Nitrogen Management Plan

Section 6

A planning document:

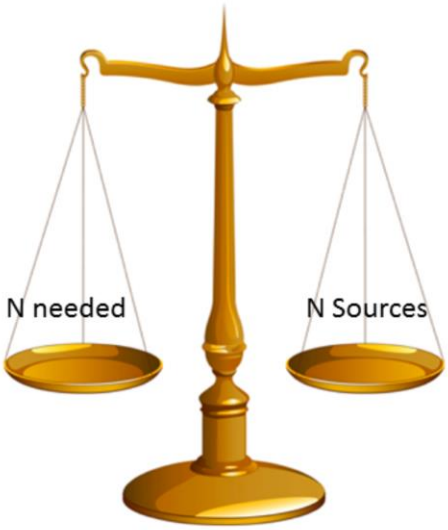
Based on :

Crop

Expected yield

vs

N sources



NITROGEN MANAGEMENT PLAN WORKSHEET

NMP Management Unit _____

		4. APN(s):	5. Field(s) ID	Acres
1. Crop Year (Harvested):				
2. Member ID#				
3. Name:				

CROP NITROGEN MANAGEMENT PLANNING		N APPLICATIONS/CREDITS	15. Recommended/ Planned N	16. Actual N
6. Crop		**17. Nitrogen Fertilizers**		
7. Production Unit		18. Dry/Liquid N (lbs/ac)		
8. Projected Yield (Units/Acre)		19. Foliar N (lbs/ac)		
9. N Recommended (lbs/ac)		**20. Organic Material N**		
10. Acres		21. Available N in Manure/Compost (lbs/ac estimate)		
Post Production Actuals				
11. Actual Yield (Units/Acre)		**22. Total Available N Applied** (lbs per acre)		
12. Total N Applied (lbs/ac)		**23. Nitrogen Credits (est)**		
13. ** N Removed (lbs N/ac)		24. Available N carryover in soil; (annualized lbs/acre)		
14. Notes:				
		25. N in Irrigation water (annualized, lbs/ac)		
		26. Total N Credits (lbs per acre)		
		27. Total N Applied & Available		

PLAN CERTIFICATION		
28. CERTIFIED BY:	**29. CERTIFICATION METHOD**	
	30. Low Vulnerability Area, No Certification Needed	
	31. Self-Certified, approved training program attended	
DATE:	32. Self-Certified, UC or NRCS site recommendation	
	33. Nitrogen Management Plan Specialist	

This is a condensed(reduced APN) version for a better fit.
XL NMP Spreadsheet available at : https://www.esjcoalition.org/nCalc.asp

NITROGEN MANAGEMENT PLAN WORKSHEET

NMP Management Unit _____

1. Crop Year (Harvested):	2015	4. APN(s):	5. Field(s) ID	Acres
2. Member ID#	xxxxxx			
3. Name:	Your Name			

CROP NITROGEN MANAGEMENT PLANNING		N APPLICATIONS/CREDITS	15. Recommended/ Planned N	16. Actual N
6. Crop		17. Nitrogen Fertilizers		
7. Production Unit		18. Dry/Liquid N (lbs/ac)		
8. Projected Yield (Units/Acre)		19. Foliar N (lbs/ac)		
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1. Enter the **Crop Year** for which this report is based upon.

The calendar year a crop is harvested.

Newly planted trees or vines should report amount of nitrogen applied even if not crop is harvested.

2. Enter the membership identification number **(Member ID)** issued by your water quality coalition

3. Enter the **Name** of the person completing the form. This needs to be the owner or manager of the farm or the individual certifying the plan (if certification is necessary).

NITROGEN MANAGEMENT PLAN WORKSHEET

NMP Management Unit: _____

		4. APN(s):	5. Field(s) ID	Acres
1. Crop Year (Harvested):	2015			
2. Member ID#	xxxx	02-025-016	1	100
3. Name:	Your Name			

CROP NITROGEN MANAGEMENT PLANNING		N APPLICATIONS/CREDITS	15. Recommended/ Planned N	16. Actual N
6. Crop		17. Nitrogen Fertilizers		
7. Production Unit		18. Dry/Liquid N (lbs/ac)		
8. Projected Yield (Units/Acre)		19. Foliar N (lbs/ac)		
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4. Enter the Assessor's Parcel Number **(APN).** If field is more than one APN enter both APN's

5. Enter the **Field Identification** (ID) for each unique management unit; the field ID can be an alpha/ numeric, your internal field identifier or the site number used on your pesticide use permit. If the same crop and same nitrogen application is used on more than one field, enter all APN's and/or field numbers where the information applies

