Nutrient Budgeting: Organic Considerations for Implementing NRCS CPS 590

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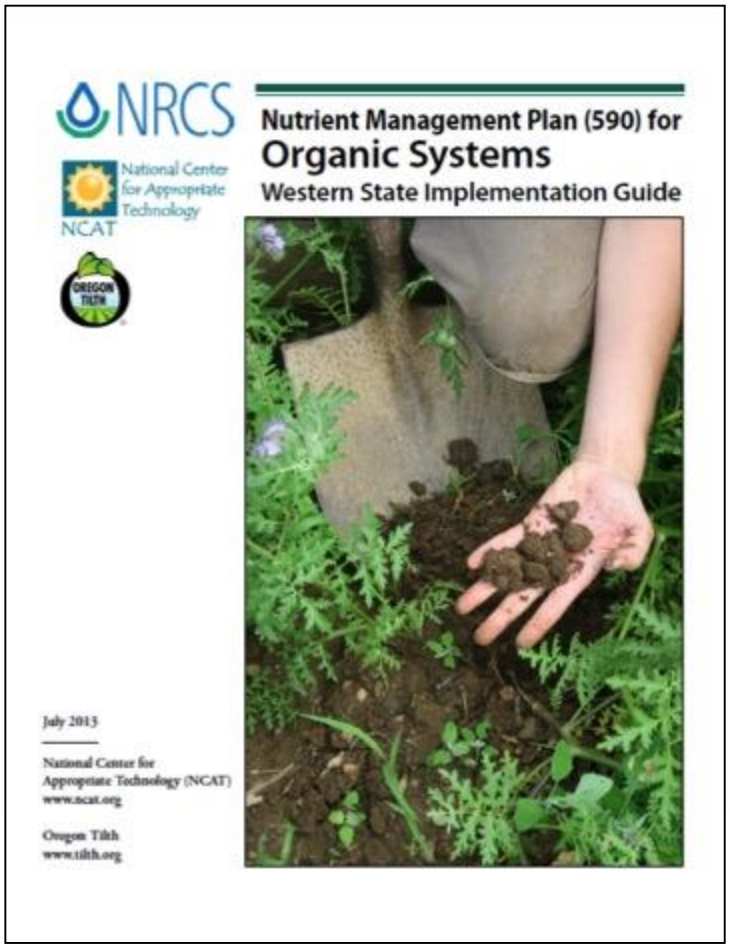
Presentation Outline

- Relevant NOP Regulations
- Crop nutrient requirements
- N:P challenge
- PAN in organic systems
- Using Organic Fertilizer & Cover Crop Calculator



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NOP Soil Fertility & Nutrient Mgt

a) …maintain or improve the physical, biological, and chemical condition of soil and minimize soil erosion

b) …(use) rotations, cover crops, and the application of plant and animal materials

c) …manage plant and animal materials to maintain or improve soil organic matter content

d) Manage crop nutrients and soil fertility to maintain or improve soil organic matter content

e) The producer must not use prohibited substances.

NOP Manure Standards

- If applied to land growing a crop for human consumption raw manure must be incorporated into soil according to pre-harvest intervals:
  - 90 days if edible portion does not have contact with soil particles
  - 120 days if edible portion does have contact with soil particles

NOP Compost Standards

*for compost derived from manure

- Initial C:N ratio between 25:1 and 40:1
- Maintain temperatures between 131° F and 170° F for:
  - 3 days using in-vessel or static aerated pile system, or
  - 15 days using a windrow composting system, during which period the materials must be turned a minimum of five times.
- NOSB Guidance
  - Attain 131° F for at least 3 days and mix or manage pile to ensure all feedstock heats to the minimum temperature
  - Processed manure: heated to 150° F for at least 1 hour and dried to 12% or less, or equivalent heating and drying that produces product that is negative for *Salmonella* and fecal coliform.

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Questions?

