

ground for the discussion of forest management operations.

There are two common times in forest stand development for fertilization in the South: in young stands (up to 5 to 8 years old), and in mid- to late-rotation stands. Forest fertilization recommendations will be discussed within the framework of these opportunities.

### Fertilization of Young Plantations

Fertilization during the first five years of the rotation must produce an economic response 18 to 30 years later when the wood is harvested. CRIFF research has focused on several questions in determining the conditions where yield responses to fertilization are likely. These questions are addressed below and the recommendations are summarized in Table 2.

#### 1. What sites should be fertilized?

The best way to identify potential long-term response sites on the Coastal Plain is to use CRIFF soil groups and soil fertility analyses. Knowledge of one or the other is less helpful than both. Pines on soils of Groups A and B have responded to P fertilization in almost all cases tested, and P fertilization at planting is generally recommended. An exception is made when subsoil pH is near neutral or higher. Under those conditions, the potential for long-term response is questionable, and P fertilization at planting is not recommended without further knowledge of soil P status from soil analyses.

Trees on soil Groups D, E, F, and G have responded to P fertilization so infrequently that no P is recommended on those soils at present.

On Group C soils, slash pines have responded to P fertilization at individual sites, but the soil group alone has not been sufficient to predict respon-

siveness. In these cases, soil fertility testing provides information useful in identifying potentially responsive sites. The soil must be sampled at three depths -- 0 to 20, 20 to 40, and 40 to 60 cm -- to provide the needed information. If Mehlich-1 extractable P is less than 6 to 8 ppm in the surface 20 cm of soil and less than 2 ppm in both the 20 to 40 and the 40 to 60 cm layers, the plantation should respond to P fertilization. The IFAS Extension Soil Testing Laboratory provides the necessary soil test. Information and forms are available through county Extension offices.

Slash pines are unlikely to respond to P fertilization on any soils which have been planted to row crops in the past. Residual P is usually sufficient for pines so P fertilization is not needed.

Results of long-term experiments are presented graphically in Figure 1. The figure shows that pine response to phosphorus is well related to the CRIFF soil groups.

#### 2. Which nutrients give responses?

Phosphorus provides the growth response most often recorded in recently planted pines. In very P-deficient areas, P fertilization is essential in order to obtain a commercial stand. When nitrogen (N) and P are used together, N sometimes produces an additional growth response. In newly planted stands, N and P together are not recommended because the N may stimulate competing vegetation growth to the detriment of the pine. After age one, N and P in combination occasionally show good growth response, but we currently cannot identify accurately those sites where such responses may occur. Nitrogen alone is not usually beneficial in young slash pine plantations.

Responses to other elements have been recorded across a range of Coastal Plain soils, but those

**Table 2. Summary of recommendations for fertilizing young pine plantations (< 5 to 8 years old).**

Topic	Recommendation
Sites to fertilize	1. CRIFF soil groups A and B, except sites where subsoil pH is near neutral or higher. 2. CRIFF soil group C only where top 20 cm of soil tests less than 6 to 8 ppm Mehlich-1 P and both subsurface layers (20 to 40 and 40 to 60 cm) test less than 2 ppm Mehlich-1 P. 3. Do not fertilize CRIFF soil groups, D, E, F, or G.
Nutrients to apply	P alone, or P plus N.
Amounts of nutrients	60 kg P/ha; or 60 kg P/ha plus 45 to 55 kg N/ha; (120 lb P <sub>2</sub> O <sub>5</sub> /acre; or 120 lb P <sub>2</sub> O <sub>5</sub> plus 50 lb N/acre).
Sources of nutrients	Any sources acceptable. Base choice on cost of fertilizer plus application.
Fertilizer placement	Broadcast, band, or spot.