Enter field acres

NITROGEN MANAGEMENT PLAN WORKSHEET

NMP Management Unit: _____

1. Crop Year (Harvested):	2015	4. APN(s):	5. Field(s) ID	Acres
2. Member ID#	xxxx	020-025-016	1	100
3. Name:	Your Name			

CROP NITROGEN MANAGEMENT PLANNING		N APPLICATIONS/CREDITS	15. Recommended/ Planned N	16. Actual N
6. Crop	Walnut	17. Nitrogen Fertilizers		
7. Production Unit	tons	18. Dry/Liquid N (lbs/ac)		
8. Projected Yield (Units/Acre)	3.00	19. Foliar N (lbs/ac)		
9. N Recommended (lbs/ac)		20. Organic Material N		
10. Acres		21. Available N in Manure/Compost (lbs/ac estimate)		
Post Production Actuals				
11. Actual Yield (Units/Acre)		22. Total Available N Applied (lbs per acre)		
12. Total N Applied (lbs/ac)		23. Nitrogen Credits (est)		
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6. Enter the **Crop** name (almonds, walnuts, table grapes, wine grapes, raisin grapes, watermelons, canning tomatoes, fresh market tomatoes, etc.)

7. Enter the standard **Production Unit.**

This is the standard unit that is the basis for your nitrogen management planning (tons, pounds, cartons, bales, etc.).

For irrigated pasture, leave blank and use University of California recommended nitrogen rates needed for desired growth in box 9.

8. Enter your **Projected Yield** per acre for the management unit for the upcoming season. Realistic yield expectations will help guide N management decisions.

For irrigated pasture, leave blank and use University of California recommended nitrogen rates needed for desired growth in box 9.

CROP NITROGEN MANAGEMENT PLANNING

9. Enter the amount of **Nitrogen Recommended** (estimated amount needed) to be applied to meet your expected yield. **Use crop recommendations from CDFA, UCCE, NRCS, commodity organizations or site specific knowledge based on previous experience to appropriately estimate the amount of Nitrogen (N) needed.** This should be the same number used in #27, Total N Applied and Available.

NITROGEN MANAGEMENT PLAN WORKSHEET

NMP Management Unit: _____

1. Crop Year (Harvested):	2015	4. APN(s):	5. Field(s) ID	Acres
2. Member ID#	xxxx	020-025-016	1	100
3. Name:	Your Name			

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6. Crop	Walnut	17. Nitrogen Fertilizers		
7. Production Unit	tons	18. Dry/Liquid N (lbs/ac)		
8. Projected Yield (Units/Acre)	3.00	19. Foliar N (lbs/ac)		
9. N Recommended (lbs/ac)	160	20. Organic Material N		
10. Acres	100	21. Available N in Manure/Compost (lbs/ac estimate)		
Post Production Actuals				
11. Actual Yield (Units/Acre)		22. Total Available N Applied (lbs per acre)		
12. Total N Applied (lbs/ac)		23. Nitrogen Credits (est)		
13. ** N Removed (lbs N/ac)		24. Available N carryover in soil; (annualized lbs/acre)		
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		26. Total N Credits (lbs per acre)		
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10. Enter total irrigated **Acres** for the management unit covered by each worksheet.

NITROGEN MANAGEMENT PLAN WORKSHEET

NMP Management Unit: _____

		4. APN(s):	5. Field(s) ID	Acres
1. Crop Year (Harvested):	2015			
2. Member ID#	xxxx	020-025-016	1	100
3. Name:	Your Name			

CROP NITROGEN MANAGEMENT PLANNING		N APPLICATIONS/CREDITS	15. Recommended/ Planned N	16. Actual N
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Post Production Actuals				
11. Actual Yield (Units/Acre)		22. Total Available N Applied (lbs per acre)		
12. Total N Applied (lbs/ac)		23. Nitrogen Credits (est)		
13. ** N Removed (lbs N/ac)		24. Available N carryover in soil; (annualized lbs/acre)	0	
14. Notes:		25. N in Irrigation water (annualized, lbs/ac)	20	
		26. Total N Credits (lbs per acre)	20	
		27. Total N Applied & Available		

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23. Soil Nitrogen Credits is the estimated amount of nitrogen that will become available for crop uptake during the growing season.

24. **Available N Carryover in the Soil** is typically estimated by analyzing a soil sample. This estimate should be reported in pounds per acre available to the crop during the growing season.

25. **Nitrogen in Irrigation Water** is estimated by analyzing an irrigation water sample to determine the nitrogen content. This estimate should be reported in pounds per acre available throughout the crop season based on the amount of irrigation water applied to the crop if less than ET. If more water applied than ET only use the ET.