NRCS 590- Nutrient Management

FIELD AND CROP INFORMATION			
List crop rotation. Identify current crop with a check.			
P Index:		Soil Map Unit:	
No Data			
Current	Crop	Yield	units
❑			
❑			
❑			
❑			
❑			
❑			

Soil Test Information*					
Date:			Laboratory Used:		
Depth:			❑	Certified Lab	
N (NO_3 + NH_4)	P	K	pH	OM%	Other:
Use ppm for units, refer to last page of job sheet for conversions					
* For some crops (e.g., blueberries), OSU recommends using last year's tissue test results rather than soil tests.					

RECOMMENDED NUTRIENTS TO MEET YIELDS				
	PAN	P_2O_5	K_2O	pH
Reference:				
Notes on Adjustments:				

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Determining Crop N-P-K Requirement

- Refer to University fertilizer guides (UC, OSU, MN, etc.)
- Look at states with similar climate and crops if needed.
- Many organic farms are highly diverse and crops with similar nutrient requirements are fertilized the same.
- Do NOT need to be organic-specific guides.

Nutrient Management for Commercial Fruit & Vegetable Crops in MN

Vegetable Crops

Table 28. Nitrogen recommendations for vegetable crops.

Crop	Approximate Yield Goal[2]	Soil Organic Matter Level (O.M.)[1] Low	Medium	High	Organic Soil	Suggested Method of Application[3,4,5]
	cwt/A	N to apply (lb/A)				
Asparagus (New Planting)	—	120	100	80	50	1/3 broadcast, 2/3 sidedress during cultivation
Asparagus (Est. Planting)	40	80	60	40	20	topdress before cutting starts or after harvest
Beets, table	200	100	80	60	30	1/2 broadcast, 1/2 sidedress 3-5 wks after planting
Broccoli	120	180	160	140	100	1/3 bcst, 1/3 sidedress 2 wks after planting, 1/3 sidedress 5 wks after planting
Brussels sprouts	175	140	120	100	70	1/3 bcst, 1/3 sidedress 2 wks after planting, 1/3 sidedress 5 wks after planting
Cabbage	400	180	160	140	100	1/3 bcst, 1/3 sidedress 2 wks after planting, 1/3 sidedress 5 wks after planting
Carrots	400	120	100	80	50	1/2 broadcast, 1/2 sidedress when plants are established
Cauliflower	150	180	160	140	100	1/3 bcst, 1/3 sidedress 2 wks after planting, 1/3 sidedress 5 wks after planting
Celery	600	180	160	140	100	1/3 bcst, 1/3 sidedress 2 wks after planting, 1/3 sidedress 5 wks after planting
Cucumber	250	100	80	60	30	1/2 broadcast, 1/2 sidedress when vines begin to run
Eggplant	250	120	100	80	50	1/2 broadcast, 1/2 sidedress when fruit appear
Endive	180	120	100	80	50	1/2 broadcast, 1/2 sidedress 3-5 wks after planting
Garlic	150	120	100	80	50	1/3 broadcast at planting (Sept./Oct.), 2/3 sidedress when shoots emerge in spring
Lettuce	300	120	100	80	50	1/2 broadcast, 1/2 sidedress 3-5 wks after planting
Mint	—	120	100	80	50	1/2 broadcast, 1/2 sidedress 3-5 wks after planting
Muskmelon	200	100	80	60	30	1/2 broadcast, 1/2 sidedress when vines begin to run
Onions (dry)	500	130	110	90	60	1/4 banded, 3/4 sidedress 4-5 wks after emergence
Onions (green)	150	80	60	40	20	1/4 bcst, 1/2 sidedress 4-5 wks after emergence, 1/4 sidedress 4 wks before hvst
Parsley	—	100	80	60	30	1/2 broadcast, 1/4 after first cutting, 1/4 after 2nd cutting
Parsnips	400	120	100	80	50	1/2 broadcast, 1/2 sidedress after plants are established
Peppers	200	140	120	100	70	1/2 broadcast, 1/2 sidedress after fruit appear

http://www.extension.umn.edu/garden/fruit-vegetable/nutrient-management-for-commercial-fruit-and-vegetables-in-mn/

Vegetable N Requirements: small, diverse farms

Soil fertility management for organic crops (2006), UC Publication 7249, Gaskell et al.

