Optimising soil retention and water infiltration

To optimise soil retention and water infiltration

1. Minimise tillage throughout crop cycle,

2. Maintain or establish groundcover during high risk periods. e.g. grassed interrows and trash placement for bananas,

3. Manage headlands, vegetation buffers, drains and sediment traps to capture and/or filter runoff from the production area (note to banana growers, this relates to vegetated headlands that are not highly trafficked by farm equipment)

4. Mechanically cultivate cross the slope,

5. Schedule irrigation based on soil properties, crop growth requirements, and monitoring of soil moisture and weather forecasts,

6. Manage fallow with cover or break crop.

Water quality

1 - Regular soil, leaf and/or sap nutrient testing to inform nutrient application (e.g. one Minimise tillage throughout crop cycle

Minimal tillage has been shown to reduce the amount of water runoff and soil erosion, as compared to conventional cultivation practices. Using a no tillage or minimum tillage system (grains and sugarcane) has been shown to have minimal impact on crop yield, while significantly reducing environmental impacts (18B & 11B).

2 - Maintain or establish groundcover during high risk periods e.g. grassed interrows and trash placement for bananas

Under development.

3 - Manage headlands, vegetation buffers, drains and sediment traps to capture and/or filter runoff from the production area

Vegetated filter strips have been demonstrated to reduce the losses of nutrients and sediment running off properties into waterways. The vegetation acts to traps sediments and nutrients carried by the flow of water. Buffer strips, depending on design, can also prevent stream bank erosion, improve wildlife habitat and improve farm safety (2B & 1B & 19B).

Wet Tropics

Experiments on a banana farm in the Johnstone catchment showed that grass buffer strips were able to reduce total amount of sediment and nutrient runoff. Results demonstrated that nitrogen, phosphorus and suspended sediment decreased by 25-65% (4B).

4 - Mechanically cultivate cross the slope

The direction chosen for cultivating the land can control the direction of runoff. If the furrows run obliquely to the slope and each furrow can carry the water from its own ‘catchment’ then this effectively lessens the slope and increases its length. The result of this is to minimise the risk of erosion. Models can be used to determine the risks of erosion (1B).

5 - Schedule irrigation based on soil properties, crop growth requirements, and monitoring of soil moisture and weather forecasts

The amount of water applied in irrigation should be matched to plant requirements. Soil moisture monitoring equipment, such as tensiometers or capacitance probes, can be used to help determine the amount of water in the soil and inform the farmer of the appropriate amount of water to apply (5B).

6 - Manage fallow with cover or break crop

Under development.

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).

Field experiments in the Wet Tropics

Experiments measuring run off demonstrated that most loss of nitrogen occurs in association is 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 interow than a conventional system with monthly nitrogen applications. http://www.reefplan.qld.gov.au/measuring-success/case-studies/case-studies.aspx

Demo farm in the Tully-Murray area

On a demo banana farm in the Tully-Murray area, it was found that grassed interrows when compared to bare interrows, did not result in a change in productivity. A slight increase in variable costs (due to slashing of the grassed interrows) led to a 3-9% decrease in gross margin on the improved practice site. The practice reduced the amount of fine soluble sediment leaving the farm by approximately 60%; no change was noticed in the level of dissolved nitrogen within runoff. Groundcover also assists with weed control, reduces herbicide usage and improves machinery accessibility (15B).

Case study south of Innisfail

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

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

The improved practices adopted included:

Nutrient management

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

Pest management

- targeted chemical application (inject rather than spray)
- reduced chemical use

Soil and water management

- reduced tillage
- longer crop cycles
- minimised traffic in wet season
- monitored soil moisture
- interrow vegetation
- composting

Capital outlays were 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 20% reduction in irrigation related costs and 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 was down by 50%, fungicide by 60%, no nematicides were used and granular fertiliser 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).

General Wet Tropics

Management practices: B1.2 split nutrient application, B3.1 minimal tillage, B3.2 interrow vegetation.

Optimising nutrient use

It was reported in 2006, that a group of banana producers in north Queensland had 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 original practices, while maintaining marketed yields of 51t/ha.

Minimal tillage

The expected benefits in using minimal tillage include:

- financial savings
- allow greater flexibility of farm operations
- conserve organic matter
- improve soil structure
- reduce risk of soil erosion
- reduce the disturbance of soil biology

Maintain groundcover with interrow vegetation

Records from one north Queensland producer show that the extra cost in slashing interrows is offset by the herbicide savings (6B).

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 asses or monitor the health of the soil inexpensively and without the need for a laboratory.
Website: http://www.daff.qld.gov.au/4789_18453.htm
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.
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)

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

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