

COST EFFECTIVE NUTRITION MANAGEMENT FOR PISTACHIO



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NUTRITION – SOME IMPORTANT DRIVERS

- **Yield**
- **Nut quality**
- **Growing fruiting wood for next season**
- **Tree establishment**
- **Early cropping**
- **Sustainability**
- **Biennial bearing**
- **ECONOMICS**

PRINCIPLES – A BRIEF REVIEW

- **Macronutrients and micronutrients**
- **How do plants take up nutrients?**
 - Active roots. Roots need water and air to function.
 - Water is needed for nutrient uptake from soil – IRRIGATION!!
 - Foliar nutrient sprays
- **Supply of nutrient from soil depends on amount and availability**
- **Soil pH**
 - Form of nutrient changes with soil pH

PRINCIPLES – A BRIEF REVIEW

- **Nutrient mobility in soil**
 - Nutrients mobile in soil – N, S, Ca, Mg & B
 - Nutrients with limited mobility in soils – P, Zn, Mn, Fe, Cu
 - Nutrients with variable mobility depending on soil – K
- **Nutrient mobility in plants**
 - Nutrient storage
 - Deficiency symptoms
 - Application method
- **Potential yield determines fertiliser inputs**

NUTRITION MANAGEMENT

- **The 4 R's of nutrition management**
 - Applying the **Right** rate of the **Right** product at the **Right** time in the **Right** place.
- **Determining which nutrients you need to apply**
- **Choosing a fertiliser**
- **Determining when to apply the fertiliser - timing**
- **Deciding on how you wish to apply the fertiliser**

