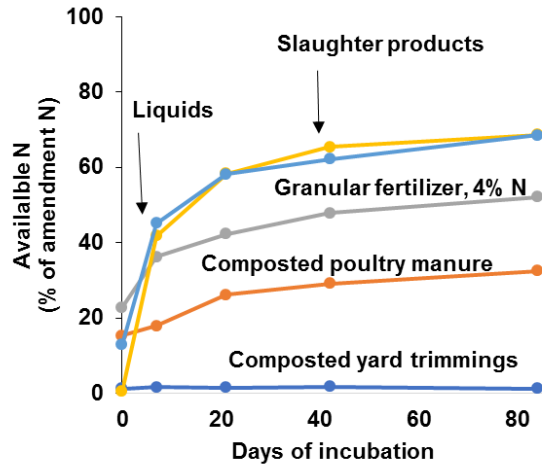
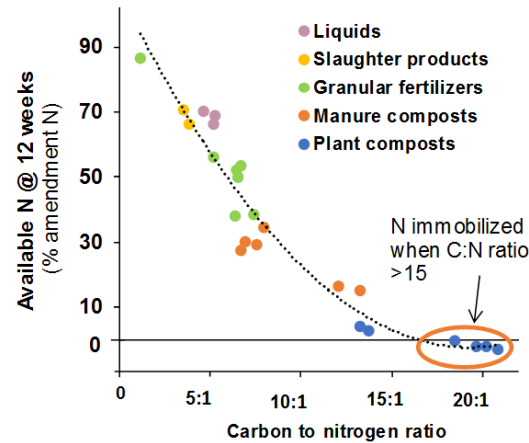


Amendment N release



Amendment carbon to nitrogen ratio predicts N availability



Incubations at optimum moisture and temperature show the amount of N which may become available during the growing season. Amendment types followed four patterns:

- ◆ Yard trimmings composts released little to no N. They contribute to long-term fertility but not the current crop demand.
- ◆ Poultry manure composts had 10-20% of their N available at application, and then slowly released over time. After 12 weeks, about 30% of their N had been mineralized.
- ◆ Granular fertilizers and liquids had 15-25% of their N available at the time of addition, and mineralized quickly for the first few weeks. Liquids mineralized more quickly, and more of their N was available.
- ◆ Slaughter products (blood and feather meal) contain no available N, but mineralize very quickly when mixed with soil.

Material	Typical C:N
Municipal yard trimmings composts	13 - 20
Poultry manure composts	6 - 8
Granular fertilizers	5 - 7
Liquid fertilizers	4 - 6
Slaughter products (blood & feather meal)	3 - 4

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Nitrogen dynamics in organic heirloom tomatoes



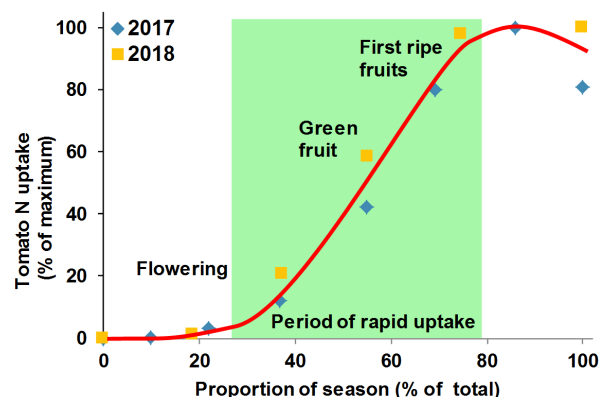


Matching soil N availability with crop demand

Nitrogen uptake rate

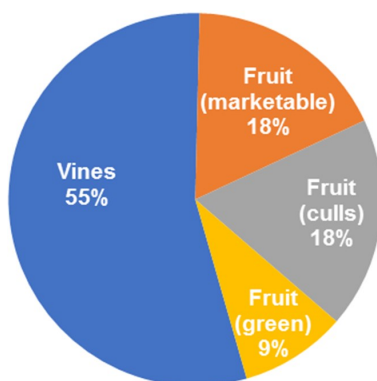
Brandywine tomatoes took up little nitrogen before flowering. On average 75% of the crop's total N was taken up between full bloom and the first harvest. Peak N uptake rates averaged 3-5 lbs N/acre/day.

