MACKAY WHITSUNDAY ISAAC

HORTICULTURE SUSTAINABILITY GUIDE 2018

REEF CATCHMENTS

PRINCIPLE	MANAGEMENT PRACTICE CATEGORY	**D** DATED **Unacceptable and potentially degrading practices**	**C** CONVENTIONAL **Legislative requirement, horticulture code of practice, ETC**	**B** BEST PRACTICE **Current best management practice**	**A** ASPIRATIONAL **Trialling and testing practices that could provide water quality outcomes**
1. Soil Management	1.1 Trees	Inter-rows cultivated.	Inter-rows bare.	Inter-rows maintained with active management of grass ground cover and mulched bed.	Actively managed for cover and soil improvement such as intercropping to improve soil nutrition and pest or disease control. Active management of the bed.
	1.2 Plantation - Bananas and Pawpaw's	Cultivated establishment phase, inter-rows cultivated in production phase.	Cultivated establishment phase, Inter-rows bare in production phase.	Inter-rows maintained with active management of grass ground cover and mulched bed, minimum till establishment phase, and contour planting.	Control traffic permanent beds with GPS guidance for establishment phase, actively managed for cover and soil improvement such as intercropping to improve soil nutrition and pest or disease control.
	1.3 Plantation - Pineapples etc.	Cultivated establishment phase, inter-rows cultivated in production phase.	Cultivated establishment phase, Inter-rows bare in production phase.	Inter-rows maintained with as much ground cover as practical in production phase, minimum till establishment phase, contour planting , EM/ electromagnetic mapping, and soil variability identification. Well designed drainage paths with permanent grass cover.	Control traffic permanent beds with GPS guidance for establishment phase, cropping and harvesting operations, inter-rows actively managed for cover and soil improvement in production phase. Use of polymer soil binders or mulch.
	1.4 Annuals	Cultivated cropping phase, no management of traffic.	Reduced tillage cropping phase, use of multitask machinery, to annually form beds (i.e. lay plastic and drip irrigation).	Developing control traffic systems, strategic till cropping phase, no inter-row tillage, beds reshaped for specific crops, EM/electromagnetic mapping and soil variability identification, and use of variable rate application of nutrient and water.	Control traffic permanent beds with GPS guidance for establishment, cropping and harvesting operations, organic mulches.
	1.5 Fallow Management	Cultivated bare fallow.	Minimal till, grass fallow.	Minimum till cover crop fallow.	Permanent bed cover crop fallow to improve soil health or disease and pest resistance.
	1.6 Headland Management	Cultivated headlands.	Grassed headlands	Permanent grassed headlands and managed to minimise erosion.	Utilise LiDAR data to develop farm topographic maps and associated planned drainage lines which incorporate permanent headlands and swales. Permanent grassed headlands managed as filter strips.
	1.7 Farm Layout Plan	No soil management plan.	Basic soil management plan.	Soil management plan developed for specific soil types: identify soil types, soil mapping/testing, adjust soil management plan for next year if required.	GPS based soil management plan: identify soil types and productivity zones for each paddock using EM/ electromagnetic soil mapping, remote sensing, Identify soil variability causes and use data to change practices to variable rate use.
	1.8 Machinery	Standard tillage equipment.	Standard tillage equipment.	Bed former, strategic till equipment, mulcher, minimum till seed/seedling planter and machinery moving towards unified wheel spacing's.	Permanent bed cover crop fallow to improve soil health or disease and pest resistance.
2. Nutrient Management	2.1 Planning and Monitoring	No nutrient management plan, no records kept.	Basic nutrient management plan, including soil test during fallow, keep basic records - daily diary.	Annual crop specific nutrient management plan, conducts regular soil tests and leaf analysis. Aware of soil types/ productivity zones for each paddock, uses harvested yield & remote sensing. Keep detailed records.	Annual productivity zone nutrient management plan including nutrient budget, conducts GPS referenced soil tests and leaf analysis. Manage for soil types & productivity zones for each paddock, uses harvested yield & remote sensing. Keep spatially referenced records.
	2.2 Fertiliser Application Rates	Application rates based on historic rates or rules of thumb or cost of fertiliser.	Application rates based on industry recommendations & soil testing.	Application rates based on soil & leaf test, and productivity zones & accounts for all sources of nutrients. Change fertiliser rates between paddocks if required.	Application rates based on soil & leaf test, and productivity zones & accounts for all nutrient sources. Change fertiliser rates for productivity zones within paddocks.
	2.3 Accuracy of Application	Irregular calibration.	Annual calibration or in accordance with manufactures recommendations.	Calibration to ensure the accuracy of application equipment (e.g. granular product change). Fertigation system calibrated annually.	Automated calibration to get instant accuracy of application and monitoring during application. Fertigation system calibrated per block annually.
	2.4 Application Timing	Application does not consider crop stage & weather conditions.	Application does consider crop stage & weather conditions.	Nutrient applications are based on crop stage, soil type & moisture levels (i.e. irrigation timing), consider2-3 day weather forecast.	Nutrient applications are based on monitoring of crop health & stage, soil type & moisture levels (i.e. irrigation timing), consider 2-3 day weather forecast.