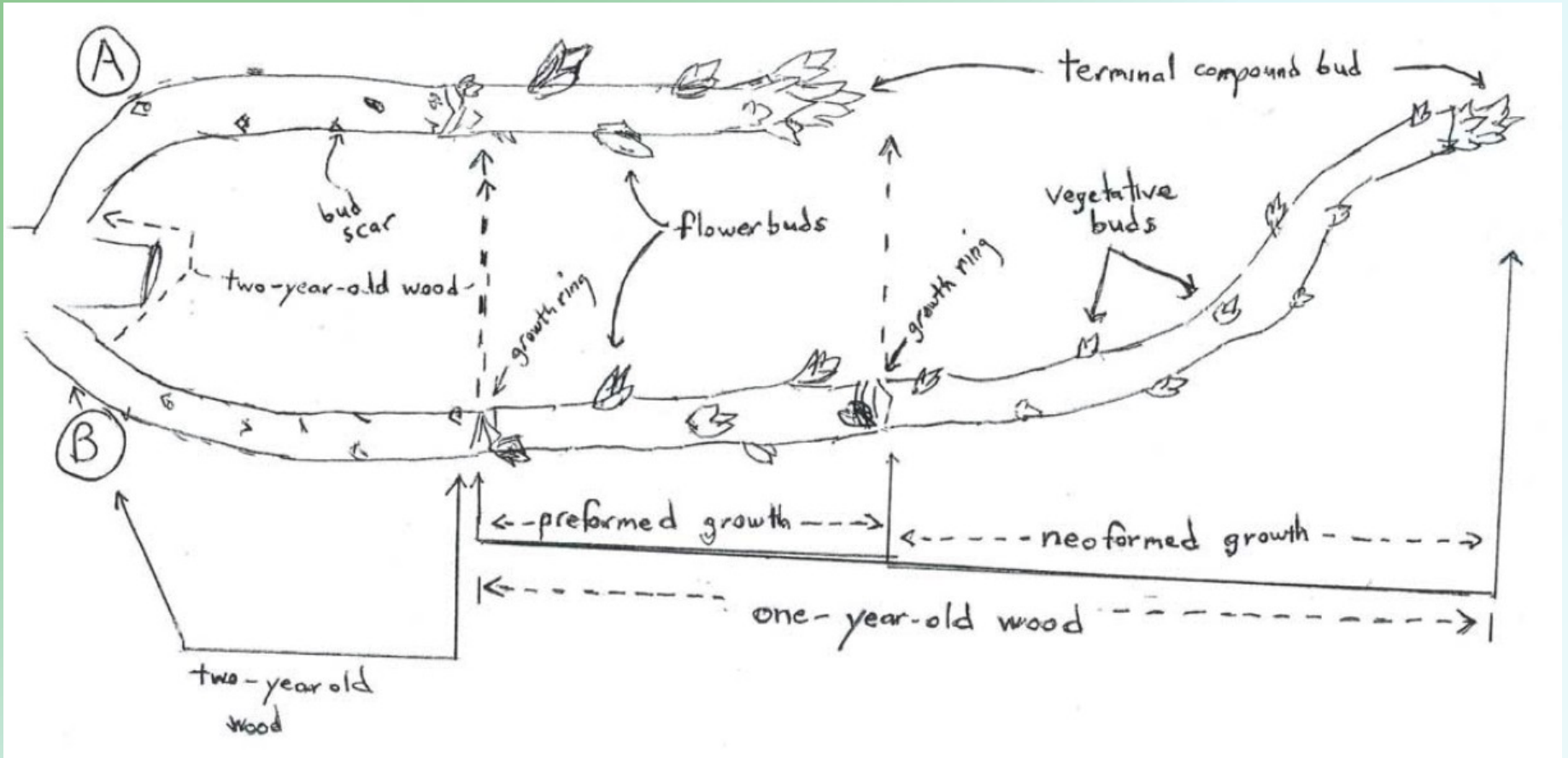
DECISION MAKING TOOLS

- **Visual assessment**
 - Vigour and leaf colour
 - Deficiency or toxicity symptoms
- **Soil analysis**
 - Indicates the amount of nutrient available to a plant in the soil
- **Plant analysis**
 - Measures the actual nutrient status of a tree at a particular point in time
- **Nutrient budgets**
 - Predicting nutrient requirements based on crop estimates