26. Total N Credits is the sum of #24 and #25.

27. **Total N Applied and Available** is the sum of #22 and #26. This total should be the same number as #12.

NITROGEN MANAGEMENT PLAN WORKSHEET

NMP Management Unit: _____

		4. APN(s):	5. Field(s) ID	Acres
1. Crop Year (Harvested):	2015			
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CROP NITROGEN MANAGEMENT PLANNING		N APPLICATIONS/CREDITS	15. Recommended/ Planned N	16. Actual N
6. Crop	Walnut	17. Nitrogen Fertilizers		
7. Production Unit	tons	18. Dry/Liquid N (lbs/ac)	140	
8. Projected Yield (Units/Acre)	3.00	19. Foliar N (lbs/ac)	0	
9. N Recommended (lbs/ac)	160	20. Organic Material N		
10. Acres	100	21. Available N in Manure/Compost (lbs/ac estimate)	0	
Post Production Actuals				
11. Actual Yield (Units/Acre)		22. Total Available N Applied (lbs per acre)	140	
12. Total N Applied (lbs/ac)		23. Nitrogen Credits (est)		
13. ** N Removed (lbs N/ac)		24. Available N carryover in soil; (annualized lbs/acre)	0	
14. Notes:		25. N in Irrigation water (annualized, lbs/ac)	20	
		26. Total N Credits (lbs per acre)	20	
		27. Total N Applied & Available	160	

PLAN CERTIFICATION		
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NMP Management Unit: _____

		4. APN(s):	5. Field(s) ID	Acres
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		25. N in Irrigation water (annualized, lbs/ac)	20	
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PLAN CERTIFICATION		
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DATE:	32. Self-Certified, UC or NRCS site recommendation	
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28. Place for the signature of person certifying this plan, if required (see definitions in 31-33).

29. **Certification Method.** Place an "X" in the box for the method used.

30. If a field is in a **Low Vulnerability** area as designated by a Groundwater Assessment Report, no certification of this NMP is necessary

31 - 33. Parcels/Fields that are in designated **High Vulnerability Areas** will need to be certified by a **Nitrogen Management Specialist.** Certification is needed on the Recommended/Planned N plan (column #15) and not for the Actual N (#16). Nitrogen Management
Specialists include Professional Soil Scientists, Professional Agronomists, Crop Advisors certified by the American Society of Agronomy (and CDFA/California CCA), or Technical Service Providers certified in nutrient management in California by the National Resource

Conservation Service (NRCS); or other specialist approved by the Executive Officer. Self-Certification is also an acceptable method provided the certifying member has attended an approved training course

Nitrogen Summary Report

Following the crop season

NITROGEN MANAGEMENT PLAN WORKSHEET

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		4. APN(s):	5. Field(s) ID	Acres
1. Crop Year (Harvested):	2015			
2. Member ID#	xxxx	020-025-016	1	100
3. Name:	Your Name			

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11. Actual Yield is the total amount of crop harvested in units per acre.
This total should be an average of the production from a management unit covered by this Nitrogen Management Plan.
Compare the Actual Yield to the total amount of N that was available for the crop. Assess if your N applications were appropriate for the yield achieved. Use available resources or site experience to determine the appropriate amount compared to the yield.

12. **Total N Applied** is the amount of nitrogen applied in pounds per acre. #12 should equal the total indicated in #27, column #16.

13. A Technical Work Group is in place to develop tools to better estimate nitrogen removal by a crop.
This information will be used to estimate the amount of **N Removed** each year to assist tracking of Nitrogen after application to a crop.
Your Coalition will provide you with the most up to date information on how to estimate N removed.

14. **Add any Notes** to the worksheet such as information about circumstances faced during the crop season that impact your recommended nitrogen applications #9 such as a larger or smaller crop than projected. Application amounts and timing can be adjusted based upon changing conditions (weather, pest damage, expected yield, etc.).

Walnut Nitrogen Management Planning
A Case Study

Walnut

- Conditions:
  - Mature Walnuts
  - Soil – Clay Loam, 5ft deep over consolidated layer
  - Irrigation water
    - 36 inches / season applied via solid set sprinkler
    - Nitrate from water test = 5 ppm Nitrate
  - Estimated yield 3.0 tons per acre
  - No organic material applied (manure or composts)
  - Winter cover *crop (peas, beans, vetch, and barley*)

Efficient N Management: Applying the 4 Rs Principle

- Apply the Right Rate
  - Match supply with crop demand (all inputs- fertilizer, organic N, water, soil).
- Apply at the Right Time
  - Apply coincident with crop demand and root uptake.
- Apply In the Right Place
  - Ensure delivery to the active roots.
  - Minimize movement below root zone
- Use the Right Source

The 4 Rs are specific to every individual orchard/field and every year.

