

Achieving Ecological Sustainability in Wool Scouring

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Problems with Scouring Effluents

- Organic load
- Biorefractory nature of wool wax
- Pesticide residues
- Detergent residues
- Potassium levels

Contaminants on Wool

	Amount on wool	COD factor	COD on wool (g/kg)
wool wax	15%	2.97	446
suint	5%	0.83	41
dirt	15%	0.65	98
		total	585

Drivers for Change

- Regulatory
- Market
- Economic

Regulatory Approach

Chinese NEPA

China NEPA Regulations

COD	100 ppm
BOD	25 ppm
Colour	40 dilutions
pH	6 - 9
Suspended Solids	70 ppm

Discharge to Surface Waters

	COD on wool (g/kg)	COD in effluent (ppm)
No treatment	565	56,500
With wax recovery (30%)	431	43,100
Chemical (95%)	60	6,000
Biological (90%)	5	500

Meeting Chinese Regulations

- Dilution
- Mixing with other effluents
 - Dyeing / Finishing
 - Carbonising
 - Shrinkproofing

Effect of Dilution

	10 litres/kg	50 litres/kg
No treatment	56,500	11,300
With wax recovery (30%)	43,100	8,620
Chemical (95%)	6,000	1,200
Biological (90%)	500	100

Market- Driven

EU Eco-label
Organic Wool

EU Ecolabels



- Requirements
- Meeting Requirements

Requirements



- Auxiliary Chemicals
- Biodegradability
- Effluent Discharge

Auxiliary Chemicals



- Prohibited Chemicals
 - Alkylphenoethoxylates (APEO)
 - Linear alkylbenzene sulphonates (LAS)
 - Ethylene diamine tetra acetate (EDTA)
- Verification
 - Declaration of non-use

Biodegradability

- Definition
 - $\geq 95\%$ degraded or eliminated in treatment
- Verification
 - Documentation, MSDS, test reports showing test methods and compliance



Effluent Discharge

- Sewer Discharge
 - COD < 60 g/Kg greasy wool
 - COD reduced by $\geq 75\%$ in off-site treatment
- Surface Waters
 - COD < 5 g/Kg greasy wool
 - pH 6 – 9
 - Temperature < 40°C
- Verification
 - Data & test report using ISO 6060



Sewer Discharge



	COD on wool (g/kg)	COD in effluent (ppm)	
		10l/kg	20//kg
No treatment	565	56,500	28,250
With wax recovery (30%)	431	43,100	21,550
Sirolan CF (87%)	56	5,600	2,800

Surface Waters

	COD on wool (g/kg)	COD in effluent (ppm)
No treatment	565	56,500
With wax recovery (30%)	431	43,100
Chemical (95%)	60	6,000
Biological (90%)	5	500



Organic Wool

- Organic wool production
- Organic wool processing

Organic wool production

Based on

- the harmonious relationship between land, water, plants and livestock
- respect for the physiological and behavioural needs of livestock
- feeding of good quality, organically grown feedstuffs.
- No synthetic pesticides

Organic Wool Processing

- Aromatic solvents prohibited
- Complexing agents and detergents (APEO, EDTA, LAS) prohibited
- Halogenated solvents prohibited
- Heavy metals prohibited
- Chlorination of wool prohibited
- Carding/spinning auxiliaries only paraffin oils and products based on natural products permitted
- Metal-complex dyes, chrome dyes and AOX containing dyes are prohibited

Difference between Ecolabel and Organic

	Ecolabel	Organic
Pesticides on greasy wool	Small amounts allowed	prohibited
Detergents	No APEO, LAS, EDTA	As ecolabel
Top making chemicals		limited
Chlorination	Only on tops	prohibited
Heavy metals	Small amounts allowed	prohibited
Effluent discharge to sewer	60 g COD/kg greasy	No stated
Effluent discharge to surface water	5 g COD/kg greasy	Not stated

