil and plant health. Other purchases included soil analysis and water monitoring equipment.

This resulted in a considerable reduction in chemical (fertiliser and pesticide) costs. The demonstrated savings included herbicide use, which was down by 50%, fungicide by 60%; no nematicides were used and granular fertiliser usage was reduced by 30%. There were also production benefits in terms of site preparation, with use of the ripper and plough down by 60%, and reduced irrigation costs. (13B & 16B & 22B)



Field experiments in the Wet Tropics

Experiments measuring run off demonstrated that most loss of nitrogen occurs in association with sediment movement. For the nitrogen that was lost through deep drainage, less nitrogen was lost in a system that used fortnightly nitrogen application and a grassed interrow than a conventional system with monthly nitrogen applications. <http://origin-www.reefplan.qld.gov.au/measuring-success/case-studies/case-studies-horticulture/monitoring-nitrogen-in-bananas.aspx>

Field experiments in the Wet Tropics

An experiment was run on a banana farm on Dermosol soils in the South Johnstone region. The average rainfall of the area is 3300mm a year and the area is irrigated by under tree mini sprinklers. The study compared B class practice which had a lower rate of nitrogen application (150kg/ha per year / 250kg/yr ratoon) and a grassed inter-row with C class practice that had higher nitrogen application (250/150kg/ha / 375kg/ha ratoon). It was demonstrated that these practices produced a similar yield, fruit characteristics and follow sucker growth. The cost of fertiliser use was less for the B practices site. Unquantified observations suggest that that a grassed inter-row have reduced loss of water and sediment. <http://origin-www.reefplan.qld.gov.au/measuring-success/case-studies/case-studies-horticulture/grassed-inter-rows-in-bananas.aspx>

General - Wet Tropics region

Management practices: split nutrient application, minimal tillage, and interrow vegetation

Optimising nutrient use:

A group of banana producers in north Queensland made savings in fertiliser costs by implementing improved management practices in a fertiliser program and reducing their application target for some nutrients by 30-50% from their former practices, while maintaining marketed yields of 51t/ha.

Minimal tillage

The expected benefits in using minimal tillage include:

- financial savings
- greater flexibility of farm operations
- conservation organic matter
- improvement in soil structure
- reduced risk of soil erosion
- reduced disturbance of soil biology

Maintain groundcover with interrow vegetation:

Records of a north Queensland producer show that the extra cost in slashing interrows is offset by resultant savings in herbicide.



Banana economic tools

Banana root and soil health user's manual:

This manual (developed by DAFF) identifies simple, practical tests to measure soil health and outlines the use of an on-farm testing kit to perform these tests. This testing is designed so that banana producers or agricultural consultants can assess or monitor the health of the soil inexpensively and without the need for a laboratory.

Website: <http://www.daff.qld.gov.au/environment/sustainable-agriculture/land-management/banana-root-and-soil-health-users-manual>

Phone: 13 23 25 (DAFF)

Extension services

Banana BMP

Best Management Practice program for the banana industry is a source of information about suggested farming practices. It was designed as an environmental guideline and considers the impact of banana production on water quality. It was created by the Australian Banana Growers Council and the Queensland Department of Agriculture, Fisheries and Forestry.

Website: <http://bmp.abgc.org.au/>

EnviroVeg

EnviroVeg (a program of AusVeg) provides growers with guidelines and information on how to manage their business in an environmentally responsible manner. Participants can also earn environmental certification.

Website: www.ausveg.com.au

Phone: (02) 9822 0388 (Victoria)

Email: info@ausveg.com.au

Fertcare

This program is a joint initiative of the Australian Fertiliser Services Association and the Fertiliser Industry Federation of Australia. It provides training, quality assurance, certification and accreditation. The training program delivers training in managing food safety, environment and occupational health and safety risks associated with the storage, handling and use of fertiliser and soil ameliorant products.

Website: www.fifa.asn.au

Phone: 02 6230 6987 (Canberra)

Email: fertilizer@fifa.asn.au

Growcom FMS (water efficiency, water quality, soil nutrient)

Developed by Growcom Land and Water staff to assist horticulture growers to identify natural resource management risks, develop action management plans and to assist with directing on-farm investment. Delivered by Growcom staff and external partners, under licence, predominately one-on-one on-farm but can be delivered within a group setting. From a Growcom perspective the FMS enables us to benchmark the horticulture industry in terms of current practices, better document change in practices, provide improved delivery of ongoing and new projects and better target on-ground activities to assist growers to meet and exceed BMP.