Following the principles of the 4R's leads to the most efficient use of nitrogen.

Details about each of the 4Rs:

Right Rate:
1. Appropriately assess soil nutrient supply
2. Assess all available indigenous nutrient sources
3. Assess plant demand
4. Predict fertilizer use efficiency

Right Time:
1. Assess timing of crop uptake
2. Assess dynamics of soil nutrient supply
3. Recognize timing of weather factors
4. Evaluate logistics of operations

Right Place:
1. Recognize root-soil dynamics
2. Manage spatial variability
3. Fit needs of tillage system
4. Limit potential off-field transport

Right Source:.
1. Supply in plant available forms
2. Suit soil properties
3. Recognize synergisms among elements
4. Blend compatibility

The Right Rate: Estimate Crop Use

- Nitrogen removed per unit of crop yield
- Estimated crop yield

- Example:
- Mature walnuts N removal I crop + growth at 37 lb N per ton
- Yield expected is 3.0 tons/acre
- Result = 111 lb N / acre use

37 Lb N per ton includes N required for mature walnut growth

Estimating Demand

- Estimated yield
- Nitrogen removal + growth(lb N/ton)
- Mature walnuts at 37 lb N per ton
- Yield expected is 3.0 tons/acre
- Result = 111 lb N / acre use

- Estimated Nitrogen Use Efficiency (NUE)

Nitrogen Use Efficiency (NUE)

$$\frac{Lbs\ N\ exported\ from\ the\ field\ in\ crop\ products}{Lbs\ N\ all\ sources} = Nitrogen\ Use\ Efficiency$$

- The NUE depends on how closely the 4 R's are followed.
- Best practices can achieve near a 70% NUE
- Most orchards are currently managed at a lower NUE

Estimated Orchard Demand

- Tree N use per Acre / Nitrogen use Efficiency (NUE)
- Tree use = 111 lb N/Acre / 0.70 = 159 lbs N/Acre

Estimating Supply: Credits

- Irrigation Water
- Organic materials (cover crop)

N in the Irrigation Water

- Formula for Nitrate:

Nitrate concentration (ppm) x inches irrigation applied x **0.052**

- Formula for Nitrate-N:

Nitrate-N concentration (ppm) x inches irrigation applied x **0.23**

Example:

Lab reports 5 ppm **Nitrate** and you apply 36 inches of water

5 x 36 x **0.052** =

Answer = 9 lb N/ac for the season

N in water is a free and very readily available nitrogen source.

Note: The conversion factors .052 and .23 are constants used to convert from N concentration in ppm to lbs.

Use applied water volume if applied water is equal or less than ET. If applied water exceeds ET use ET water volume.

Cover crop
Peas, beans, vetch, and barley

Cover crop

- Peas, beans, vetch, and barley

- 3000 lbs Dry Matter/ cover crop planted acre
- 60 % of total tree acreage planted
- Average of 3000 x 0.60 = 1800 lbs / tree planted acres

- Legumes = 2.8% N Grasses 1.5% N (average of mix = 2.4% N)
- 1800 lbs x .024 = 43 lb N /ac

N Fertilizer Application

- Use – Supply credits = Fertilizer application
- 159 lb N/acre crop use
- 9 lb N/acre irrigation water supply
- 43 lb N /acre cover crop supply
- 107 lb N /acre Fertilizer required

The Right Time

- Match the delivery of nitrogen with the tree use
  - Research finds uptake to be steady over the season
- Application Timing
  - 25% in May
  - 25% in June
  - 25% in July
  - 25% in August

N use prior to May fertilization is from tree storage

The Right Place

- Most walnut roots are in the top 3 feet of soil
- Manage irrigation systems to:
  - Apply irrigation evenly across the orchard
  - Apply the correct amount of irrigation water to prevent leaching and saturated soil conditions
  - Irrigate after dry fertilization to minimize volatilization
  - Inject liquid fertilizers at a time to position the fertilizer where the root are located

The Right Source

- In orchards, there is no evidence to suggest that any type of N fertilizer delivering the same amount of N can produce higher yields.

- Material selection should be made on costs, application equipment available, and effect on soil chemistry.

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2. Member ID#	xxxx	020-025-016	1	100
3. Name:	Your Name			

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28. CERTIFIED BY:	29. CERTIFICATION METHOD	
	30. Low Vulnerability Area, No Certification Needed	
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DATE:	32. Self-Certified, UC or NRCS site recommendation	
	33. Nitrogen Management Plan Specialist	

28. Place for the signature of person certifying this plan, if required (see definitions in 31-33).

29. **Certification Method.** Place an "X" in the box for the method used.