Economic Driver

A Rational Approach

Ecological Sustainability

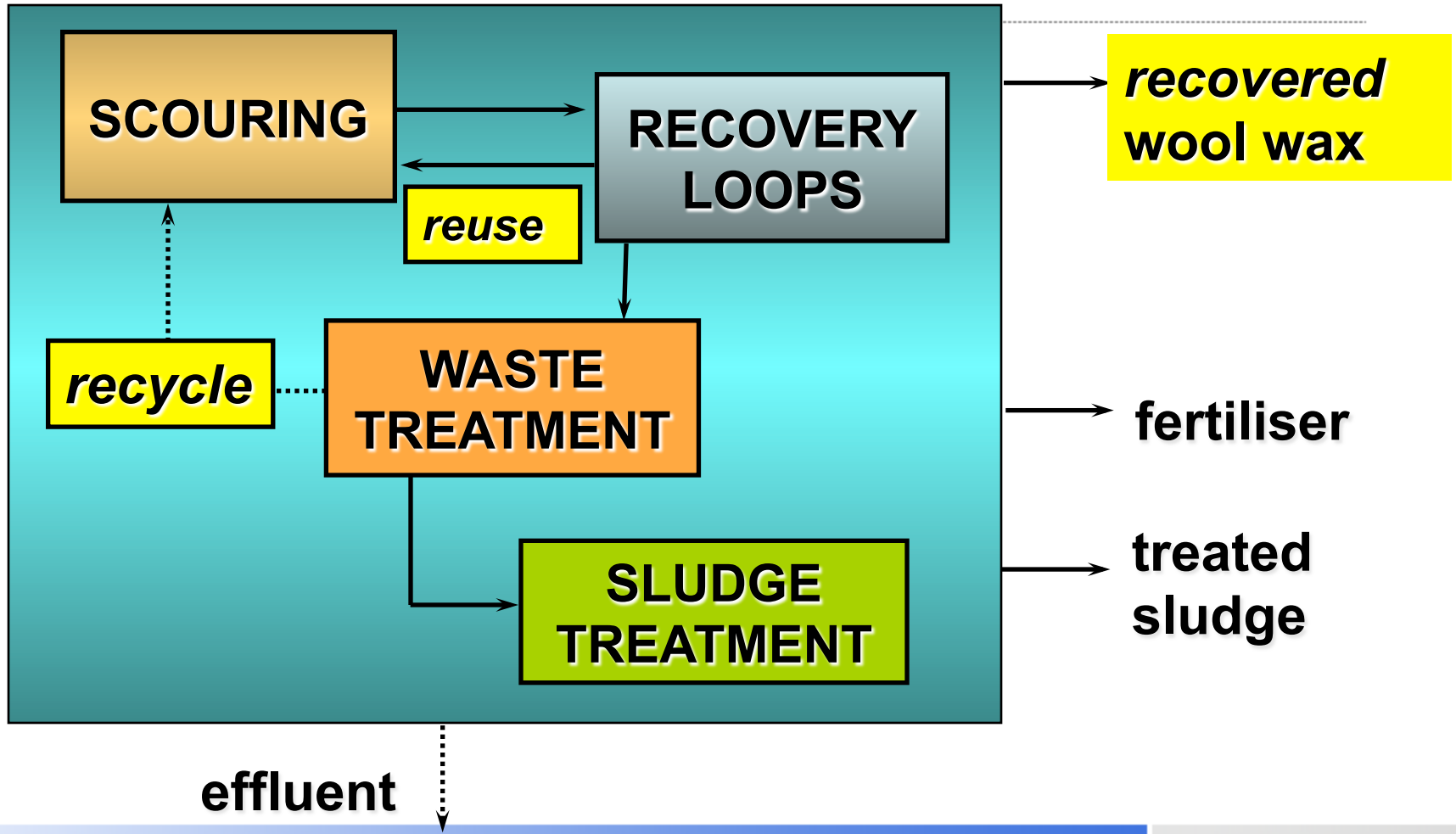
- Waste minimisation
- No waste discharges
- Contaminants used as a resource

Features of a Rational Approach

- Waste minimization
- Separation of waste streams
- Resource rather than a waste
- Integration with scouring process
- Modular
- One sludge

