



Reducing Orchard Fertilizer Costs

Lenny Wells
UGA Horticulture





Are we using too much N?

- Yield and leaf N of Mature 'Stuart' trees in good condition did not respond to N at rates of 0-120 lbs/A until 6 years later (Worley 1974).



Nutrient Cycling in The Orchard

- Leaves= 66-130 lbs/tree (Smith and Wood 2006)
 - $2.6\% \text{ N} \times 100 \text{ lbs leaves} = 2.6 \text{ lbs N / tree}$
 - $2.6 \times 12 = 31.2 \text{ lbs N/acre}$
 - Acuna-Maldonado et al. 2003:
 - 2.5 lbs organically bound N/tree (November)
- Shucks
 - $0.18 \text{ lbs N/tree} \times 12 = 2.16 \text{ lbs N per acre}$
(Acuna-Maldonado et al. 2003)
- Approximately 33 lbs N goes back into orchard soil each year



More Efficient Nutrient Management

- Build and Maintain High Organic Matter Levels
- Test Soil ANNUALLY
- Balance Nutrient inflows and outflows
- Minimize compaction
- USE LEGUMES and credit the N
- Get away from broadcasting fertilizer (unless K, P, or Zn is low)
- Better Placement and Timing
- Split Applications



Timing

- Ammonium Nitrate: contains both nitrate N, which is immediately available, and ammonium N, which is retained in the soil and becomes available more slowly. If applied in the fall or winter, a large portion of the nitrate N may be lost by leaching before the soil warms and roots become active in the spring.



Why is Organic Matter Important?

- Higher inputs required with lower organic matter
- Increased Water-Holding Capacity
- Nitrate provided to plants via mineralization as soil organisms decompose organic matter
- Neg. charged humus holds K, Ca, Mg, preventing loss
- Provides natural chelates that keep Zn and Cu in forms plants can use
- Reduced compaction, better water-holding capacity, reduced erosion
- Slows down (Buffers) changes in pH
- For every 1% increase in organic matter , 10 lbs N released
- Crop yield increased 12% for every 1% increase in organic matter (Michigan)



Fertilizer Costs

- Ammonium Nitrate (33% N)
 - 2007/08 = \$457/ton
 - » (\$103.86/Acre based on 150 lbs N/A)
- Phosphorous (44% P₂O₅)
 - » \$12.80/Acre (40 lbs/A)
- Potash (51% K)
 - 2007/08 = 475/ton (51% K)
 - » (\$28.50/acre based on 60 lbs K/acre)
- Zinc \$17.50/Acre (50 lbs/Acre)
- Total: \$162.66/Acre



Making Adjustments to Fertilizer Application Rates

- Base Rate on Crop Load and Leaf /Soil test Recommendations
 - Credits:
 - Legumes
 - Manure
 - Grass (40 lbs/acre?)
 - Leaf and Shuck Residue
 - Organic Matter



N Credit for Legumes

- General N Recommendation for Pecans
 - 10 Lbs N/ 100 lbs expected crop
- Crimson Clover
 - Year 1 = Replaces 30 lbs N/Acre
 - On Year = 150 lbs N - 30 lbs N = 120 lbs N/Acre
 - Off YEAR = 75 lbs - 30 lbs = 45 lbs N/Acre
 - After 3 Years = Replaces 75-150 lbs N/Acre
 - On Year = 150 lbs N - 100 lbs N = 50 lbs N/Acre
 - Off Year = No additional N required



Costs

- **Clover + Amm. Nitrate**

- Off YR

- Yr 1 **\$42.90/Acre + \$31.15/Acre (45 lbs N) = \$74.05/A**

- Yr 3 + **\$0/Acre**

- On YR

- Yr1 **\$42.90/Acre + \$83.08/Acre (120 lbs N) = 125.98/A**

- Yr3 + **\$34.27/Acre (50 lbs N)**

- **Broadcast Ammon. Nitrate**

- Off year: \$51.83/Acre

- On year: \$103.86/Acre



Poultry Litter

- Consider what nutrients you need:
- 65% of N and 80% of P should be used in the first year
- 10% of N is available immediately
- For 60-60-40 analysis @ 1 ton/a
 - 60 X .65 = 39 lbs N/Acre
 - Off Year = 75-39 = 36 lbs N/A Needed
 - On Year = 150-39 = 111 lbs N/A