30. If a field is in a **Low Vulnerability** area as designated by a Groundwater Assessment Report, no certification of this NMP is necessary

31 - 33. Parcels/Fields that are in designated **High Vulnerability Areas** will need to be certified by a **Nitrogen Management Specialist.** Certification is needed on the Recommended/Planned N plan (column #15) and not for the Actual N (#16). Nitrogen Management
Specialists include Professional Soil Scientists, Professional Agronomists, Crop Advisors certified by the American Society of Agronomy (and CDFA/California CCA), or Technical Service Providers certified in nutrient management in California by the National Resource

Conservation Service (NRCS); or other specialist approved by the Executive Officer. Self-Certification is also an acceptable method provided the certifying member has attended an approved training course

Silage Corn Nitrogen
Management Planning

Corn Silage

- Conditions:
  - Soil– sandy loam
  - Irrigation water
    - 21 inches ETc (crop water use)
    - 34 inches / season applied
    - Nitrate from water test = 45 ppm Nitrate
  - Estimated yield 30 tons per acre
  - No organic material applied
  - 1.5% soil organic mater content

Efficient N Management: Applying the 4 Rs Principle

- Apply the Right Rate
  - Match supply with crop demand (all inputs- fertilizer, organic N, water, soil).
- Apply at the Right Time
  - Apply coincident with crop demand and root uptake.
- Apply In the Right Place
  - Ensure delivery to the active roots.
  - Minimize movement below root zone
- Use the Right Source

The 4 Rs are specific to every individual orchard/field and every year.

Following the principles of the 4R's leads to the most efficient use of nitrogen.

Details about each of the 4Rs:

Right Rate:
1. Appropriately assess soil nutrient supply
2. Assess all available indigenous nutrient sources
3. Assess plant demand
4. Predict fertilizer use efficiency

Right Time:
1. Assess timing of crop uptake
2. Assess dynamics of soil nutrient supply
3. Recognize timing of weather factors
4. Evaluate logistics of operations

Right Place:
1. Recognize root-soil dynamics
2. Manage spatial variability
3. Fit needs of tillage system
4. Limit potential off-field transport

Right Source:.
1. Supply in plant available forms
2. Suit soil properties
3. Recognize synergisms among elements
4. Blend compatibility

The Right Rate: Estimate Crop Use

- Nitrogen used per unit of crop yield
- Estimated crop yield

- Example:
- Silage corn 8.3 lbs N / ton
- Yield expected is 30.0 tons/acre
- Result = 249 lb N / acre use

Note: source
Western Fertilizer Handbook, 8th ed.)
"utilized" by the crop

The Right Rate: Estimate Crop Use

For silage and hay crops, the N removed is similar to N "utilized"

SILAGE CORN

From Western Fertilizer Handbook, 8th ed.)
"utilized" by the crop
1 ton silage corn– "utilizes" 8.3 lb N
30 T would be 249 lb N

Or you can calculate uptake after the fact to use in the future.

Left Box: Two different book values are provided for silage corn; for this and other reasons, it can be more useful to calculate N requirement based on expected crop uptake; for silage crops this can be done using protein content, a method shown on the next slide.

The Right Rate: Estimate Crop Use Grain Corn

How much is needed for the crop as a starting point before subtracting various sources of N?

- Removal in grain is less than utilized by crop; grain is only 50-60% of the N utilized by the crop.
- Knowing this helps to predict expected N removal at harvest.

1. GRAIN CORN

From the harvested portion (IPNI)

1 ton corn grain – 25 lbs N

6 T would be 150 lbs N

2. "utilized " by the crop

From Western Fertilizer Handbook, 8th ed.

1 ton grain corn – "utilizes" 48 lb N

6 T would be 288 lb N

Karlen paper: 42 lbs per ton @ 15.5 % moisture

The process for grain corn is slightly more complicated than for silage, and there are multiple book values available. It is very important to distinguish between N in grain removed at harvest (method 1) or N utilized by the whole crop (method 2).

Application should be for the "utilized" N rather than the removed N. The stover N is returned to the soil as crop residue and considered as an input to the next crop

Estimating Demand

- Estimated yield
- Nitrogen removal (lb N/ton)
- 1 ton corn silage (67%) 8.3 lbs N /acre
- Yield expected is 30 tons/acre
- Result = 249 lb N / acre use

- Estimated Nitrogen Use Efficiency (NUE)

Nitrogen Use Efficiency (NUE)

- *Corn Silage N use per Acre / Nitrogen use Efficiency (NUE)*

- NUE is the amount of nitrogen removed from the field in the crop vs the amount available from all N sources.