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Website: <http://www.growcom.com.au/> Ph: 4613 1066
Email: growcom@growcom.com.au

Guidelines for environmental assurance in Australian horticulture (soil, nutrients, water, chemicals, biodiversity, waste, air, energy)

Developed by the Horticulture for Tomorrow project, managed by Horticulture Australia Limited (HAL) in partnership with industry, and funded by the Natural Heritage Trust, through the Australian Government's Pathways to industry EMS program. The guidelines help growers link production targets with their care for the environment as an integral part of daily business management. The final version includes a review checklist (to record progress and identify priorities for action and information about risk assessment); suggested practices, monitoring and recording of eight key areas, including soil, nutrients, water, chemicals, biodiversity, waste, air and energy. The guidelines are available online for free via www.horticulturefortomorrow.com.au or the CD and/or hard copy folder can be ordered from HAL.

Ph: 02 8295 2317

Email: horticulturefortomorrow@horticulture.com.au

Regional extensional services

ABCD framework of bananas, papaws and mixed cropping (e.g. potatoes, peanuts, maize, grass seed)

Developed for Terrain NRM for use in identifying recommended best practice. Part of the Reef Rescue program to prioritise practices for incentives funding to achieve water quality improvement.

Website: www.terrain.org.au

Ph: 07 4043 8000

Supplementary resources

Freshcare code of practice - Environmental, Second Edition (2011)

This is an on-farm environmental assurance program. It covers the issues of environmental action planning, land and soil, chemicals, fertiliser and soil additives, water, biodiversity, waste, air, energy and fuel.

Website: www.freshcare.com.au

Phone: 1800 853 508

Email: info@freshcare.com.au

Guidelines for environmental assurance in Australian horticulture

Developed by Horticulture for Tomorrow in association with Horticulture Australia Ltd and the Natural Heritage Trust. The guidelines look at:

- land and soil management
- water and soil management
- chemical management
- nutrient management

- biodiversity
- waste management
- air management
- energy management

It also includes a self-assessment checklist.

Website: www.horticulturefortomorrow.com.au/for_growers/guidelines_table.asp

Phone: 02 8295 2300 (Horticulture Australia Ltd, Sydney)

Email: horticulturefortomorrow@horticulture.com.au

Wetlands management handbook

Farm Management Systems (FMS) guidelines for managing wetlands in intensive agriculture. Developed by the Australian and Queensland Governments, as part of the Queensland Wetlands Program. The guide provides information to landholders and extension officers on:

- identifying wetlands
- wetland management
- artificial wetland creation

The guide was designed to complement other industry FMS programs, for holistic farm management.

Website: <http://wetlandinfo.ehp.qld.gov.au/wetlands/resources/publications/reports.html>

Phone: 13 74 68 (Queensland government statewide)

More information

If you would like to contact DAFF about the information presented in this factsheet, contact us on: 13 25 23, for the cost of a local call within Queensland, or 07 3404 6999, or email us at;

