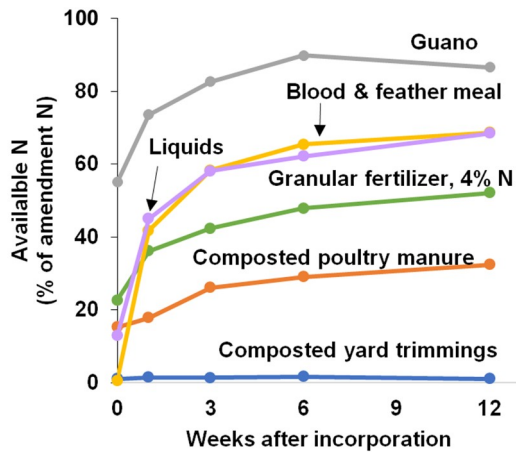
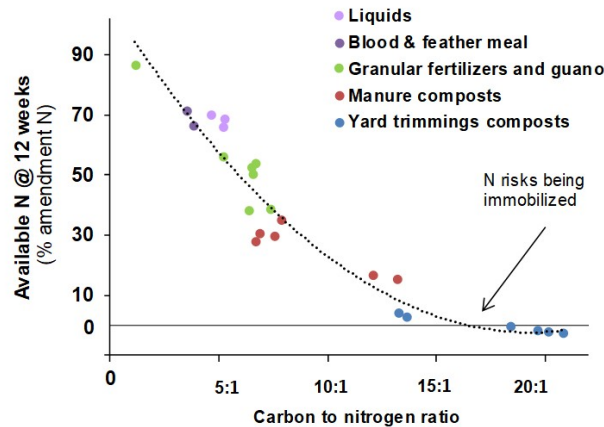


## Amendment N release



## Amendment carbon to nitrogen ratio predicts N availability



Potential N release had a strong relationship to C:N

Material	Typical C:N ratio	N available after 12 weeks	Releases in:
Municipal yard trimmings composts	13 - 20	-3% - 4%	Years
Poultry manure composts	6 - 8	30 - 35%	Weeks-months
Granular fertilizers	5 - 7	38 - 60%	Days-weeks
Blood & feather meal	3 - 4	65 - 70%	Days
Liquid fertilizers	4 - 6	65 - 70%	Days
Guano	3 - 4	80-90%	Days

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# Nitrogen dynamics in field-grown organic heirloom tomatoes



Margaret Lloyd, Patricia Lazicki, Daniel Geissler

Results of a two year field and lab study whose goal was to quantify the patterns of nitrogen availability and uptake for organically managed Brandywine tomatoes.

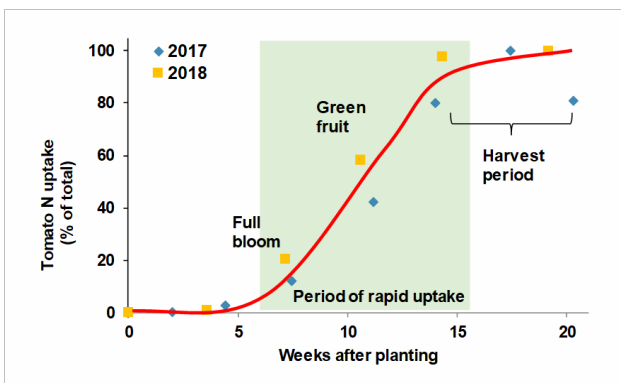


# Matching soil N availability with crop demand

## Nitrogen uptake rate

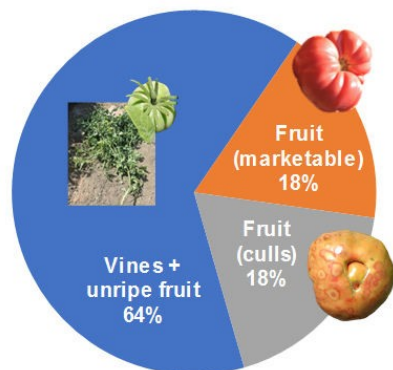
Brandywine tomatoes took up little N before flowering. On average 73% of the crop's total N was taken up between full bloom and the first harvest. Peak N uptake rates averaged 3-5 lbs N/acre/day.