Waste Minimisation

Ecological Sustainability

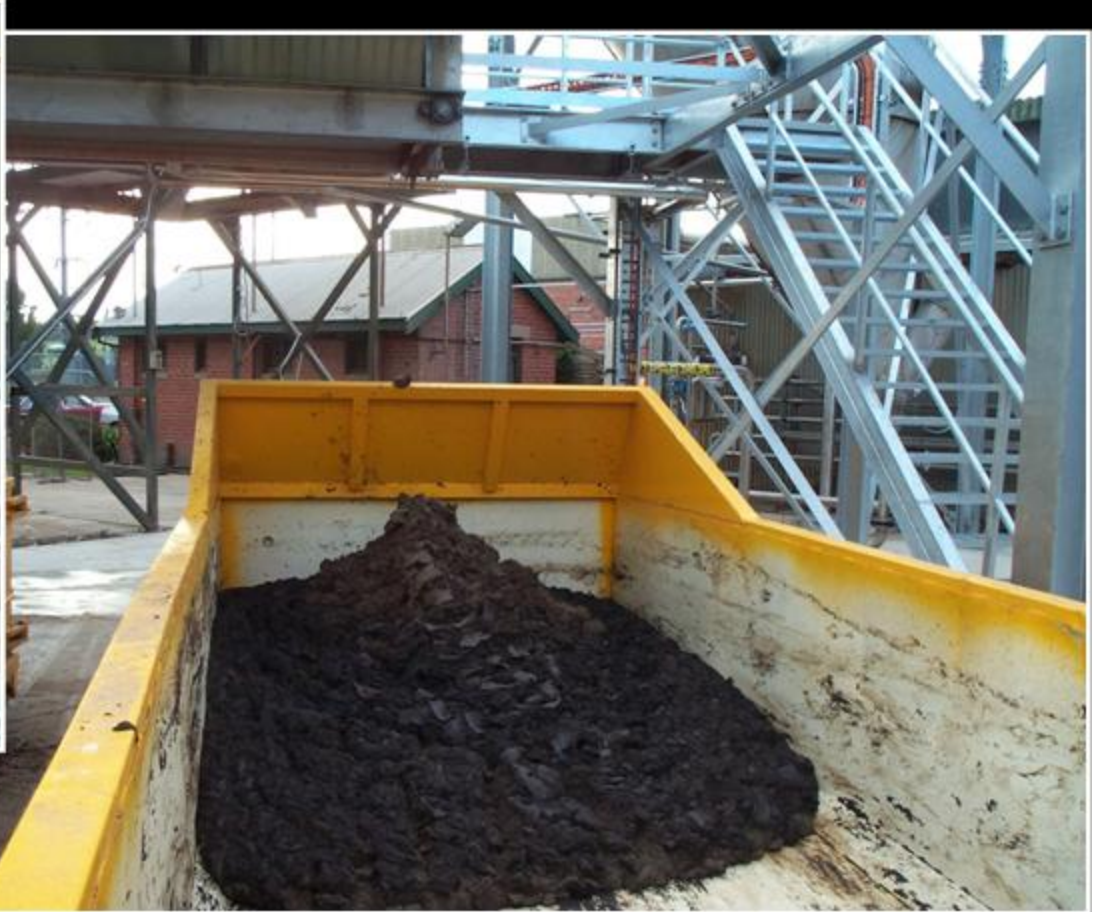


Sirolan CF - The Cornerstone to a Rational Approach

- Simple