During the harvest period, N uptake rate negligible.



Nitrogen partitioning at harvest

In our study, relatively little of the N taken up was ended up in the marketable fruit. See next page for calculating N uptake and removal.



Predicting crop uptake

Given a marketable yield of 15 tons per acre, a cull rate of 40%, and N uptake of 7 lbs/ton of fruit produced

Step 1: Use marketable yield to calculate total yield

$$\text{Total yield} = (\text{marketable yield}) \times (1 - \text{cull rate})$$

$$\text{Total yield} = (15 \text{ tons marketable fruit/acre}) \times (1 - 0.4) = 9 \text{ tons fruit/acre}$$

Step 2: Use an estimate of plant N uptake for each ton of yield to calculate plant uptake

$$\text{N uptake} = \text{Total yield} \times \text{uptake per ton}$$

$$\text{N uptake} = (9 \text{ tons fruit/acre}) \times (7 \text{ lbs N uptake per ton fruit})$$

$$= 63 \text{ tons N/acre taken up by the crop}$$

Predicting N removed from the field

Given a marketable yield of 15 tons per acre, a cull rate of 40%, and 2.4 lbs N in each ton of fruit

Step 1: Calculate the N removed with the marketable yield

$$\text{N removed} = (\text{marketable yield}) \times (\text{N per ton fruit})$$

$$\text{N removed} = (15 \text{ tons marketable fruit/acre}) \times (2.4 \text{ lbs N/ton})$$

$$= 36 \text{ lbs N/acre}$$

Next, account for culls which may be removed from the field

Step 2: Calculate the weight of the culls leaving the field (estimated to be about 1/3 of the total culls)

$$\text{Culls leaving the field} = ((\text{Marketable yield}) / (1 - \text{cull rate})) \times \text{cull rate} \times \text{proportion culls leaving the field}$$

$$\text{Culls leaving the field} = ((15 \text{ tons per acre}) / (1 - 0.4)) \times 0.4 \times 0.33 = 3.3 \text{ tons culls/acre}$$

Step 3: Calculate the total N leaving the field

$$\text{N removed} = \text{N in marketable fruit} + \text{N in culls leaving the field}$$

$$\text{N removed} = 36 \text{ lbs N/acre} + (3.3 \text{ tons culls/acre} \times 2.4 \text{ lbs N/ton})$$

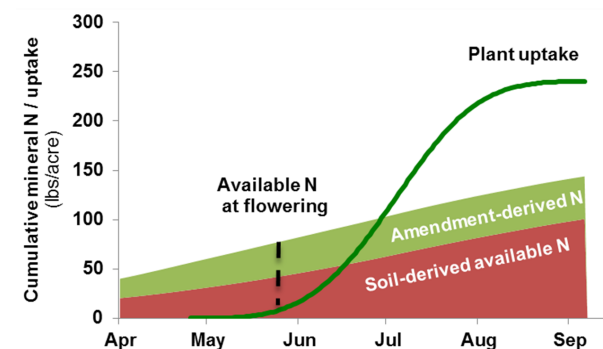
$$= 41.3 \text{ lbs N/acre removed from the field}$$

Average and range of yield and N uptake parameters from Yolo county field sites in 2017 and 2018

Parameter	Average	Minimum	Maximum
Yields (tons/acre)	32	13	48
N in fruit (lbs/ton)	2.4	1.6	3.9
Cull rate (%)	51	23	78
Plant N uptake (lbs/ton fruit)	7.1	3.9	12.1

Monitoring soil and plant N

The most meaningful time to sample the soil for available N is a couple weeks before the period of rapid uptake. Samples taken at this stage will include the N from the soil organic matter, cover crops and amendments which the quickly growing crop will be able to use.



Nitrogen concentration in the most recently matured leaf had the best relationship with yields when leaves were sampled at the green fruit stage. Broad ranges are given below.