- The NUE depends on how closely the 4 R's are followed.

- Best practices using pressurized irrigation may be able to achieve near a 70% NUE

- Most fields are currently managed at a much lower NUE

Estimated Silage Corn Demand

- Corn N use per Acre / Nitrogen use Efficiency (NUE)
- Corn use = 249 lb N/Acre / 0.70 = 356 lbs N/Acre

70% NUE is optimistic for furrow irrigation

Estimating Supply: Credits

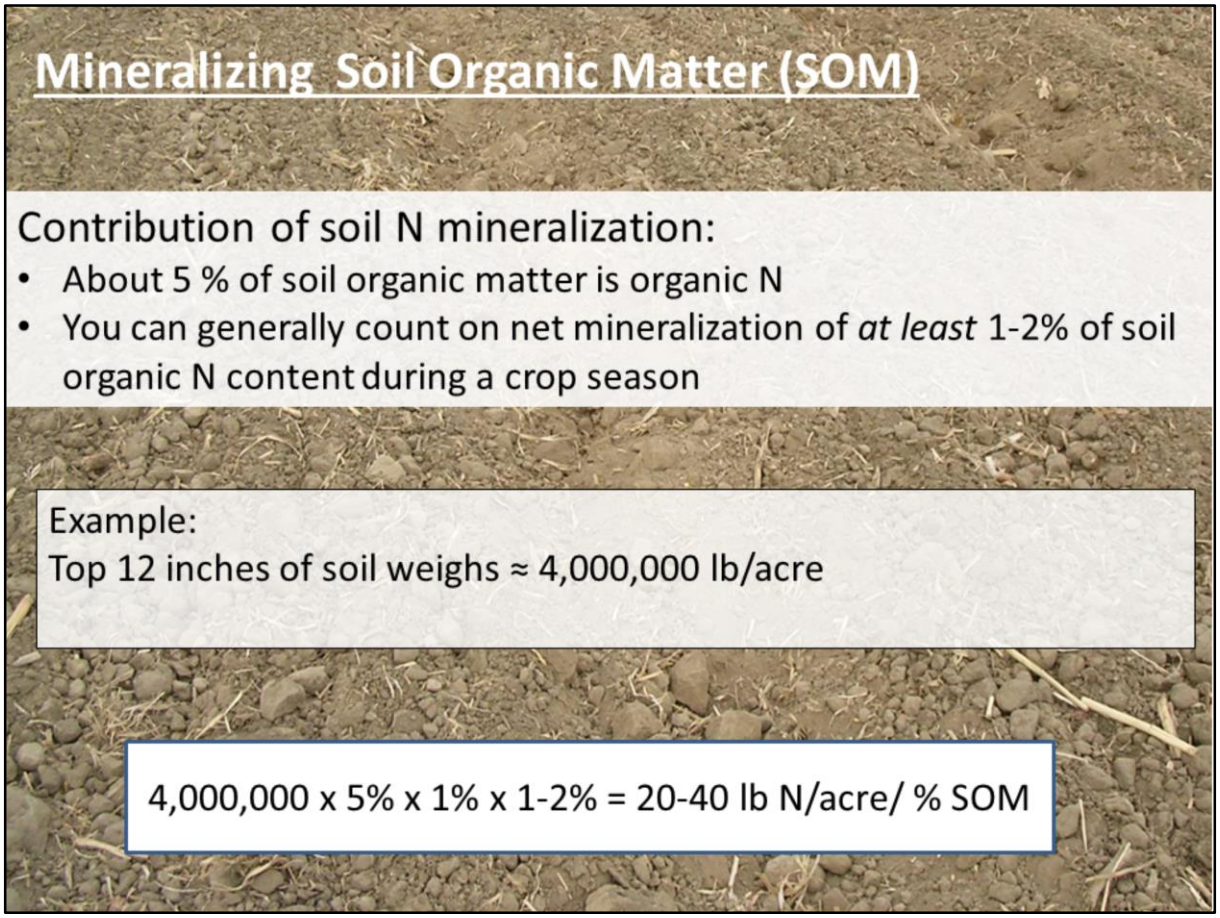
- Available soil N – Soil testing
- Soil organic matter mineralization
- Irrigation Water

Soil Available Nitrogen -- Credit

- Soil test pre plant 52 lb N /acre

Test Description	Result	Units
Primary Nutrients		
Nitrate-Nitrogen	26.0	Lbs/AF
Phosphorus-P_2O_5	174	Lbs/AF
Potassium-K_2O (Exch)	1020	Lbs/AF
Potassium-K_2O (Sol)	125	Lbs/AF

Mineral N available in the top 2 feet of soil 2 ft x 26 lbs/ft = 52 lbs/acre
The question is whether the N will be in the top 2 ft when needed.
Irrigation could move it out of the rootzone for a leaching loss



Note: the final amount is multiplied by whatever % organic matter your soil has, perhaps around 1%. The 1-2% net mineralization figure is for a crop season.