Low total N content <120 lb/ac	Medium total N content 120-200 lb/ac	High total N content >200 lb/ac
Baby greens	Carrot	Broccoli
Beans	Corn, sweet	Cabbage
Cucumbers	Garlic	Cauliflower
Radish	Lettuce	Celery
Spinach	Melons	Potato
Squashes	Onion	
	Peppers	
	Tomatoes	

How is an organic nutrient management different?

- Dependent on many variables
  - Cover crop stand, soil temp, moisture, tillage, OM%.....
- Slower release
- Often higher P applications (with manure & compost)
- Soil quality builds and provides returns over time
- Diversified & specialty crop operations pose additional challenges
  - Small blocks of crops
  - Complexity of different crop needs
  - Seasonal changes in N mineralization

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Nitrogen/Phosphorous Ratios

	CROP UPTAKE (lbs/ac)		
	N	P_2O_5	K_2O
beans	100	40	150
cabbage	220	75	300
carrot	140	50	170
cauliflower	220	90	300
cucumber	110	45	110
onion	160	45	140
radish	100	50	100
tomato	160	60	170
peas	100	40	70
Mean	***146***	***55***	***168***
Mean nutrient ratio	***2.6***	***1.0***	***3.1***

	ORGANIC AMENDMENTS (%)		
	Total N	P_2O_5	K_2O
Dairy manure & bedding	0.5	0.2	0.5
Poultry manure & litter	2.8	2.3	1.7
Pelleted chicken manure	4.0	3.0	3.0
Composted poultry manure	0.9	2.0	1.2
Composted dairy manure	0.6	0.6	1.3
Mean	***1.7***	***1.6***	***1.5***
Mean nutrient ratio	***1.1***	***1.0***	***1.0***

	PAN	P_2O_5	K_2O
Vegetable crop	150	60	170
3.5 tons chicken manure	145	210	210

	Specialty Products		
	Total N	P_2O_5	K_2O
Feather meal	12.0	0.0	0.0
Blood meal	12.0	0.0	0.0
Fish meal	10.0	6.0	2.0
Soybean meal	7.0	2.0	1.0
Sulfate of potash	0.0	0.0	22.0
Muriate of potash	0.0	0.0	60.0
Bone meal	2.0	15.0	0.0
Rock phosphate	0.0	2.0	0.0

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Courtesy of Nick Andrews, OSU Extension

NRCS 590- Nutrient Management

NUTRIENT SOURCES				
Credits	**PAN (lbs/acre)**	**P_2O_5 (lbs/acre)**	**K_2O (lbs/acre)**	**Other__ (lbs/acre)**
1. Adjustment to soil N Mineralization				
2. Nitrate from irrigation water				
3. Nitrogen from previous cover crop				
4. Other source(s)				
5. TOTAL CREDITS				
6. FINAL NUTRIENTS RECOMMENDED FOR YIELD (FOR UPCOMING CROP)				
Nutrients to be applied to the field. Rate (lbs/acre)	**Planned**	**Planned**	**Planned**	**Planned**
7. Manure rate per acre**				
8. Compost* rate per acre**				
9. Specialty Organic Fertilizer Product: Analysis:				
10. Total Organic Inputs (add lines 7, 8, and 9)				
11. Nutrient status (subtract line 6 from line 10)				

If the number on line 11 is **positive**, this indicates over application.
If the number on line 11 is **negative**, this indicates under application.
If the number is 0, then planned applications meet and do not exceed crop requirements.
Include an explanation of these numbers, especially as they relate to the Phosphorus Index.

Describe Timing below (when organic applications are and are not going to occur) and Application Methods (surface applied with or without incorporation, time lapse until incorporation, applied at planting with tillage, injected, and other details relevant to how the organic amendments are applied).

