

## Nutrition

Australian soils are not fertile enough to meet the needs of highly productive orchards. Additional nutrients are needed prior to planting and then on an annual basis. This maintains optimum tree growth for an orchard to produce consistent, high quality fruit. It is important that fertiliser applications or recommendations for an intensive pear orchard are based upon knowledge of local soil and tree nutrient conditions.

### Essential mineral elements

There are a number of essential mineral elements required for pear growth. Availability of these to the roots depends upon factors such as climate, rootstock type, soil type, total nutrients in the soil, soil moisture, soil oxygen content, humus content and soil pH (see Table 1).

Element	Ideal pH availability range
Nitrogen	5.8-8.0
Phosphorus	6.5-7.5
Potassium	6.0-7.5
Calcium	7.0-8.5
Magnesium	7.0-8.5
Zinc	5.0-7.0
Boron	5.0-7.0
Copper	5.0-7.0
Iron	4.0-6.0
Sulfur	6.0-10.0
Manganese	5.0-6.5

*Table 1 : pH availability range for mineral elements*

### Determining nutrient needs

In order to properly assess nutrient requirements growers should undertake soil and leaf analysis. Soil analysis is most useful prior to planting as the adjustment of soil pH, phosphorus and potash content is more easily done before blocks are established. It is important to plan any soil testing thoroughly as soils may not be uniform across a block, therefore a cross-section of samples is recommended.

Ideally should have a link to a reference on how to soil sample here.

Once trees are established leaf analysis is the most useful guide to understanding nutritional requirements. Leaf analysis can help with the diagnosis of deficiencies and provide a guide to fertiliser program development. Leaf analysis over a number of seasons can also help to develop a useful management record.

Ideally should have a link to a reference on how to sample leaves for nutrient testing.

## Choosing a fertiliser

Nutrient status can be improved through the use of both organic and inorganic fertilisers.

### Organic fertilisers

Most nutrients in solid organic fertilisers are not available immediately to the plant. Nutrient availability depends on degradation by soil micro-organisms under favourable conditions.

However, organic materials are important for maintaining soil structure and organic matter content of the soil over the long term. Two ways in which levels of organic matter can be improved in orchards are through surface mulching, and establishment of a cover crop. Cover crops are grown along the tree line in winter and then sprayed off with herbicide in spring.

### Inorganic fertilisers

There are numerous inorganic fertilisers available to growers. The choice of fertiliser for any situation should take into account: soil or leaf analysis results, soil pH, proposed method of application, potential of fertiliser to alter soil pH, cost per unit of nutrient and mobility of fertiliser.

## Further Information

The following sites may be useful for growers. However they are intended as a general information source only. Any specific chemical or other control recommendations may be outdated or irrelevant for Australian conditions and growers should seek local advice.

## Australian Resources

A range of useful articles on nutrition for Australian growers can be found in *Tree Fruit* magazine:

<http://www.treefruit.com.au/index.php>

Nutrition NSW DPI Primefact 95: Apple and pear nutrition:

<http://ucanr.org/sites/nm/files/76700.pdf>

Boron deficiency: <http://www.dpi.nsw.gov.au/agriculture/horticulture/pomes/boron>

Fertigation:

<http://www.dpi.nsw.gov.au/agriculture/resources/water/irrigation/systems/general/fertigation>

Efficient fertilizer application: Victorian Department of Primary Industries Agnote AGO 240:  
<http://www.depi.vic.gov.au/agriculture-and-food/horticulture/fruit-and-nuts/orchard-management/efficient-fertiliser-application-in-orchards>

### **Determining nutrient needs**

Orchard nutrition 2: Soil and leaf analysis : Victorian Department of Environment & Primary Industries: <http://www.depi.vic.gov.au/agriculture-and-food/horticulture/fruit-and-nuts/orchard-management/orchard-nutrition-2-soil-and-leaf-analysis>

Apple and Pear Nutrition: NSW Department of Primary Industries fact sheet.  
<http://www.dpi.nsw.gov.au/agriculture/horticulture/pomes/apple-pear-nutrition>

### **References (Note full access may incur a fee)**

Neilsen, G.H., Neilsen D. and Peryea, F. (1999) Response of Soil and Irrigated Fruit Trees to Fertigation or Broadcast Application of Nitrogen, Phosphorus, and Potassium. HortTechnology 9(3): 393-401.

Quartieri, M., Millard, P. and Tagliavini, M. (2002) Storage and Remobilisation of Nitrogen by Pear (*Pyrus communis* L.) Trees as Affected by Timing of N Supply. European Journal of Agronomy 17: 105–110.

Stassen, P.J.C. and North, M.S. (2005) Nutrient Distribution and Requirement of 'Forelle' Pear Trees on Two Rootstocks. Acta Horticulturae 671: 493 – 500.

Yin, X., Seavert, C., and Bai, J. (2008). Split N and P fertigation beneficial for pear production. Fluid Journal 16(2).