Session 3 AGENDA

- Budget worksheet wrap up and brief discussion on regulatory reporting-Margaret
- N uptake levels and curves from various crops-Richard
- Synchronizing crop demand with N release rates from multiple sources-Joji
- Approaches to designing fertilizer programs to provide the N needs of those vegetables-Richard
- *4pm BREAK 5min*
- Use of soil nitrate testing to adjust fertilizer programs (pro's/con's) and use in monitoring management-Richard
- Frontiers and advanced topics in nitrogen in organic production-Joji
- Time for discussion
- Evaluation

Session 3

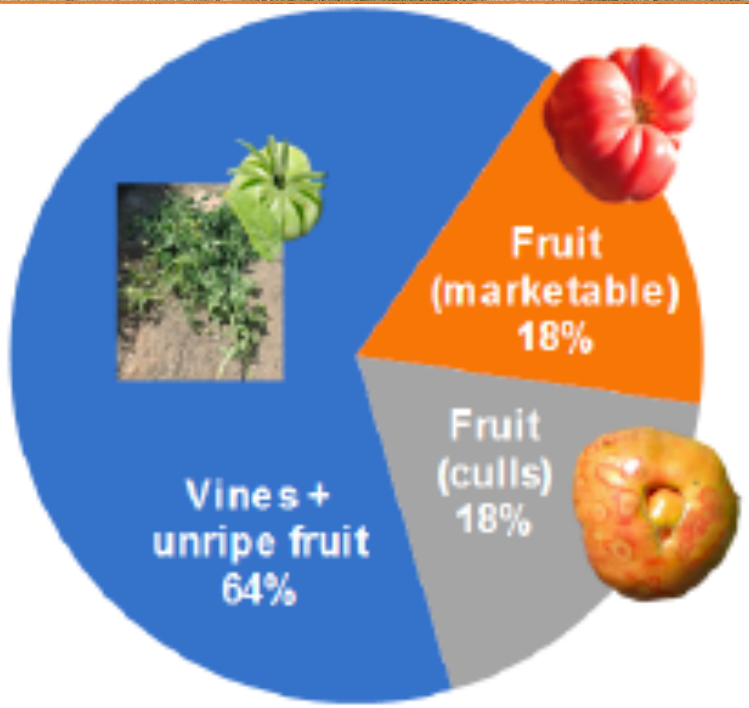
Establishing N demand

Completing the worksheet budget

Crop N Demand Is for the Whole Plant

N requirements to produce

- plant material
- harvested crop
- cull produce



Crop N demand and yield are very closely linked

Table 1: Estimates of N uptake by major California crops

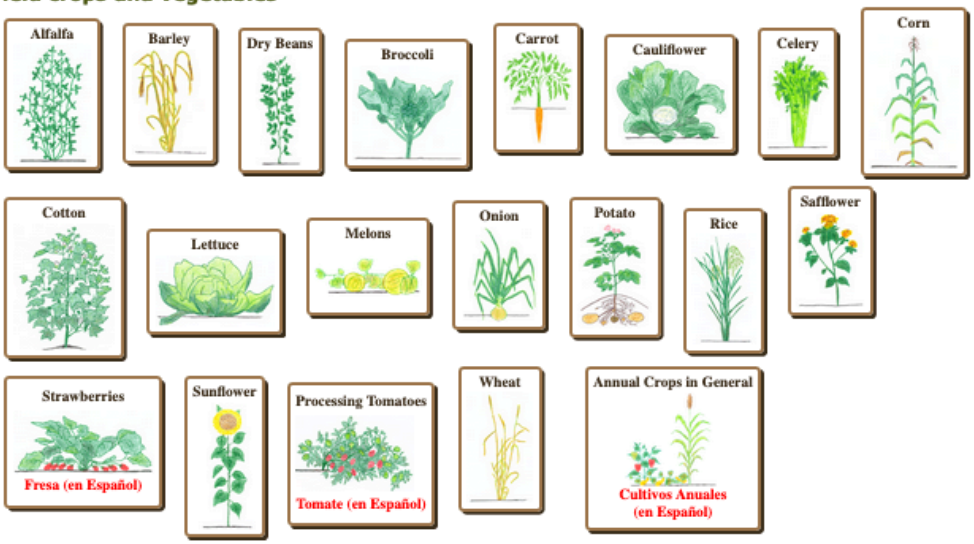
Crop	Example yield (tons/acre)	Total crop N uptake		N in harvest (lb N/ton yield)
		(lb N/ton yield)	(lb N/acre)	
Lettuce	20	8	160	3
Tomato (fresh-market)	30	8	240	4
Tomato (processing)	50	5	250	3
Sweet potato	20	5	100	5
Broccoli	10	35	350	11
Carrot	20	10	200	3
Melon	20	7	140	4
Potato	25	11	275	6
Strawberry	40	5	200	3
Spinach	15	8	105	5