Other Information/ Considerations to Nutrient Management Plan: 1) Calibration of application equipment is required. See Calibration tab for guidance on equipment calibration. Fillable calibration worksheets are available on Oregon's eFOTG, Section IV, Conservation Practices, WasteUtilization (633) Job Sheet and shall be attached to this nutrient management plan and reviewed with the producer.

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Nitrogen Credits

- Soil organic matter
- Cover crops
- Irrigation water

Information needed	Resource or calculation
+ Crop N requirement	University fertilizer guides, N-uptake studies
- N in irrigation water	Water test: NO_3-N (lb/ac) = in. water app'd * ppm NO_3-N * 0.227
- N mineralized from organic matter	Pre-season estimates and in-season monitoring
- N mineralized from cover crops	Cover crop sampling and OSU Organic Fertilizer and Cover Crop Calculator

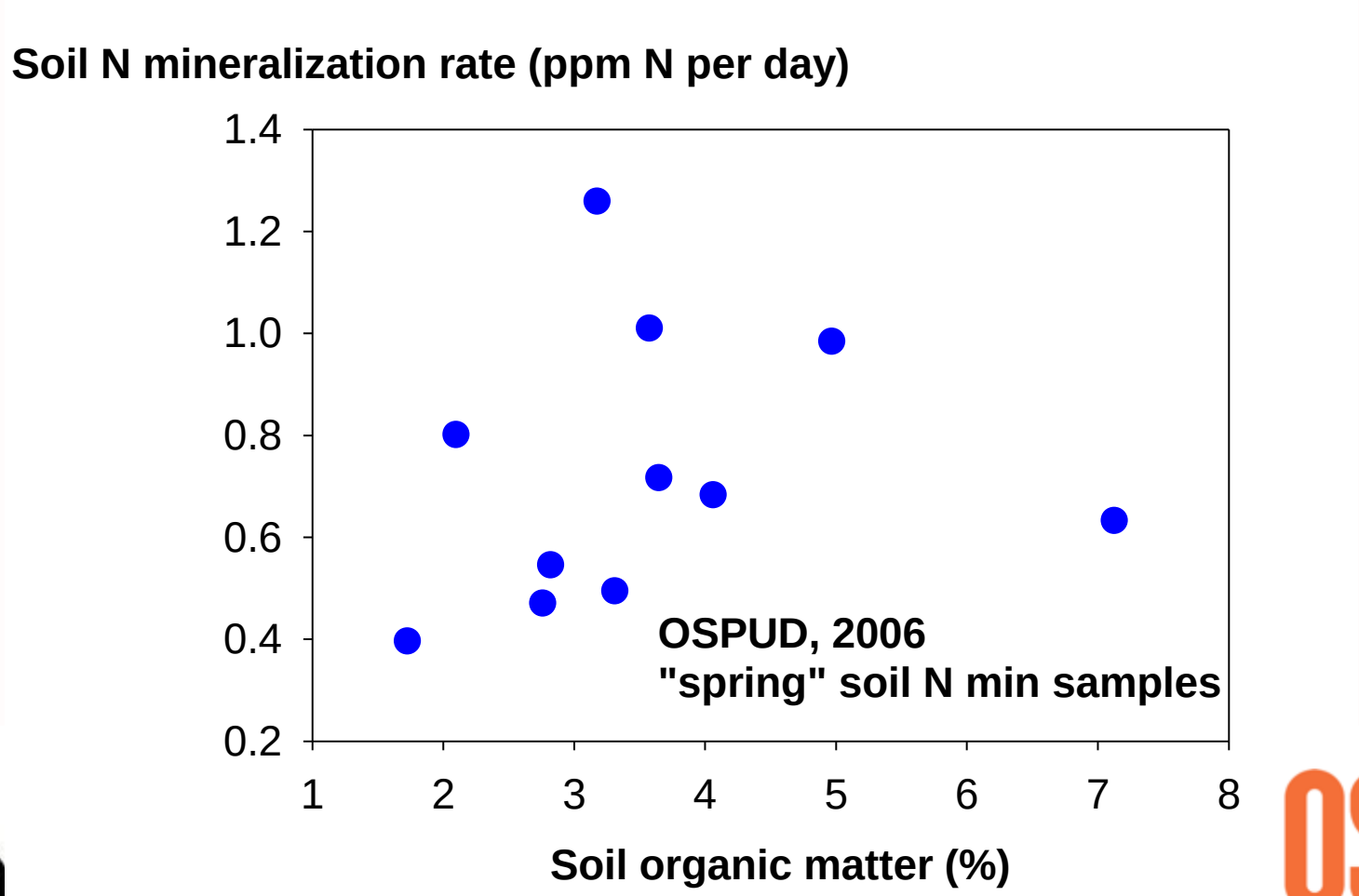
Courtesy of Nick Andrews, OSU Extension

Types of Soil Organic Matter

Pool	Size/Age (years)	Functions
Biologically Active	Small 1-5	**Meat:** nutrient mineralization, macro-aggregation, disease suppression
Protected	Intermediate 5-30	**Bones:** soil structure, porosity, water relations
Stable	Large 50-10,000	Micro-aggregation, CEC, fate of compounds, color