The example calculation breaks down as 4,000,000 x 5% x 1% x 1-2% = lb N/acre

Note: in systems where manure and other organic materials are being applied, these portions would be higher. Behavior of N mineralization would also change in a system with very high organic matter content.

N in the Irrigation Water -- Credit

compare ET crop to applied water

ET **corn**: 21 ac-in
Irrigation : 34 ac-in

- If applied > ET, credit only ET ac-in
- If leaching is not significant, credit all or most of the irrigation water nitrate.

Nitrate (ppm) x ac-in x 0.052 = lbs N/acre

Example: 21 ac-in x 45 ppm Nitrate x 0.052 = 49 lbs N from irrigation N

If more water is being applied than is being evaporated and transpired then some water is leaching. This means the plant is not receiving all N applied, and only the amount of N in ET should be credited. If crop water use and applied water are similar, there is more room for flexibility in the N budget.

Most of N and water uptake is in the top 2 ft. for corn. Roots may be found deeper but usually are not doing much

Note: Depending on location/time of planting/corn variety/weather, ET of corn can range from 21-27 in.

The Right Rate: N Fertilizer Application

- Crop use – Supply credits = Fertilizer application

- 356 lb N/ acre crop use

  52 lb N / acre available soil test

  30 lb N / acre mineralized soil organic matter

  49 lb N/ acre irrigation water supply

- 225 lb N / acre Fertilizer required

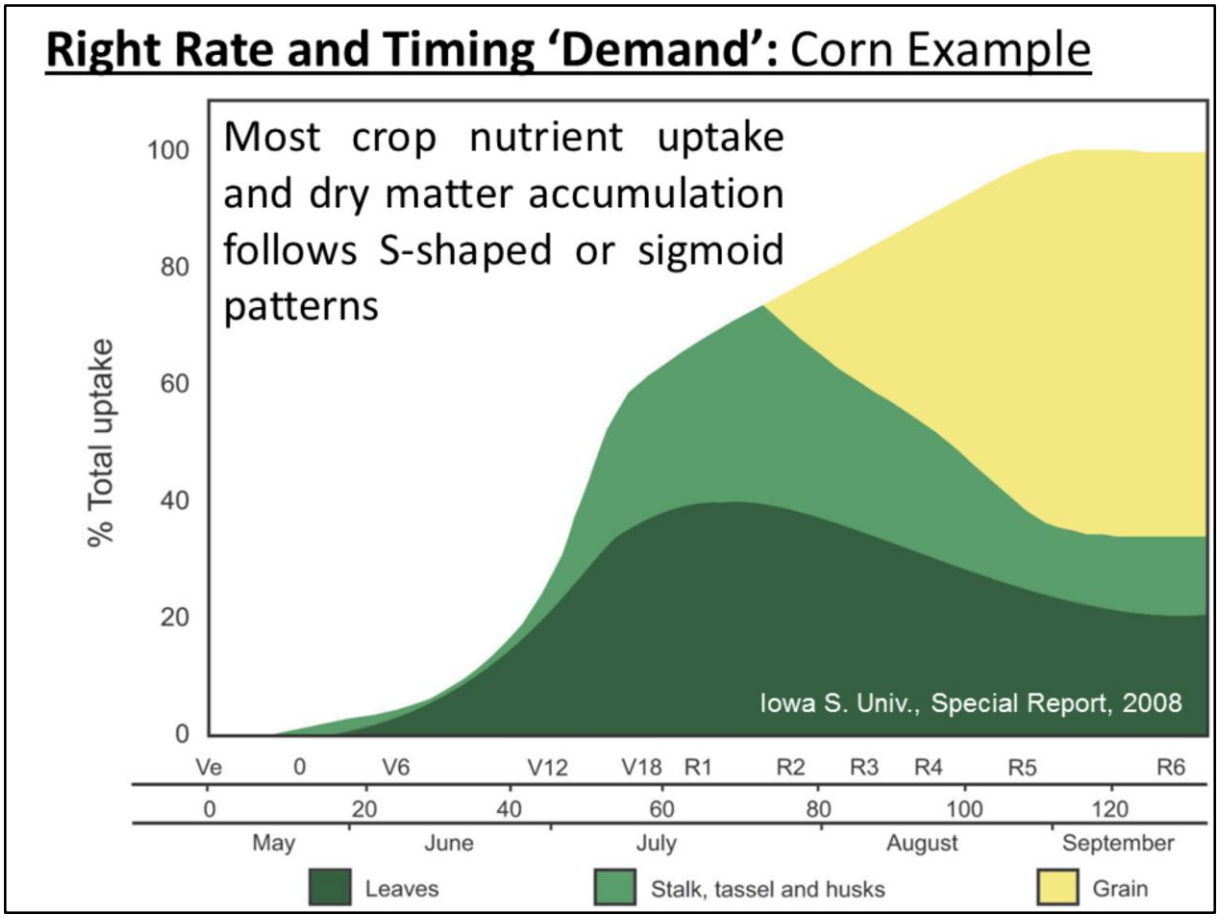


Figure: Cumulative corn N uptake divided by plant organ. Nutrient demand is characterized by slow early uptake, increase to a maximum during the rapid growth phase, and decline as the crop reaches flowering and matures. At flowering, N is remobilized from the flowers back in, rather than taken up.

Demand for N is largely driven by biomass accumulation.

Nutrient demand per time is related to growth rate; fast growth requires a high rate of N uptake and assimilation.

What Losses are Expected: Leaching Scenarios

Typical scenarios:

- Minimal leaching:
  - In fields with pressurized irrigation or clay-loam soils
  - Fertilization protocol is more straightforward and flexible
- Leaching pre and first irrigations
  - Extensive leaching during first 7-9 inches of irrigation
  - Soils then 'seal up' so leaching is no longer significant after the first few irrigations
  - Cultivation opens the soil and increases leaching potential
- Leaching all or most irrigations
  - Sandy soils

These various scenarios highlight the need for tailored N application per field.

Managing Excess Leaching:

Improving Irrigation:

- Pressurized systems reduce N leaching, but come with high costs and complications of parcel size/ownership details.