	2.5 Application Method	Surface applied not incorporated.	Mixture of surface incorporated and subsurface applications.	Specific application method utilised to maximise efficiency of nutrient uptake (e.g. subsurface, basal/preplant, fertigation and foliar).	Automated specific application method utilised to maximise efficiency of nutrient uptake (e.g. subsurface, basal/ preplant, fertigation and foliar).
3. Pesticide Management	3.1 Planning and Monitoring	No pesticide management plan, no records kept.	Basic pesticide management plan, with pest monitoring and reactive pest control, keep basic record.	An IPM/ integrated pest management program has been developed and implemented using pest pressure, soil types, crop stage, surrounding crops and yield mapping. Change pesticide strategy for different blocks if necessary. Document pest monitoring & identify pests. Complete record keeping.	A GPS based IPM program has been developed and implemented using pest pressure, soil types, crop stage, surrounding crops and yield mapping. Change pesticide strategy for different blocks if necessary, document pest monitoring and identify pests, spatial record keeping.
	3.2 Pesticide Application Rates	One Crop protection strategy for each crop based on historic application rates or rules of thumb, and the use of non selective products, irrespective of the control needed.	Multiple crop protection strategies for each crop, uses a combination of selective and non selective products at rates appropriate to control needed.	Paddock scale pest presence and pressure monitoring is used to guide selection and application rate of pesticides. Where practical pesticides that are selective to target species replace non selective, broad spectrum pesticides (strategic pesticide use only).	Variable pesticide strategies within blocks. Management of high pest pressure zones with specific pesticides while also maximising benefit from encouraging natural and introduced biological control agents, i.e. increasing level of beneficial organisms.
	3.3 Application Timing	Calendar scheduled applications regardless of pest pressure or climatic conditions.	Application timing based on evidence of pest & disease pressure, including weather conditions (i.e. rainfall and wind at time of applications).	Timing pesticide applications with respect to crop stage, pest pressure, irrigation and rainfall. Pest scouting governs pest control program.	Variable timing of pesticide applications within blocks with respect to crop stage, pest pressure, irrigation and rainfall. Pest scouting governs pest control program.
	3.4 Application Method	Irregular calibration & maintenance of spray equipment.	Annual calibration or in accordance with manufactures recommendations.	Modern application technology for improved placement & timing to improve application efficiency, accuracy , and to extend the window of opportunity. Calibration to ensure the accuracy of application technology.	Apply variable pesticide strategies within paddocks: specific nozzles, volume, pressure and droplet size matched to specific chemical and variable rate. Computerised application: GPS and/or sensor controlled, and/or control droplet, height control and section control, electronic weather station, use of low volume applicators. Use of crop or weed sensors to target crop canopy. Automated calibration to get instant accuracy of application and monitoring during application
4. Irrigation and Drainage management	4.1 System Design	Irrigation system not suited to majority of soil type or crop (e.g. flooding on sandy soils). Basic pumps not necessarily matched to irrigation system. Inefficient reticulation systems.	Irrigation system suited to majority of soil type or crop. Marginal capacity to deliver crop water requirement. Pumps designed to suit the application. Efficient reticulation system.	Irrigation systems suited to all soil types and crops. Has capacity to deliver crop water requirement. Pumps designed to suit the application. Efficient reticulation system. Irrigation system efficiency assessed biannually.	Variable rate irrigation systems suited to all soil types and crops. Has capacity to deliver crop water requirement. Pumps designed to maximise efficiency. Efficient reticulation system with use of controllers and automation. Irrigation system efficiency assessed annually.
	4.2 Scheduling	Calendar scheduling.	Scheduling based on basic field monitoring using visual/manual assessments such as a penetration test.	Irrigation scheduling based on regular field monitoring to determine plant available water content, moisture monitoring equipment, daily evaporation data, soil type and crop stage. Irrigation water tested for EC/electrical conductivity & nutrients. Flow meters used to record whole of farm water use.	Irrigation scheduling based on regular field monitoring at multiple locations and depths to determine plant available water content, moisture monitoring equipment, daily evaporation data, soil type and crop stage. Irrigation water tested for EC/ electrical conductivity and nutrients. Flow meters used to record water use per block.
	4.3 Run-off Management	No planned drainage management.	Runoff is managed to minimise farm impacts.	Whole of farm run-off including packing sheds etc. is filtered via properly designed and managed traps and buffers.	Whole of farm run-off including packing sheds etc. is filtered via properly designed and managed sediment traps and vegetated buffers. Water quality leaving farm is monitored.
	4.4 Uniformity	Application uniformity (DU/ distribution uniformity) unknown. No monitoring.	Irrigation application uniformity (DU/ distribution uniformity) below industry benchmark (<80%DU) Annual farm scale monitoring of irrigation uniformity.	Irrigation system performing at industry benchmark (i.e. 80 - 85% DU/ distribution uniformity). Annual paddock scale monitoring of irrigation uniformity.	DU/ distribution uniformity consistently above industry benchmarks (typically >90%). Annual paddock scale monitoring of irrigation uniformity.