ReefPlan@daff.qld.gov.au



References

- 1B) Fairbairn, D.M. and Loch, R.J. and Silburn, D.M. (1996), [Soil erosion and soil conservation for versitols](#), Developments in Soil Science, Volume 24, pp. 303-62.
- 2B) Karssies, L.E. and Prosser, I.P. (1999), [Guidelines for Riparian Filter Strips for Queensland Irrigators](#), Technical Report 32/99. CSIRO Land and Water, Canberra.
- 3B) Kent, J. (2004), [The need for best practice herbicide management](#), Fourth Australian Weeds Conference, Wagga Wagga, 6-9 September 2004, pp. 232-35.
- 4B) McKergow, L.A. and Prosser, I.P. and Grayson, R.B. and Heiner, D. (2004), [Performance of grass and rainforest riparian buffers in the wet tropics, Far North Queensland. 2. Water quality](#), Australian Journal Soil Research, Volume 42, pp. 485-98.
- 5B) Nicholls, Z. and Layden, I. and Bagshaw, J. and Stockwell, B. and Groubler, L. (2008), [Strawberry – best soil, water and nutrient management practices](#), Department of Primary Industries and Fisheries, viewed 22 February 2011.
- 6B) Pattison, T. and Lindsay, S. (2006) [Banana root and soil health user's manual: FR02023 Soil and root health for sustainable banana production](#). Department of Primary Industries and Fisheries, Queensland.
- 7B) Peverill, K.I. (2003), [Soil testing and plant analysis in Australia](#), Australian Journal of Experimental Agriculture, Volume 33, pp. 963-71.
- 8B) Poggio, M. and Van Grieken, M.E. (2010) Economic analysis of Banana ABCD Management Practices in the Tully Region. MTSRF Project report July 2011.
- 9B) Prasertsak, P. and Freney, J.R. and Saffigna, P.G. and Denmead, O.T. and Prove, B.G. (2001), [Fate of urea nitrogen applied to a banana crop in the wet tropics of Queensland](#), Nutrient Cycling in Agroecosystems, Volume 59, Number 1, pp. 65-73.
- 10B) Price, T. and Beumer, B. and Graham, P. and Hausler, P. (1997), [Machinery Calibration Boomspray, Seeder and Fertiliser Applications](#), Agnote, Number C31.
- 11B) Prove, B. and Doogan, V. and Truong, P. (1995), [Nature and magnitude of soil erosion in sugarcane land on the wet tropical coast of north-eastern Queensland](#), Australian Journal of Experimental Agriculture, Volume 35, Number 5, pp. 641-49.
- 12B) Prove, B.G. and McShane, T.J. and Reghenzani, J.R. and Armour, J.D. and Sen, S. and Moody, P.W. (1996), in Bond, W.S. (ed) Occasional paper 08/96 [Measurement and Management of nitrogen losses for groundwater protection in agricultural production systems](#), Workshop proceedings held in conjunction with Water Downunder 94, the 25th Congress of the International Association of Hydrogeologists and the International Hydrology and Water Resources Symposium of the Institute of Engineers Australia, Adelaide, November 1994.
- 13B) Queensland Wetlands Program (2011), [Banana farming for healthier wetlands](#). Department of Environment and Resource Management, Queensland.

- 14B) Rattray, D.J and Standley, J. and Silburn, D.M. and Freebairn, D.M. and Spann, K.P. (2007), 'Atrazine degradation and transport in runoff on a Black Vertosol', Soil Research, vol. 45, no. 8, pp. 598-606. <http://era.deedi.qld.gov.au/1351/>
- 15B) Roebeling, P.C. and Webster, A.J. and Biggs, J. and Thorburn, P. (2007) [Financial-economic analysis of current best management practices for sugarcane, horticulture, grazing and forestry industries in the Tully-Murray catchment](#). CSIRO: Water for a Healthy Country National Research Flagship. Final MTSRF report to MTSFT and FNQ-NRM Ltd. CSIRO Sustainable Ecosystems, Townsville, pp. 48.
- 16B) Silburn, M. (2011) Personal Communication.
- 17B) Silburn, D.M. and Kennedy I.R. (2007), [Rain Simulation to Estimate Pesticide Transport in Runoff](#), in Rational Environmental Management of Agrochemicals, American Chemical Society, Volume 966, pp. 120-35.
- 18B) Tullberg, J.N. and Ziebarth, P.J. and Li, Y. (2001), [Tillage and traffic effects on runoff](#), Soil Research, Volume 39, Number 2, pp. 249-57.
- 19B) USDA-NCRS, (2000), [Conservation buffers to reduce pesticide losses](#), United States Department of Agriculture, Natural Resources Conservation Service, National Water and Climate Centre and the United States Environmental Protection Agency Office of Pesticide Programs.
- 20B) Van Grieken, M.E. and Webster, A.J. and Poggio, M. and Thorburn, P. and Biggs, J. and Stokes, C. and McDonald, C. (2010) [Implementation costs of Agricultural Management Practices for Water Quality Improvement in the Great Barrier Reef Catchments](#). CSIRO: Water for Healthy Country National Research Flagship.
- 21B) Vegetables WA (2012), [Nutrient Management](#), Vegetables WA Good Practice Guide, Vegetables WA.
- 22B) Queensland Wetlands Program (2011) [Case Study: Bananas – Nurturing the soil and neighbouring wetlands on a banana farm in the wet tropics](#), Department of Environment and Resource Management, Queensland.