- With Surface Irrigation:
  - Reduce field length
  - Increase flow rate (flood/basin irrigation)
  - Increase slope
  - Smooth soil surface
  - Use pulsed/surge irrigation

Since land ownership details and parcel size can complicate the shift to these systems, it is not an ideal option for many. For dairies, long term/whole farm use may need to be in conjunction with new solids and salt management technologies

Many of the suggestions to improve surface irrigation are not usually sufficient on their own. Utilizing **strategic timing of N applications can make up the difference**; this means planning to have a minimal amount of N in the soil during leaching events.

Note: Details of these and other irrigation improvements can be found in Module 4, linked here: http://ciwr.ucanr.edu/files/205046.pdf

NITROGEN MANAGEMENT PLAN WORKSHEET

NMP Management Unit: _____

		4. APN(s):	5. Field(s) ID	Acres
1. Crop Year (Harvested):	2015			
2. Member ID#	xxxx	020-025-016	1	100
3. Name:	Your Name			

CROP NITROGEN MANAGEMENT PLANNING		N APPLICATIONS/CREDITS	15. Recommended/ Planned N	16. Actual N
6. Crop	Silage Corn	17. Nitrogen Fertilizers		
7. Production Unit	tons	18. Dry/Liquid N (lbs/ac)	225	
8. Projected Yield (Units/Acre)	30	19. Foliar N (lbs/ac)	0	
9. N Recommended (lbs/ac)	356	20. Organic Material N		
10. Acres	100	21. Available N in Manure/Compost (lbs/ac estimate)		
Post Production Actuals				
11. Actual Yield (Units/Acre)		22. Total Available N Applied (lbs per acre)	225	
12. Total N Applied (lbs/ac)		23. Nitrogen Credits (est)		
13. ** N Removed (lbs N/ac)		24. Available N carryover in soil; (annualized lbs/acre)	82	
14. Notes:		25. N in Irrigation water (annualized, lbs/ac)	49	
		26. Total N Credits (lbs per acre)	131	
		27. Total N Applied & Available	356	

PLAN CERTIFICATION		
28. CERTIFIED BY:	29. CERTIFICATION METHOD	
	30. Low Vulnerability Area, No Certification Needed	
	31. Self-Certified, approved training program attended	
DATE:	32. Self-Certified, UC or NRCS site recommendation	
	33. Nitrogen Management Plan Specialist	

Available N = total of soil organic mater mineralization (30 lb N /acre) and available soil N 52 lbs N /acre

The amount of **Nitrogen Recommended** (estimated amount needed) to be applied to meet your expected yield. Use crop recommendations from CDFA, UCCE, NRCS, commodity organizations or site specific knowledge based on previous experience to appropriately estimate the amount of Nitrogen (N) needed. This should be the same number used in #27, Total N Applied and Available.

University of California

Nitrogen Management Training

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