Crops that can be grown in both winter and summer usually take up less N in a winter planting.

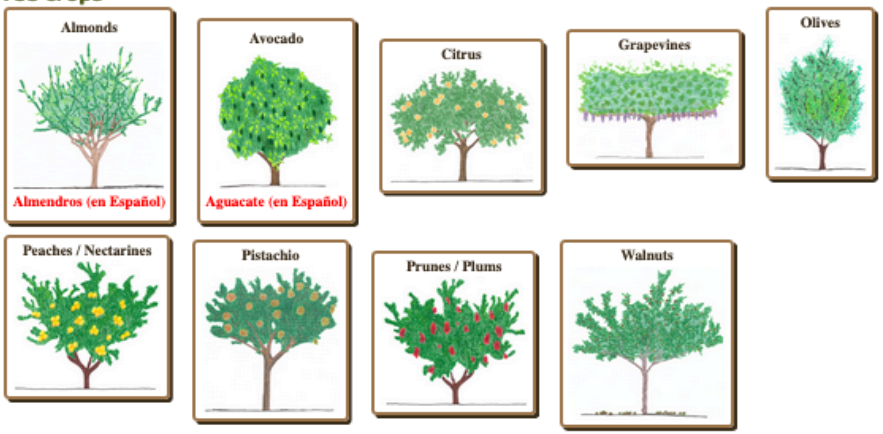
California Fertilization Guidelines

These guidelines have been written by scientists from the **University of California, Davis** with support from **CDFA-FREP**. The guidelines are based on research results from studies carried out in California and elsewhere. For an optimal fertilization program, site-specific information needs to be taken into account. A discussion about site-specific adjustments can be found **here**.

Field crops and vegetables

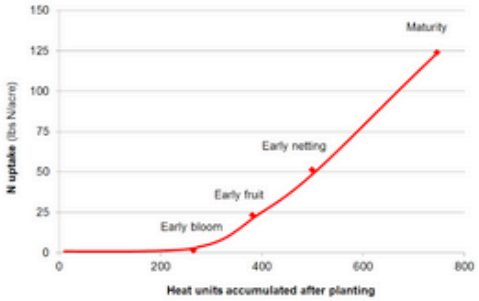


Tree crops



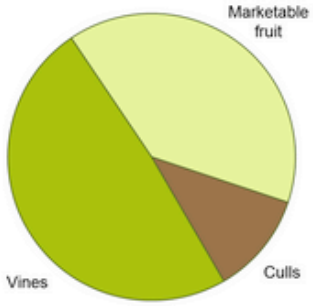
Melon Nitrogen Uptake and Partitioning

Seasonal N Uptake



N uptake in hybrid cantaloupes grown in several commercial fields in Yuma Valley, Arizona. Average yield in this study was around 23 tons/acre. Cantaloupe plants took up less than 2 lbs N/acre before the early bloom stage. Following the early bloom stage, uptake progressed steadily until maturity [7]. Honeydews have a similar N uptake pattern to cantaloupe, but likely take up less N per unit yield [5,8].

