



Organic/BD vs Conventional Viticultural Systems : the science

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Similar elements between systems

- Infrastructure
- Processing
- Winemaking, sales and distribution
- Machinery
- Mid-row management
- Irrigation requirements
- Energy inputs / outputs

System differences

- Undervine management
- Pest management
- Disease management
- Nutrient and soil management
- GHG impact

Wagga trial Melanie Weckert, 2010



Permanent swards

- Permanent living ground cover is the best for microbes (pastures have very high activity and biodiversity).
- Root exudates
- Improved soil structure: decreased bulk density
- HWC improved by 73%.

Undervine management

Herbicide	Beneficial insects	Aquatic toxicity	Ground water contaminant	Soil organisms	Other issues
Glyphosate		Yes	Potential	Stimulated fungi and actinomycetes Bacteria reduced	Reduced decomposition of crop residues
Paraquat	1 parasitoid	Yes	Potential		Reduced decomposition of crop residues
Oxyfluorfen	unknown	Yes	Insufficient data		
Glufosinate-ammonium	v.Harmful to 1 mite spp	Yes	Potential		
Isoxaben		Yes	Potential		
Pendimethalin		Yes	Insufficient data		
Pine oil		Yes	Insufficient data		
Cultivation	Dust / mites	Pollution potential		Respiration unchanged	Clemens weeder



Light Brown Apple Moth Control

Insecticide	Aquatic toxicity	Ground water contaminant	Parasitoid	Ladybird
Methoxyfenocide				
Spinosad			Very harmful	
Enamectin	High	Potential	Very harmful	
Indoxacarb			Moderately harmful	Moderately harmful

Disease control – organic David Madge, 2004

- Cultural practices
 - Canopy structure, for air flow and spray contact
 - Water and nutrient suppression – less dense canopies
 - Flag shoot removal
- Fungicides
 - Sulphur, copper
 - Milk, whey, Potassium bicarbonate, 501 silica

Disease control – impact of common fungicides on beneficial organisms

Fungicide	Ladybird	Parasitoid	Predatory Mite	Pollinator	Earthworms
Sulphur		Very harmful			
Copper oxychloride					Very harmful
Azoxystrobin	harmless	Slightly harmful			
chlorothalinalol	harmless	harmless			
Metarim			Very harmful		
Captan		harmful	Very harmful	Very harmful	
Mancozeb	Very harmful		Very harmful		
Spiroxamine	Very harmful	Very harmful			
Tebuconazole		Moderately harmful	Moderately harmful		
Quinoxifen	Very harmful				

Nutrition

- Amount removed / tonne of fruit
 - Nitrogen 1.5 kg
 - Phosphorus 0.3 kg
 - Potassium 3.1 kg
 - Sulphur 0.1 kg
 - Potassium 0.5kg
 - Magnesium 0.1kg

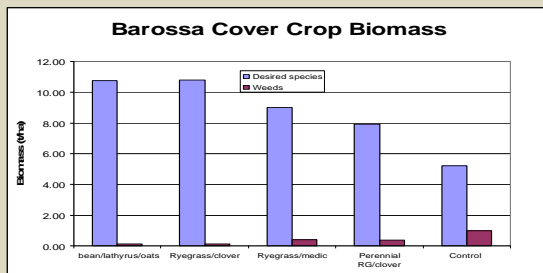
Fertilisers – conventional viticulture

- Conventional – synthetic N applied through the drippers
 - Production of synthetic N has a significant footprint – natural gas, transport
 - Use of synthetic N
 - Leaching
 - Volatilisation
 - Reduced soil pH

Organics and vine nutrition

- Nitrogen
 - produced from legumes
 - applied in compost
 - added via driplines
- Other nutrient sources eg. Fish and seaweed fertilisers
- Nutrient cycling
 - Prunings
 - grape marc
 - cover crops

Barossa Cover Crop Biomass



Ag inputs and & soil organisms

(Bunemann et al, 2006)

- Mineral fertilizers – limited direct effects
 - increased biomass generated can increase soil biological activity
 - Soil acidification
 - P decreased VAM colonisation of roots
- Organic amendments (composts, manures)
 - direct C source for microbes
 - Increased biomass production

- Microbial inoculants
 - Small, transient effects
 - Eg. humic acid (100 L/ha) for 5 years – no impact on microbial biomass or enzyme activity

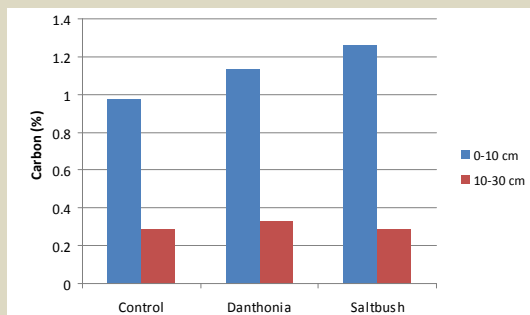
Vineyard Impacts on Atmospheric GHG's

(Carlisle, Smart, Browde, Arnold, PWV, 2009)

Components	CO ₂ X	N ₂ O 300X	CH ₄ 25X	Organic vs Conventional
Carbon Sequestration	--	+/-	+	S
Tillage	+++	+/-	+/-	++
Nitrogen Fertilizer	+	+++	-	--
Biomass				
Vine carbon Storage	--	?	?	S
Vine decomposition	+++	++	+	+
Soil Amendments				
Compost	--	++	+	S
Lime	+/-	+/-	?	S
Cover Cropping	+/-	+/-	+	S
Irrigation Water	+/-	+++	+	S
Fuel Use				
Vehicles	+++	++	+	S
Pumps	+++	++	+	S
Electricity	+++	++	+	S



Total soil carbon, Nuriootpa, 2009



Root length density – Nuriootpa, 2009