A *Aspirational*

- New and innovative practices adopted by growers that require further validation to determine industry wide environmental, social and economic costs/benefits.
- Validation requires R&D and if appropriate, some validated practices will become recommended BMP.
- Development of Farm Management Plans and utilisation of new and innovative technology.

B *Best practices*

- Currently promoted practices referred to as ***Best Management Practices***.
- Widely promoted by industry to achieve current and future industry expectations and community standards.
- Development of Farm Management Plans and utilisation of common technology.

C *Conventional*

- Common practices widely adopted by industry but meet only basic current industry expectations and community standards.

D *Dated*

- Practices superseded or unacceptable by current industry expectations and community standards.

The Mackay Whitsunday Isaac Region Sustainable Horticulture Guide provides relevant information and tools to assist producers in achieving sustainable management of their land, whilst maintaining or enhancing farm efficiency and productivity. It is designed to be a resource for finding information rather than a comprehensive manual on horticulture management.

This guide has been written for horticulture producers in the Mackay Whitsunday Isaac region. It links to the Mackay Whitsunday ABCD Management Practice Framework for Horticulture: 2018 Update (Reef Catchments, 2018).

'A' Class or innovative practices from the ABCD Framework are identified throughout this document.

The Mackay Whitsunday region includes the catchments of the Pioneer, O'Connell and Proserpine River systems and covers an area of approximately 9,000 square kilometres. The climate is subtropical to tropical with a distinctive wet season. The average annual rainfall is 1,300 to 2,000 millimetres and over 50 percent of this falls in three months between January and March.

Horticulture is a minor land use in the Mackay Whitsunday Isaac region, with sugarcane, grazing and natural areas being the most significant.

The Mackay Whitsunday Horticulture Management Practices: ABCD Management Framework document has been designed to support the identification, validation, implementation and review of horticulture practices that can improve both freshwater and marine water quality and ecosystem health, as identified in the Mackay Whitsunday Isaac Water Quality Improvement Plan (WQIP) (Folkers et al. 2014).

The development of ABCD frameworks for a range of industries is pivotal to implementation, monitoring, measurement and continual improvement through the WQIP process. The ABCD frameworks are designed to highlight and facilitate communication about the different levels or standards of management practices (as opposed to resource condition) for different water quality parameters (i.e. sediment, nutrients and chemicals).

The classification provides a definition and scale of improvement from ***Dated***, through ***Conventional*** and ***Best Management Practice***, to future ***Aspirational*** cutting-edge practices. Over time, changes in knowledge, technology, costs and market conditions may validate ***Aspirational*** cutting-edge practices such that they eventually become ***Best Management Practices***. If ***Best Management Practices*** are widely adopted and become the new industry standard, they may become ***Conventional*** practices, while ***Conventional*** practices may become dated.

Reef Catchments has produced this framework with the help of Scott Wallace and Luke Hargreaves from Growcom to align with the Hort360 model of sustainable practices in horticulture. Hort360 is a computer based tool, which is designed to give a 360 degree view of farm business operations. It assists growers to identify potential risks, capitalise on business opportunities and highlight unnecessary farm expenses. It's a whole of farm business approach. Visit www.growcom.com.au.

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