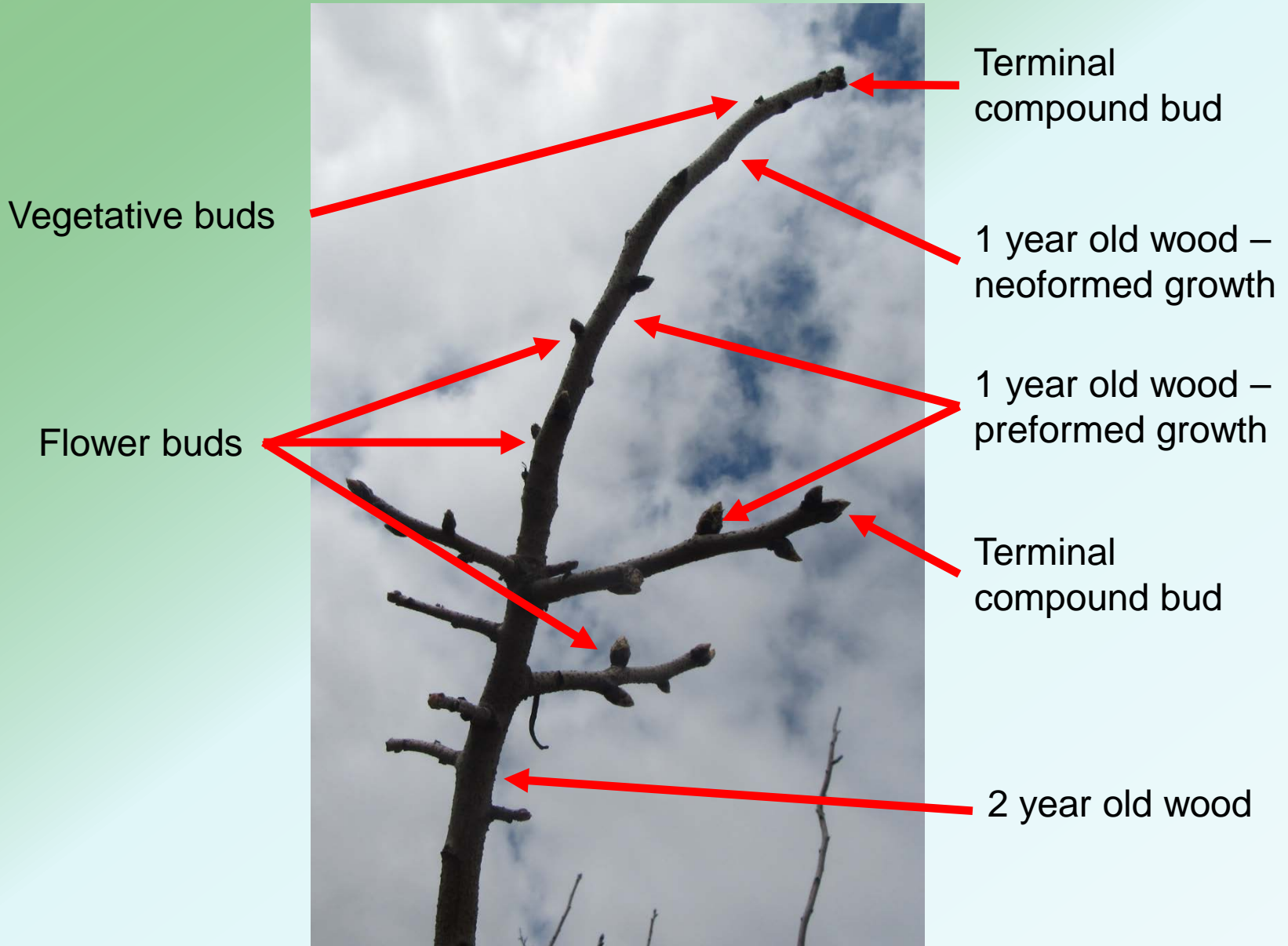
LEAF COLOUR & VIGOUR



PISTACHIO SHOOT DEVELOPMENT



PISTACHIO SHOOT DEVELOPMENT



FERTILISER USE EFFICIENCY

- **Getting the timing right to maximise the effect and fertiliser recovery**
- **Critical growth stages**
 - Late dormant boron foliar nutrient sprays
 - Zinc and copper foliar nutrient sprays
 - Nutrient uptake patterns
- **Soil temperature**
- **Rain events**
- **Fertigation and leaching risks**

NUTRIENT BUDGETS

- **Predicting fertiliser requirements based on target yields, nutrient content of pistachio fruit and nutrient recovery**
- **Need to allow for vegetative growth and efficiency of uptake**
- **Budget adjusted once final crop load is known and according to vigour being achieved. Don't be afraid to adjust the program according to what you are seeing!**
- **Retrospective nutrient budgets – an excellent review tool**

PISTACHIO NUTRIENT UPTAKE PATTERNS

Nutrient	Season	Nutrient uptake (g/tree)		
		Spring flush	Nut fill	Postharvest
Nitrogen	On	243	543	3
	Off	317	403	0
Phosphorus	On	3	54	0
	Off	26	47	0
Potassium	On	0	1014	74
	Off	3	479	0

Adapted from Rosecrance *et al.* 1996 *Tree Physiology* **16**, 949-956

CHOOSING A FERTILISER - SOME CONSIDERATIONS

- **Price - Calculate the cost of actual nutrient in a fertiliser**
 - e.g. 1L of UAN (42%N) costs \$1.40 and provides 420g actual nitrogen. This is equivalent to \$3.33 per kg actual nitrogen.
 - In comparison, 1L calcium nitrate costs \$1.23 and provides 250g actual nitrogen. This is equivalent to \$4.92 per kg actual nitrogen.
 - Multinutrient fertilisers can make this difficult.
- **Single element vs. multi-element fertilisers**
- **Liquid, soluble solid, solid fertilisers**
- **Mobility, risk of leaching or loss to atmosphere**
- **Soil acidification**

CHOOSING A FERTILISER - SOME CONSIDERATIONS

- **Forms of fertiliser using potassium as an example**
 - *Potassium chloride* – often cheap but avoid if possible due to chloride concerns.
 - *Potassium nitrate* – more expensive but provides some nitrogen
 - *Potassium sulfate* – less soluble than other forms
 - *Potassium carbonate* – less common but starting to be used due to high potassium content and cost
 - *Potassium thiosulfate* – uncommon.
- **In some circumstances, a more expensive form of fertiliser should be used**
 - EDDHA-chelated iron in calcareous soils

FERTILISER APPLICATION METHODS

- **Fertigation**
 - Targeted application to roots
 - Nutrients rapidly available
- **Foliar nutrient sprays**
 - Targeted and timing specific application
- **Banded or broadcast**
 - Does not require irrigation
 - Aiming to boost soil reserves
 - Requires rain to wash into soil

PUTTING IT ALL TOGETHER

- **Develop nitrogen, phosphorus and potassium fertiliser budgets based on target yields and nutrient uptake patterns**
- **Use visual assessments of vigour and crop load during the season and adjust fertiliser budgets accordingly**
- **Apply boron and zinc (and copper if required) foliar nutrient sprays at appropriate times**
- **Compare and choose fertilisers based on nutrient content, cost, form and method of application**
- **Use regular soil analysis to check soil nutrient reserves, pH, sodicity and salinity. Use leaf analysis in January to monitor the actual nutrient status of the trees**
- **Using actual yields, review the fertiliser program with retrospective nutrient budgets**