Nitrogen Partitioning



Nitrogen uptake in 'Oro Rico' hybrid cantaloupe fruits and vines. Data was taken in 2006 from three commercial fields in the San Joaquin Valley. Average marketable yield was about 19 tons/acre, or 930 boxes/acre [5].

Nitrogen Removed at Harvest

Cantaloupe and honeydew melon removal with harvested fruit. The overall average is weighted for the number of observations in each trial. More information can be found here [4].

Cantaloupe

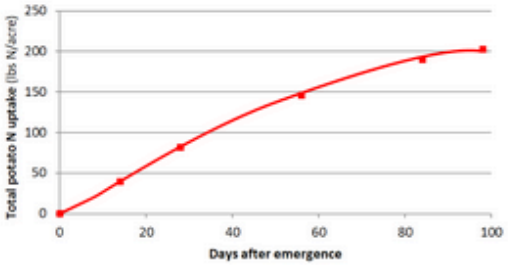
Location	Years	Removal (lbs N/ton fresh weight)		Source
		Mean	Range	
Arizona	1990	3.88	2.41 - 4.91	[3]
Arizona	2003-2005	5.90	5.24 - 7.02	[7]
Spain	2010	3.08	1.97 - 4.47	[2]
Various		3.01		[6]
Weighted Average		**4.87**	**1.97 - 7.02**	

Honeydew

Location	Years	Removal (lbs N/ton fresh weight)		Source
		Mean	Range	
Spain	2005-07	2.96	1.98 - 4.25	[1]
Various		2.82		[6]
Weighted Average		**2.95**	**1.98 - 4.25**	

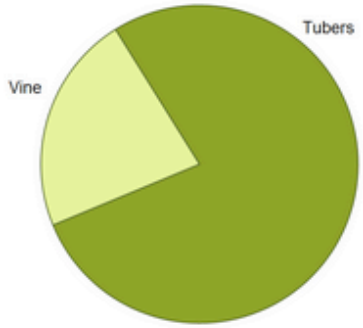
Potato Nitrogen Uptake and Partitioning

Seasonal N Uptake



Nitrogen uptake curve of Russett Burbank potatoes grown in Paterson, WA. The tuber yield was 563 cwt/acre [4].

Nitrogen Partitioning



Estimated N in vines and tubers at vine kill. Data from a trial with Classic Russett and Russett Norkotah in Tulelake. The average total yield was 506 cwt/acre [7]. Nitrogen partitioning to potato vines and tubers depends on fertilization. In a well-fertilized crop about 20-30% of the total N is found in the vine. Under excessive fertilizer over half of the total N may be in the vine, and under deficient fertilization it can be as low as 10% [4,7].

Nitrogen Removed at Harvest

Nitrogen removed with potato tubers. The overall average is weighted for the number of observations in each trial. More information can be found here [2].

Location	Years	Removal (lbs N/ton fresh weight)		Source
		Mean	Range	
Tulelake, CA	2012	8.02	6.83 - 9.22	[8]
Washington	1980-81	5.81	4.18 - 8.33	[4]
Minnesota	1994-95	5.94	4.08 - 6.91	[7]
Wisconsin	2000-02	6.37	5.19 - 8.14	[1]
Various		6.16	4.61 - 7.1	[5]
Various		6.05		[6]
Weighted Average		**6.24**	**4.08 - 9.22**	

Links

Potato Fertilization Guidelines

Because plants do not capture all N applied, the amount of total fertilizer N needed for optimal crop growth is often more than actual crop uptake.

Two reasons for the imperfect match between N applied and N uptake are

inefficiencies in irrigation management

variability in the field

Soil texture influences water movement which influences nitrate movement.

- Leaching of residual nitrate is more pronounced on sandy soils compared to clay soils which hold water more tightly
- On a sandy soil following a wet winter it is often necessary to apply more fertilizer N to make up for the loss of residual soil N than after a dry winter.

This means that uptake numbers are best used as a starting point, not a prescription.

http://ucanr.edu/nitrogencourseevaluation