Poultry Litter Costs

- Total Synthetic Cost N,P,K,Zn = 162.66
- 1 ton litter = \$35-\$50
 - 1 appl.: \$50/Acre for 39 lbs N, 48 lbs P, +K, +Zn
 - 2 appl.: \$100/Acre for 78 lbs N, 96 lbs P, +K, +Zn
- Not much difference if N is only benefit
(@ \$50/ton)



Poultry Litter + Clover

Poultry Litter + Clover (Yr 3+)

- Off Year: 100 lbs N from clover = No litter required (\$0)
- On Year:
 - (2 appl. Litter) 78 lbs N + 100 lbs N from clover = 178 lbs N (+P, K, Zn) for \$100/acre (+P, K, Zn)
 - (1 appl. Litter) 39 lbs N + 100 lbs N from clover = 139 lbs N (+P, K, Zn) for \$50/acre



Nitrogen Costs

(Assuming 150 lbs N for ON year)

If only N needed

If N,P,K,Zn needed

	Broadcast Ammonium Nitrate	Clover + Ammon. Nitrate	Clover + Litter
On Year	\$103.86/Acre	\$34.27/Acre	\$50-\$75/Acre
Off Year	\$51.83/Acre	\$0/Acre	\$0/Acre



Band Applications

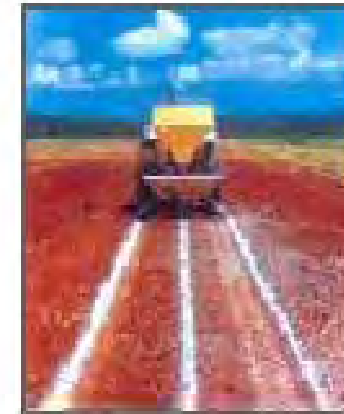
Vicon Maquinas Fertilizer Spreader Accessories Create More Possibilities:



High lift attachment for late top dressings on grain crops.



2-band spreading in vineyards and plantations such as grape, orange, apple.



3-band spreading

Vicon PS403 Fertilizer Spreader—950 lb. capacity

\$3063.00

Vicon PS203 Fertilizer Spreader---400 lb. capacity

\$1913.00

PS000FS Band Spreading Spout---3'-14' band

\$278.00



How Much Does a Band Application Save?

- Example: 100 acre orchard spaced 60 X 60
- Apply 75 lbs N/acre
 - Step 1: Determine % of area you are treating:
 - Divide band width (3') by row spacing (60'):
– $3/60 = 0.05 = 5\%$
 - Step 2: Decide N rate: 75 lbs/acre
 - Step 3: How much product?
 - $75/.33 = 227$ lbs Ammonium Nitrate
 - Step 4: Adjust Broadcast Rate to Band Rate:
 - $227 \times 0.05 = 11.36$ lbs Ammonium Nitrate/orchard acre



Orchard Acre: How many rows = 1 acre?

- 43,560 sq ft/acre
- Multiply row length by row spacing:
 - $3000 \times 60 = 180,000$
- Divide 180,000 by 43,560 (1 acre)
 - $43560/180000 = \text{Approx. } 0.25$ ($\frac{1}{4}$ of a row)
 - 1 row = 4 acres
- So, 1 row should get $11.36 \times 4 = 45.44$ lbs
- 100 acre orchard @ 50 trees per row = 48 rows
- $45.44 \times 48 = 2181.12$ lbs Ammonium Nitrate
 - **Cost: Approx. \$460 for the total 100 acres**
- Broadcast Amount Needed: 100×227 lbs Ammonium Nitrate = 22700 lbs
 - **Cost: \$5186.95 for 100 acres**



Which makes more sense?

	Broadcast Ammonium Nitrate	Clover + Ammon. Nitrate	Clover + Litter	Clover+ Band Appl.
On Year	\$103.86/Acre	\$34.27/Acre	\$50- \$75/Acre	\$4.60/Acre
Off Year	\$51.83/Acre	\$0/Acre	\$0/Acre	\$0/Acre