

Fertilizer Materials, Costs & Application Techniques

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Topics

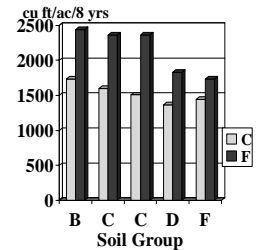
- Fertilizer effects
- Rates & prescriptions
- Methods & timing
- Combination with other treatments
- Pine straw considerations
- Economics of fertilizing
- Environmental effects

Growth Benefits Summary

- P at planting (A & B soils)
 - 8 to 40 cds/acre additional volume
- N + P mid-rotation
 - minimum 2 to 5 cds/acre
 - average: 0.5 - 1.0 cd/ac/yr
 - more wood in higher value product sizes
 - 80% of loblolly plantations will respond

Benefits from Fertilizing *Slash pine, mid-rotation*

- *Jokela & Stearns-Smith, 1993 SJAF*
 - 200 lb N + 50 lb P applied after canopy closure (14-17 yrs age)
 - measured after 8 years
 - Average response =
 - 77 cu ft/ac/yr
 - 3 - 9 cds/ac
 - 40% more growth



Other Effects of Fertilization

- Wood quality
 - Specific gravity not generally affected (UGA)
 - Fewer rings per inch
 - Larger juvenile wood core (with early N+P)
- Pest incidence
 - Associated with increases in pitch canker & fusiform rust

Fertilizers

	%P/N	Lbs fert for 100 lb P/N	\$/ton (2006)	\$/lb P/N
<i>Phosphorus</i>				
TSP	20	500	\$325	\$0.81
RP	15	667		
DAP	20	500	320	0.80
<i>Nitrogen</i>				
DAP	18	555	320	0.89
Urea	46	217	345	0.38
NH4-NO3	33	300	315	0.48

* Prices from Northern Plains Annual Fertilizer Prices

Prescriptions & Rates *Time of Planting - P alone*

- Loblolly and slash pine on A and B soils
- 40-50 lb/ac P (TSP, DAP or GRP)
- During site preparation or after planting: timing not critical
- Broadcast, strips along beds, side dressing
- Other soils: more benefit from weed control

Prescriptions & Rates *Time of Planting - N + P*

- Species and soil groups:
 - Loblolly and slash pine on A and B soils
 - Loblolly pine on C to F soils
 - Not recommended on old field sites
- 25-50 lb P + 40-50 lb N (usually as DAP)
- Combine with herbaceous weed control
 - Can delay fert on C to F soils 2-3 years if preceded by weed control

N + P at Planting *Cautions*

- Small nutrient demand/uptake by seedlings
- Competing vegetation utilizes most resources
- Nutrient supply usually sufficient from decomposition after harvesting
- Long carrying period for fertilizer costs and waiting period for capturing gains

Prescriptions & Rates *Mid-rotation (crown closure)*

- Loblolly and slash pine on A to F soils
- After crown closure - nutrient demand peaks
- 150-200 lb/ac N + 25-50 lb/ac P
- Rates can be split over 2 to 4 years
 - 250 lb DAP (45 lb N + 50 lb P) one year
 - 300 lb urea (138 lb N) 2-4 years later
- Response persists 6-8 years

Prescriptions & Rates *Mid-rotation - 2*

- Stand criteria for good response
 - Uniformly stocked, 60-90 sq ft/ac basal area
 - Less than 10-15% b.a. in hardwoods
 - Live crown length at least 40% of height
 - Less than 30% stems with rust cankers
 - Low risk for pitch canker or root rot

Prescriptions & Rates *Mid-rotation - 3*

- Other considerations
 - Apply 5-8 years before thin or final harvest
 - Thin dense stands before applying N
 - Avoid prescribed burning 6 months before or after treatment
 - Apply N in winter or early spring
 - period of active root uptake
 - minimizes potential losses
 - Repeat treatments to maintain growth response

Application Methods

- Ground equipment
 - Require 10' spacing between rows or row thin
 - \$25 - 35/acre
- Aerial (mostly helicopter)
 - Require open and accessible staging area
 - Should have GPS navigation
 - \$30 - 40/acre
- Application methods are equally effective

Pine Straw Considerations

- Nutrient losses
 - Single raking removes 20-30 lb/ac N, 1-3 lb P
 - Potential soil organic matter reduced
- Fertilization benefits
 - Extra straw production (UGA: 40-50%)
 - Nutrient replacement
 - Maintain wood growth rates

Pine Straw Considerations *Recommended prescriptions*

- Annual raking (starting at age 8 to 10 yrs)
 - Age 6: 200 lb N, 50 lb P, 80 lb K
 - Every 5 years: 200 lb N
- Periodic raking (2 or 3 times)
 - Age 8 to 12: 150-200 lb N, 50 lb P
 - E and F soils: supplement with 50 lb/ac K

Economics of Fertilization *2007 costs*

- Per acre costs
 - Planting time
 - 50 lb/ac P: \$60 fert + \$30 applic = \$90/ac
 - 25 lb P + 50 lb N: \$38 fert + \$30 applic = \$68/ac
 - Mid rotation
 - 25 lb P + 200 lb N: \$114 fert + \$35 app = \$150/ac
- ROIs still in range of 5-10% for CNS

Environmental Issues -1

- Nutrient losses
 - Phosphorus
 - Immobilized in most soils, staying on site
 - May leach on acid sandy soils low in aluminum and iron
 - May need second application in next rotation
 - Nitrogen
 - Up to 50% may volatilize or leach if wrong timing
 - Leaching may be to ground or surface waters
 - Losses greater with nitrates than with ammonium or urea

Environmental Issues -2

- Water Quality
 - Stream nutrient concentrations may increase if:
 - Direct application to water surfaces
 - Surface runoff with heavy rain right after application
 - Otherwise, water quality has not been noticeably affected