

Soil Fertility Guide



PF-1

NUTRIENT MANAGEMENT PLANNING FOR PERENNIAL FRUIT CROPS: AN OVERVIEW

Introduction

Nutrient management for perennial fruit crops involves assessing a number of factors including soil nutrient levels, tissue nutrient levels, and life cycle stage.

Nutrient recommendations for perennial fruit crops are dependent upon the life cycle stage. The three stages are:

- **Pre-plant** - Recommendations are based on soil test results.
- **Non-bearing** - Nutrient applications are typically limited to nitrogen as the other nutrient levels have been addressed prior to establishing new trees or bushes.
- **Bearing years** - Tissue analyses are the primary source of information and are used in conjunction with soil test results.

Figure 1 on page 2 shows an example of a complete life cycle (including the three stages) for peach and apple trees. Note: The life cycles of both trees are similar, except that peach trees are earlier to come into production and earlier to decline.

Each life cycle stage will be discussed in detail to establish a base on which a nutrient management plan is constructed.

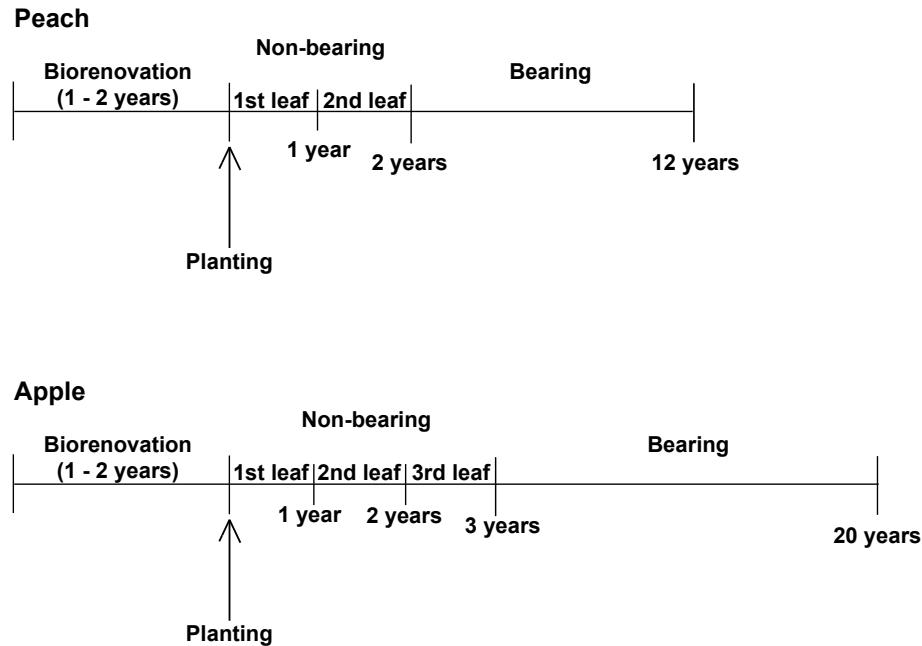


Figure 1. Typical life cycles for peach and apple trees

Pre-plant

The **pre-plant** stage involves a two-year soil preparation process prior to establishing fruit crops. This two-year time period, known as biorenovation, involves planting two crops such as a sorghum-sudangrass hybrid and rapeseed in succession. These crops are deep rooted and help abate soil compaction and improve the organic matter levels in the soil. In addition, rapeseed produces chemicals that are toxic to plant-parasitic nematodes commonly found in old orchard sites and pasture fields being considered for conversion to orchards.

Soil test results should be consulted when developing phosphorus, potassium and lime recommendations for the crops planted during the biorenovation period. Nitrogen recommendations are determined based on the crop to be planted and its expected yield. (See SFM-1 “Agronomic Crop Nutrient Recommendations Based on Soil Tests and Yield Goals” for more information on nutrient recommendations for crops grown during biorenovation.)

Soil samples should be taken again prior to establishing fruit crops to ensure adequate soil fertility and to allow for final adjustments.

Non-bearing

The **non-bearing** stage is the time period that includes the establishment year and the years before a plant begins to bear fruit.

No soil or plant tissue samples are collected during this time period. Ideally, pH and soil nutrient levels for phosphorus and potassium were addressed during the pre-plant stage of production, thus eliminating the need for additions at the time of planting. The fruit crops however will require some nitrogen during the non-bearing stage.