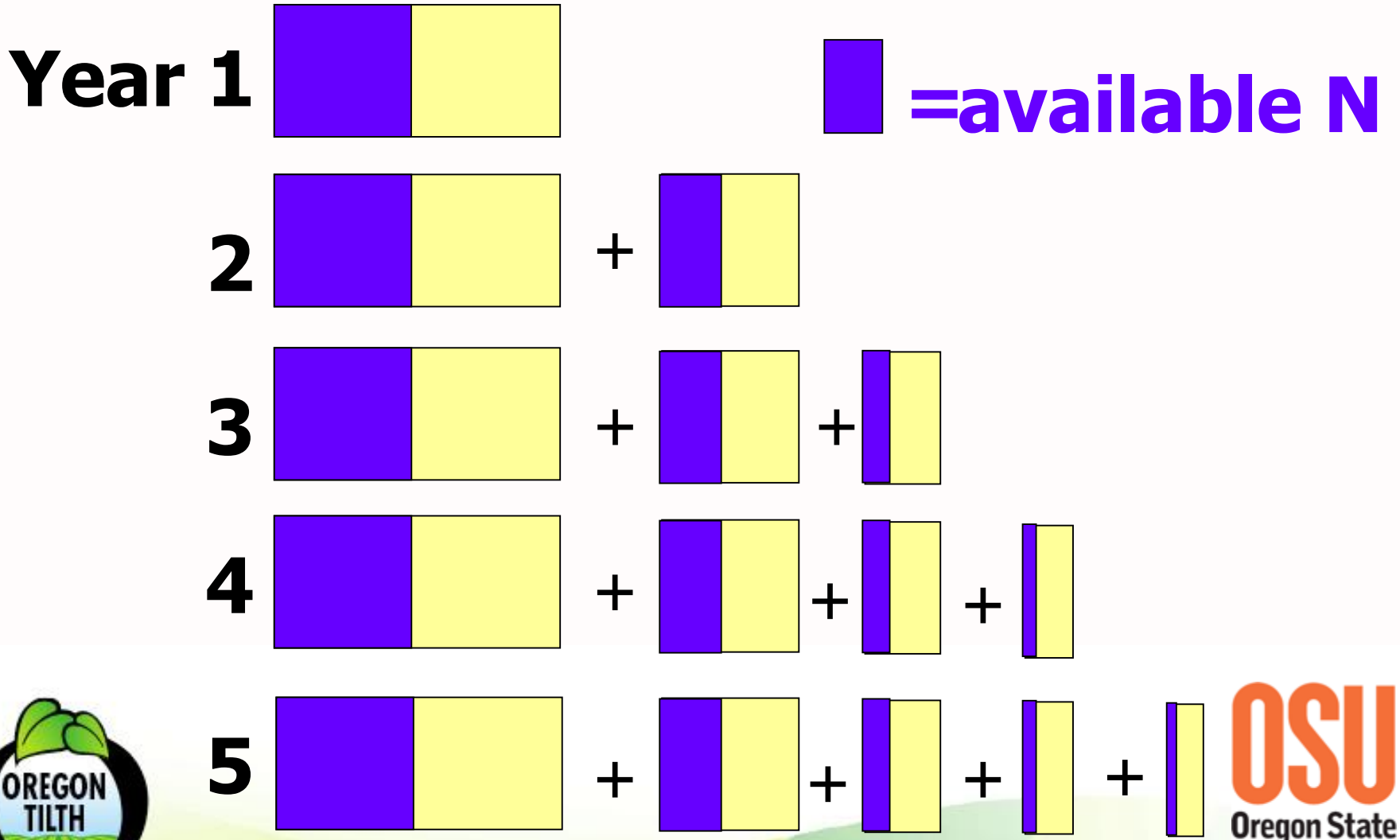
Courtesy of Nick Andrews, OSU Extension

Does total soil organic matter correlate with N mineralized from soil OM?



Courtesy of Nick Andrews, OSU Extension

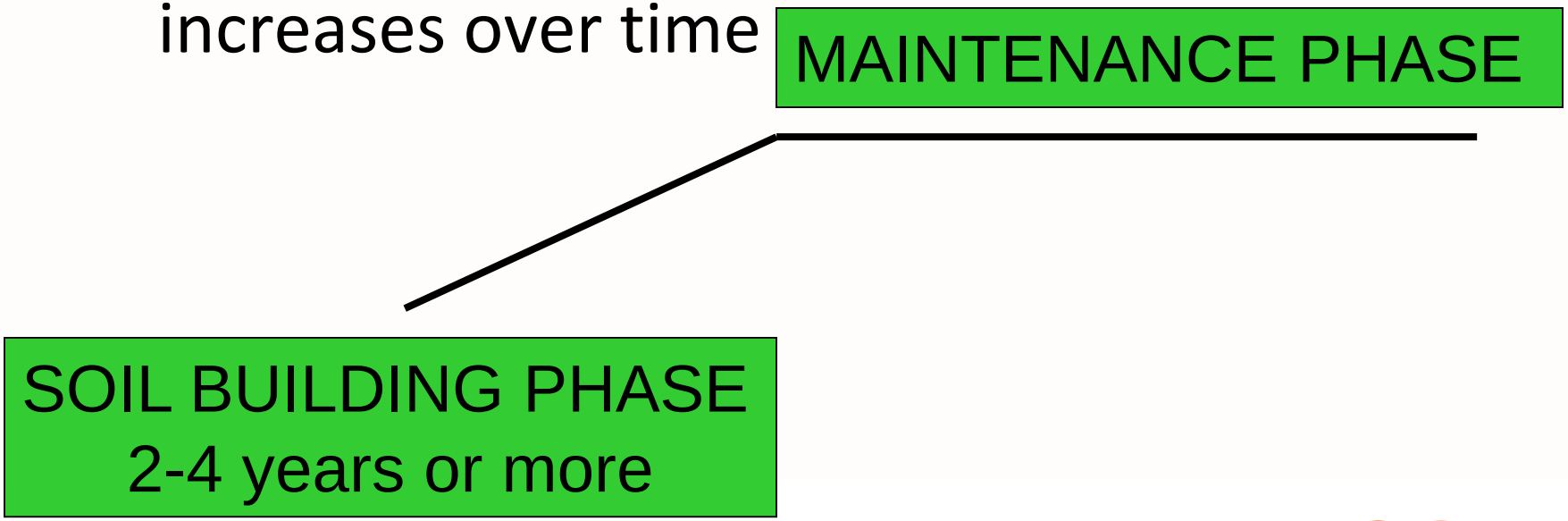
Cumulative Available N from Organic Sources



Courtesy of Dan Sullivan OSU Crop & Soil Science

Organic Equilibrium

- Organic matter & soil C accumulate over time
- Soil fertilizer (e.g. N mineralization) increases over time



Courtesy of Dan Sullivan OSU Crop & Soil Science

Estimating Organic Matter Nmin Potential

- If organic amendment application records are not available, use table below.

