

**MACADAMIA NUT RESEARCH STRATEGY ANALYSIS
AUGUST 2019**



CROP PROTECTION PROGRAMME

PHYTOSANITARY / INVASIVE PESTS AND DISEASE		
Polyphagous shot hole borer	Crop susceptibility Management strategy Ecology within production areas	
Mosquito bug	Biology Management strategy Crop susceptibility	
Felted coccid	Control measures Containment strategy	Chemical, non-chemical and biological Critical aspect to prevent spread within industry
<i>Rosellinia necatrix</i>	Control strategy	
NEMATOLOGY		
Entomopathogenic nematodes	Application against pests MNB Citrus thrips	Initial research in place. Combination with fungi and other control strategies
Entomopathogenic fungi	Stinkbugs MNB Coccid	Combine in a program with and without registered chemicals Combine in a program with and without mating disruption and with and without registered chemicals Combine in a program with and without registered chemicals
Plant parasitic nematodes	Survey	
SOIL HEALTH AND ORCHARD ECOLOGY		
Soils	Soil compaction Effect of ridging Soil preparation	How to prevent and how to regenerate: best practices. Correct ridges (built with the right equipment) pH, Ca:Mg and P norms per cultivar and soil type
Cover crops	Increasing production Effects on pest management Effects of green manures and amendments	Measure the effect of soil health and heterogenous species composition of yield Measure the number of beneficials: pests and damage / losses. Soil health indicators - long term study
Soil carbon nitrogen ratio	Effects on soil ecology Effect of compost with wrong ratios Optimal levels	Measure biological integrity of the soil N-defficiencies due to too early / wrong application of compost What should it be for great N-uptake by the plant and sustainable biology?
Mulching	Benefits Organic versus plastic	Water, biological, yield

Evaluation methods	Soil health parameters Soil health recommendations	Earthworms, micro-organisms like springtails, Bacteria and the Nematodes Create a norm that is linked to good yield data across geographic and cultivar ranges
Drainage	Development of recommendations Oxygen levels and optimization	
Compost	Benefits of compost Parameters and recommendations	Need to define quality and quantity
PLANT PATHOLOGY		
Husk rot	Management strategy Effective fungicides	
<i>Phytophthora</i>	Management strategy Root health relative to disease Chemical control	Rootstock susceptibility Registrations lacking
Dry flower	Identification of causative organisms Management strategy Temperature based modelling	
Cankers	<i>Botryosphaeria</i> Tree die back	Identification and when is a tree infected Frequency relative to tree age
<i>Cladosporium</i>	Control strategy	
<i>Pythium</i>	Management strategy	
Macadamia chlorosis disease	How, what, why?	
INTEGRATED PEST MANAGEMENT		
Bees and pollination	Pollination hives Bee safety - insecticides Cross pollination	Hive density, pollination period, crop set. Performance of cross pollinators, optimum density
Stinkbugs	Management strategies Coconut bug Monitoring methods Thresholds relative to damage	
Thrips	Scouting methods Thresholds relative to damage Management strategies	
Pest monitoring methods	Economic thresholds Scouting methods Indirect and direct monitoring methods	Applicable across pests and diseases
Modelling and prediction	Day degree models Climate and pest populations	
Population biology	Population movement Demographics	

Biological control	Pheromones and kairomones Parasitic wasps Viruses Bats and birds as predators	
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PRECISION AGRICULTURE

Remote sensing - drones	NDVI Scouting Mapping orchards	
Tree shakers	Design and cost	No damage to roots and tree stem: sustainable option
Soil maps	Mapping and orchard placement	
Climatic data	Large and small scale	
Precision application	Fertilizers	
Benchmarking	Data collection of production	Comprehensive data base per area
EC monitoring	Fertigation Nutrient management	
FT	Proactive irrigation	
Pruning	Technology	Development of pruning regimes
Crop estimation	Lidar and remote sensing	
Soil moisture probes	Improved water management	
Dehusker	Improved design	
Spray application	Improved spray application methods New technologies	
Irrigation	Low volume irrigation optimization	
Decision support	Scouting apps and literature data and machine learning	

CROP PRODUCTION PROGRAMME

NURSERY TREE PRODUCTION

Discussed but not itemized

Critical aspect: healthy young trees are vital.

YOUNG TREE QUALITY / ORCHARD ESTABLISHMENT

Tree training	Pruning young trees Topping height	
Soil preparation	Ridging Deep ripping Soil surveys Calcium nutrition/fertilization	See soil health above for additional comments

	Phosphates pH Compaction	
Orchard of the future	Planning and design Mechanization Planting density	
Shade netting	Effects on pests Microclimate control	
Optimal planting areas	Optimal soils/cultivar Climate	
Ant and termite control		Ideally non chemical control
Weed management	Mulches	
Disease management	<i>Phytophthora</i>	

CLIMATE AND CLIMATE CHANGE

PLANT BIOLOGY

Cultivar selection	Climate, soil and elevation Pest and disease resistance Sensitivity to climate change Cultivar evaluation in areas Breeding Genetic potential per cultivar	
Plant growth regulators	Reduce drop Increase yield	
VPD	Effects on set and recovery	
Stick tights	Management and control	
Starch reserves	Effects on flowering Alternate bearing	
Flowering and harvest	Estimate harvest time	
Dwarfing rootstocks		
Pollinators	Cross pollination Pollination biology	See above under IPM for additional aspects
Canopy management		

MECHANIZATION

Dehuskers
Harvesters

IRRIGATION AND NUTRITION	
Water requirements	Cultivar specific water requirements Scheduling Irrigation design Irrigation requirements relative to soil types
Nutritional requirements	Cultivar specific requirements How, when and standards Application timing and scheduling
BRIX	Manipulation Correlation with pests and diseases
Irrigation types	Micro versus drip versus dry land production
Application	Application of water research results
Tree age effects	Age effects on irrigation and nutrition
Yellow trees	

POST HARVEST PROGRAMME

QUALITY MANAGEMENT		
Onion ring	Effect of climate on onion ring	Market onion ring and coloured nuts differently
Storage	Storage time and effect on quality	
Human health benefits		
Discolouration		Market onion ring and coloured nuts differently
Analysis of defects	Systematic analysis of defects and causes	Industry data base