The N uptake rate slowed during the harvest period.



## Nitrogen partitioning at harvest

In our study, relatively little of the N taken up 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 45%, and N uptake of 6.5 lbs/ton of fruit produced

Step 1: Use marketable yield to calculate total yield  
 $Total\ yield = (marketable\ yield) / (1 - cull\ rate)$   
 $Total\ yield = (15\ tons\ marketable\ fruit) / (1 - 0.45) = 27.3\ tons\ fruit$

Step 2: Use an estimate of plant N uptake for each ton of yield to calculate plant uptake  
 $N\ uptake = Total\ yield * uptake\ per\ ton$   
 $N\ uptake = (27.3\ tons\ fruit) * (6.5\ lbs\ N\ uptake\ per\ ton\ fruit) = 177\ tons\ N/acre\ taken\ up\ by\ the\ crop$

## Predicting N removed from the field

Given a marketable yield of 15 tons per acre, a cull rate of 45%, and 2.4 lbs N in each ton of fruit

Step 1: Calculate the N removed with the marketable yield  
 $N\ removed = (marketable\ yield) * (N\ per\ ton\ fruit)$   
 $N\ removed = (15\ tons\ marketable\ fruit/acre) * (2.4\ lbs\ N/ton) = 36\ lbs\ N/acre$

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

Step 2: Calculate the weight of the culls leaving the field (estimate about 1/3 of the total culls)  
 $Culls\ leaving\ the\ field = ((Marketable\ yield) / (1 - cull\ rate)) * cull\ rate * proportion\ culls\ leaving\ the\ field$   
 $Culls\ leaving\ the\ field = ((15\ tons\ per\ acre) / (1 - 0.45)) * 0.45 * 0.33 = 4.1\ tons\ culls/acre$

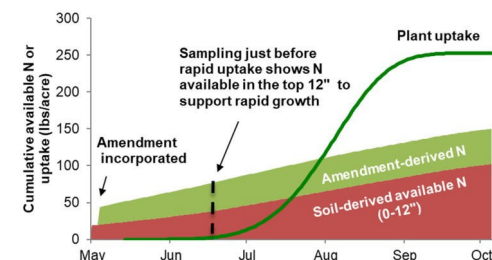
Step 3: Calculate the total N leaving the field  
 $N\ removed = N\ in\ marketable\ fruit + N\ in\ culls\ leaving\ the\ field$   
 $N\ removed = 36\ lbs\ N/acre + (4.1\ tons\ culls/acre * 2.4\ lbs\ N/ton) = 45.8\ lbs\ N/acre\ removed\ from\ the\ field$

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

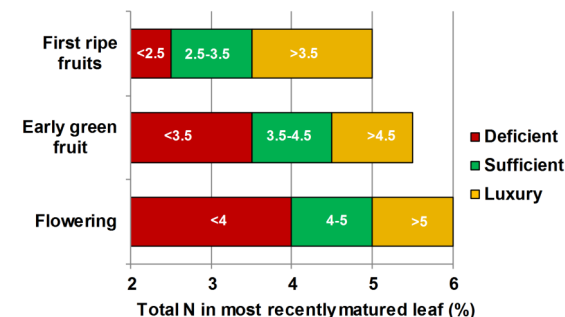
Parameter	Average	Minimum	Maximum
N uptake (lbs/acre)	202	58	391
Yields (tons/acre)	31	13	48
N in fruit (lbs/ton)	2.4	1.6	3.9
Cull rate (%)	51	23	78
Plant N uptake (lbs/ton fruit)	6.5	3.4	10.2

## 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 wasn't a very sensitive indicator of N status. In this study, it had the best relationship to yield at green fruit stage. Broad ranges are shown below.



Observations were in line with values listed for fresh market tomatoes in the Western Fertilizer Handbook