Estimated N credit	Field history
0	No previous organic inputs
50 lbs/ac	≥ 3 years of history of organic inputs

Courtesy of Nick Andrews, OSU Extension

Estimating Organic Matter Nmin Potential

- If organic amendment application records ARE available

PAN, Percent of Total N (general rule)	Years After Application	lbs PAN per acre
45%* x 80 lbs/acre	current year	36
8% x 80 lbs/acre	1	6.4
5% x 80 lbs/acre	2	4
3% x 80 lbs/acre	3	2.4
* From Table 7		

Courtesy of Nick Andrews, OSU Extension

Questions?


Cover Crops & Nutrient Management

Cover crops

Product	$/ton	Total % N	Est'd % PAN	$/lb PAN	$/100lbs PAN
Urea (not organic)	$500	46%	100%	$0.54	$54
	$1000	46%	100%	$1.09	$109
Processed chicken manure	$200	4%	50%	$5.00	$500
	$250	4%	50%	$6.25	$625
Legume cover crops	**$1-3.00/lb PAN** All costs attributed to PAN			**$0.50-$1.50/lb PAN** Seed and inoculum only	

Courtesy of Nick Andrews, OSU Extension

Cover Crop PAN Varies

Rye, vetch and peas
~20” canopy

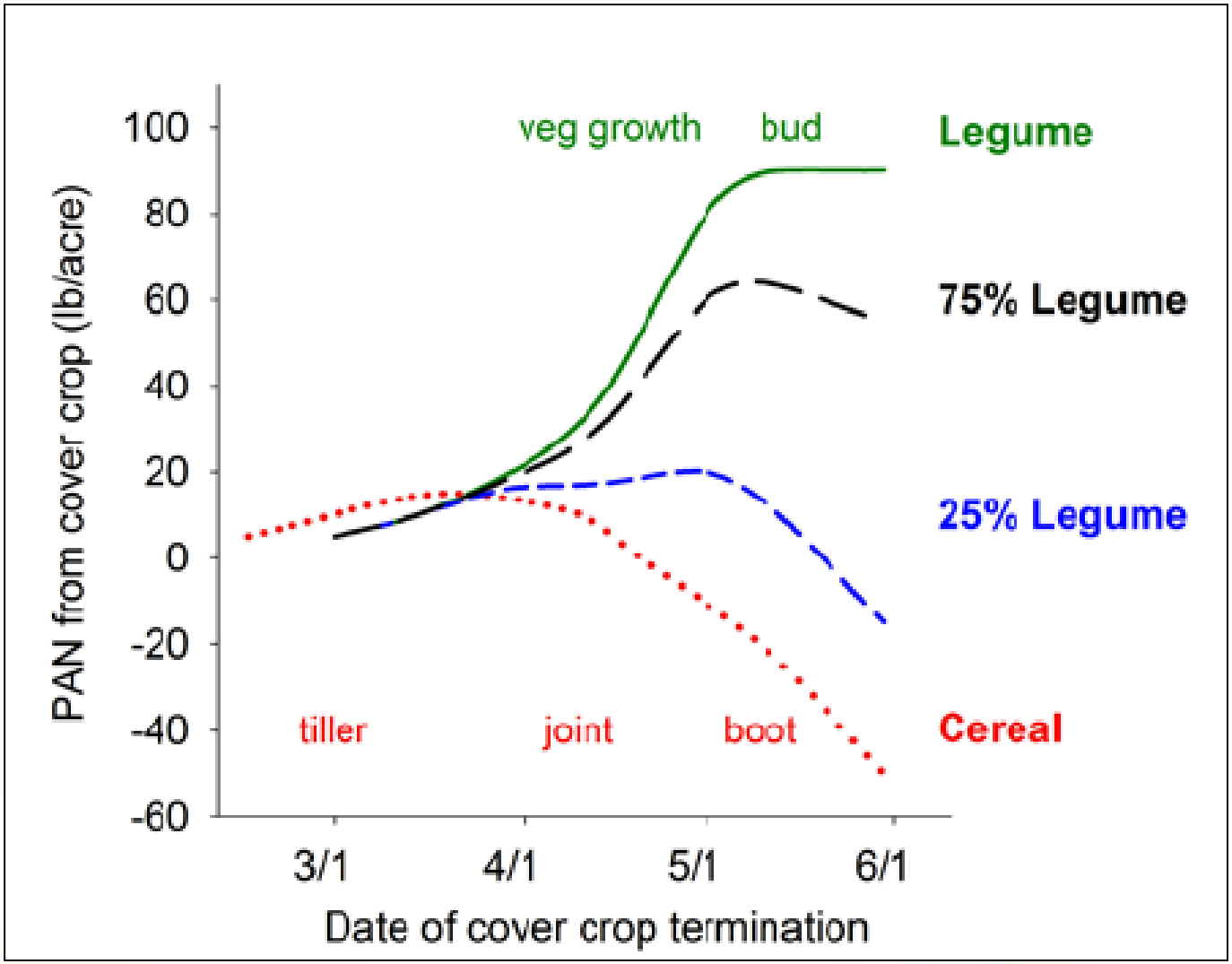
~155 lbs total N & 60 lbs PAN

~110 lbs total N & 10 lbs PAN

Oats and vetch
~26” canopy

Courtesy of Nick Andrews, OSU Extension

Terminating Cover Crops for Maximum N



Courtesy of Nick Andrews, OSU Extension

Lab analysis:
Total percent N
Percent dry matter

OSU
Oregon State
UNIVERSITY

No lab analysis?

	Percent dry matter	Total %N
Common vetch and other legumes	12-18%	3-4%
Cereals	15-20%	1.5-2.5%
50/50 vetch/cereal mix	15%	2.5-3%

You still need to estimate the cover crop biomass.

Courtesy of Nick Andrews, OSU Extension

NRCS 590- Nutrient Management