- In-line treatment
- No mixing tanks
- Dry sludge

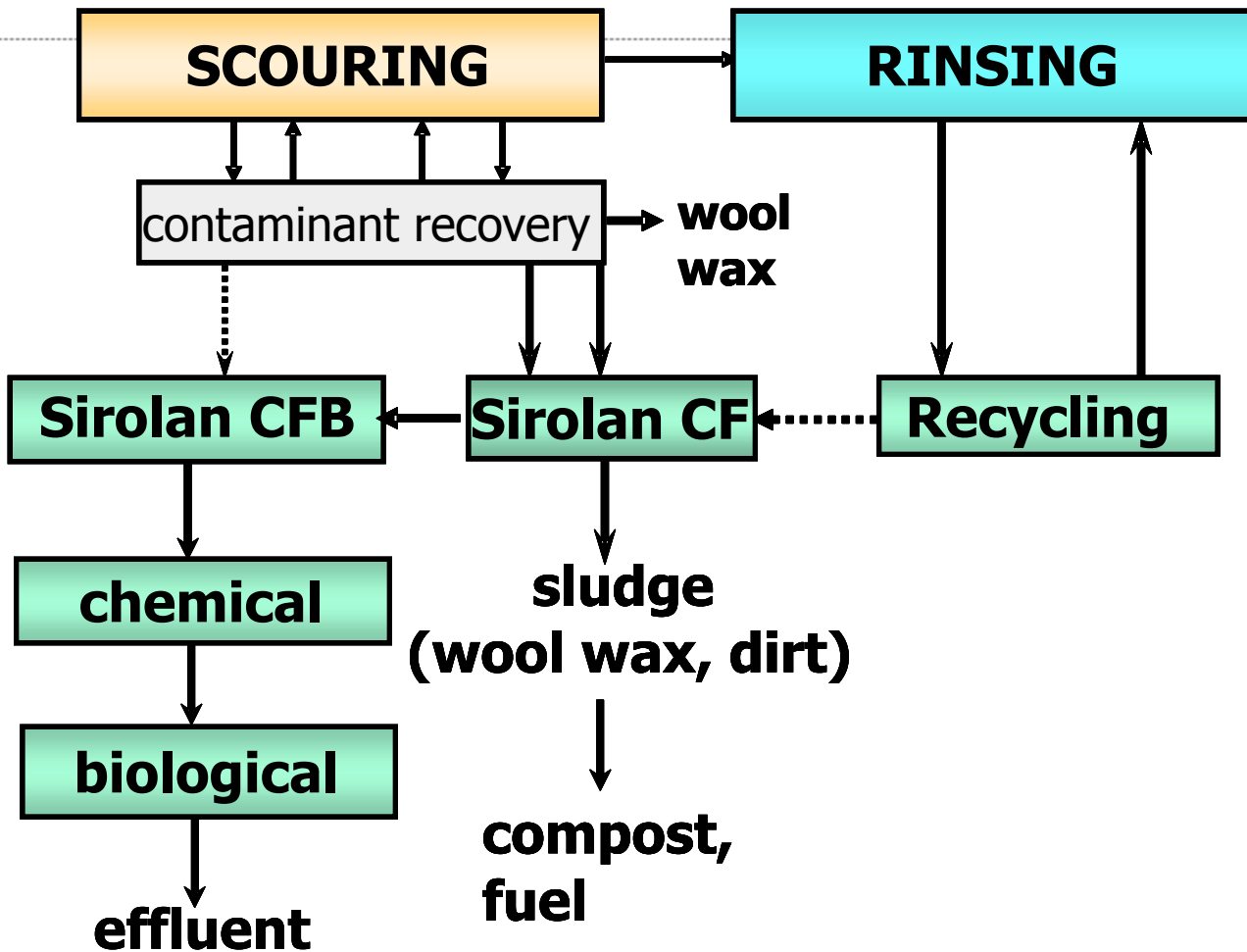
Sirolan CF in Australia

Ecological Sustainability

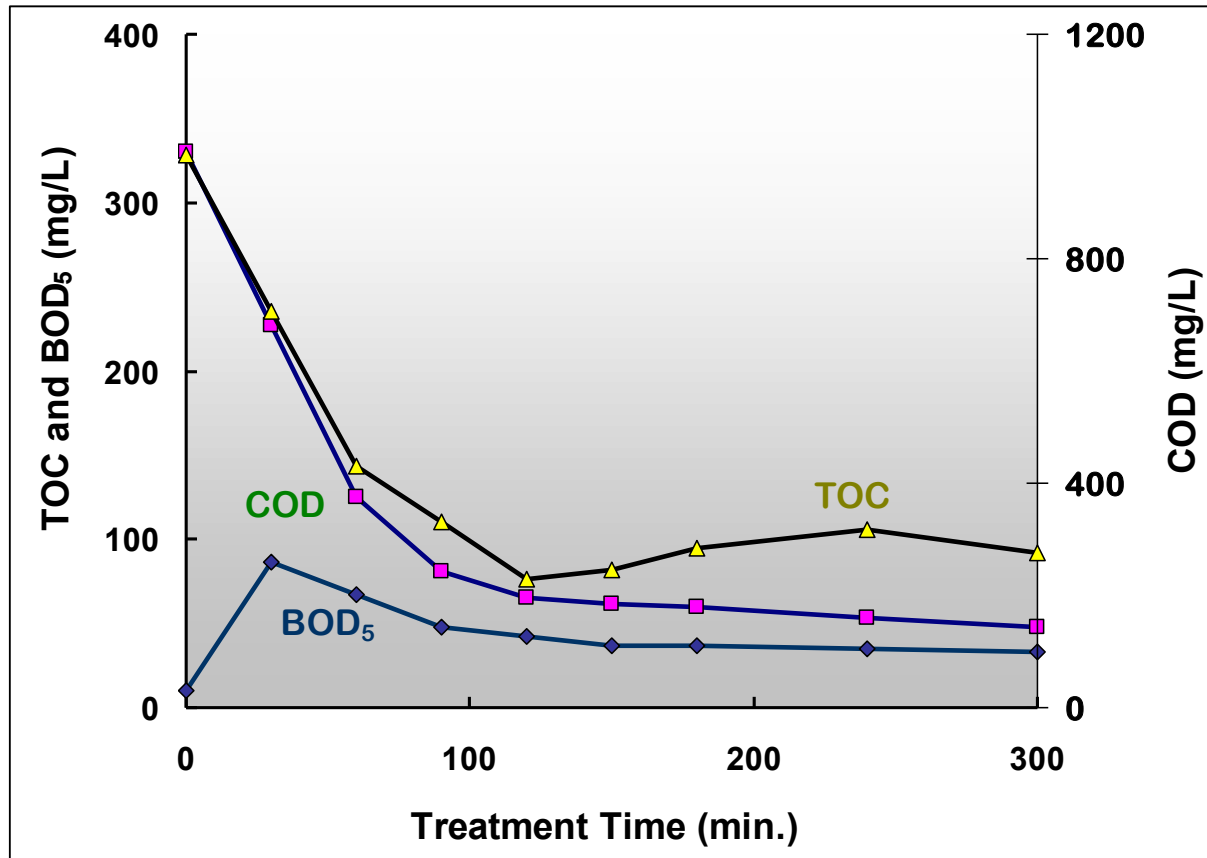