Hand placement or banding in the herbicide strip are the most effective means for fertilizing non-bearing fruit crops. Consult Table 1 for information regarding nitrogen recommendations for non-bearing plantings of perennial fruit crops.

Table 1. Nitrogen fertilizer recommendations for young, non-bearing plantings of perennial fruit crops (hand-placed nitrogen fertilizer per plant per year)

	Calcium Nitrate (15.5% N)	Ammonium Nitrate (33% N)	Ammonium Sulfate (21% N)
Tree Fruit			
Apple	8 oz	4 oz	-
Peach and nectarine	12 oz	6 oz	-
Pear			
Fireblight Resistant	8 oz	4 oz	-
Fireblight Susceptible	4 oz	2 oz	-
Cherry, apricot and plum	8 oz	4 oz	-
Small Fruit			
Blackberry	10 oz	5 oz	-
Blueberry	-	-	2.25 oz
Raspberry	3 oz	1.5 oz	-

Bearing

Nutrient recommendations for the **bearing** stage of production are based on a combination of plant tissue analyses and soil test results. The plant tissue analysis is given primary consideration; however, if a plant tissue analysis shows a deficiency, soil tests should be consulted to confirm a fertility issue or to explore the possibility of a disease or nematode problem. Additionally, when finalizing nutrient recommendations it is important to consider factors such as observations of plant growth, leaf color, and pruning severity.

For information on proper tissue sampling procedures, refer to PF-2, “Tissue and Soil Sampling for Perennial Fruit Crops,” in the *Soil Fertility Guide* series.

Interpreting Tissue Analyses

Proper interpretation of a tissue analysis is key to providing an accurate nutrient recommendation. Tissue analysis procedures are consistent among laboratories and reporting units are the same. Results are reported in percent dry weight for the elemental forms of macronutrients and in parts per million (ppm) for micronutrients.

It is important to pay attention to the nutrient concentration reported (in either % or ppm) rather than the nutrient status category assigned by the laboratory. Maryland recognizes four nutrient status categories, while other states and/or laboratories may have more (or fewer) categories. In addition, laboratories may use different category names and the nutrient ranges associated with each category may differ between labs.

The four nutrient status categories recognized by Maryland are:

- deficient
- low
- normal
- high

The nutrient ranges associated with each category vary among species and in some cases (e.g., apples and peaches) vary among cultivars. Table 2 lists the category names and some nutrient ranges for fresh market apples.

Table 2. Nutrient ranges for macronutrients for fresh market apples (Delicious, Fuji, and Braeburn)

Category	Nutrient Range (% dry weight)		
	Nitrogen	Phosphorus	Potassium
Deficient	< 1.6	< 0.11	< 0.70
Low	1.6 – 2.2	0.11 – 0.15	0.70 – 1.2
Normal	2.2 – 2.25	0.15 – 0.31	1.2 – 2.01
High	> 2.25	> 0.31	> 2.01

Making Recommendations

In Maryland, Nutrient Management-5 (NM-5), “Nutrient Management for Tree Fruits and Small Fruits,” is the document in which nutrient recommendations for major fruit crops are published. Care must be taken when assigning nutrient recommendations for perennial fruit crops.

- **Always** compare the nutrient concentration (% or ppm) reported by the testing laboratory to the nutrient ranges listed in NM-5. Follow the recommendations for that range.
- **Never** make recommendations based on nutrient categories reported by the testing laboratory. Nutrient recommendations will vary from state to state based on climate and soil types.

Summary

When making nutrient recommendations for perennial fruit crops, it is important to first consider the life cycle stage. Next, consider whether soil analysis or plant tissue analysis will be used.

The type of analysis needed will vary throughout the life of the planting. Soil tests are important during the biorenovation and pre-plant stages; however, they play a less dominant role during the bearing years. Plant tissue analyses are of primary importance during the bearing years.

Table 3 summarizes the various life cycle stages and type of analysis that should take place at each stage.

Table 3. Soil and tissue testing summary for each life cycle stage

Stage of Planting	Soil Analysis	Plant Tissue Analysis
Biorenovation	Yes	No
Pre-plant	Yes	No
Non-bearing	No	No
Bearing	Yes	Yes

Reference

Walsh, C. and P. Steinhilber. 2005. *Nutrient Management for Tree Fruits and Small Fruits*. NM-5. University of Maryland Department of Natural Resource Sciences and Landscape Architecture, College Park, MD, 20742. www.anmp.umd.edu.

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