Option 1

Ecological Sustainability

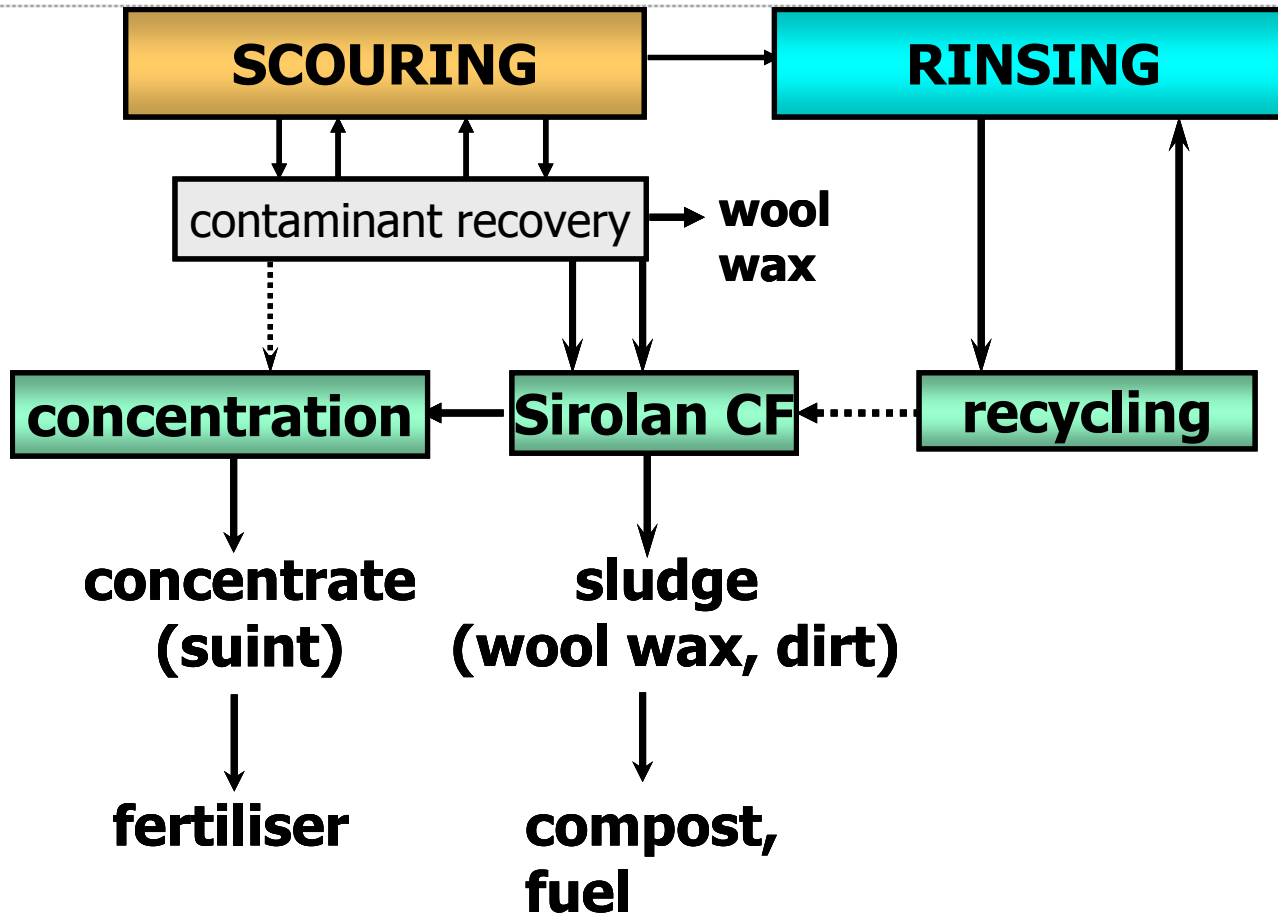


Biorefractory Suint - Effect on COD Removal



Ecological Sustainability

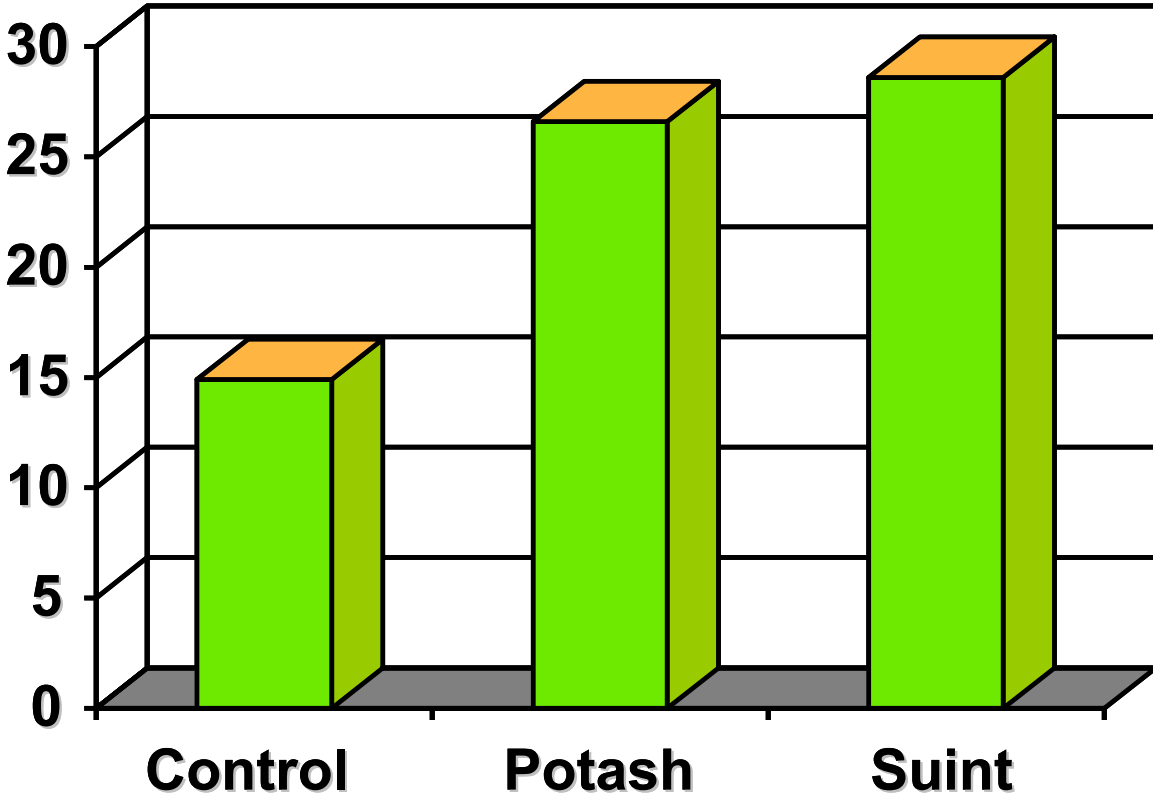
Option 2



Potassium Uptake

Ecological Sustainability

Potassium in Plant Tissue, mg/kg dry



SUMMARY