NUTRIENT SOURCES				
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2. Nitrate from irrigation water				
3. Nitrogen from previous cover crop				
4. Other source(s)				
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Nutrients to be applied to the field. Rate (lbs/acre)	**Planned**	**Planned**	**Planned**	**Planned**
7. Manure rate per acre**				
8. Compost* rate per acre**				
9. Specialty Organic Fertilizer Product: Analysis:				
10. Total Organic Inputs (add lines 7, 8, and 9)				
11. Nutrient status (subtract line 6 from line 10)				

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National List of Allowed & Prohibited Substances

- Synthetic substances are prohibited, non-synthetic substances are allowed.
- National List is the list of exceptions to that rule
- *Synthetic.* A substance that is formulated or manufactured by a chemical process or by a process that chemically changes a substance extracted from naturally occurring plant, animal, or mineral sources, except that such term shall not apply to substances created by naturally occurring biological processes.

Table 4. Nutrient analysis (percent by weight) of common organic fertilizer materials (Gaskell et al., 2007)

Material	Nitrogen (% N)	Phosphorus (% P_2O_5)	Potassium (% K_2O)
Chilean nitrate	16	0	0
Blood meal	12	0	0
Feather meal	12	0	0
Fish meal/powder	10-11	6	2
Seabird & bat guano	9-12	3-8	1-2
Meat and bone meal	8	5	1
Soybean meal	7	2	1
Processed liquid fish residues*	4	2	2
Alfalfa meal	4	1	1
Pelleted chicken manure	2-4	1.5	1.5
Bone meal	2	15	0
Kelp	<1	0	4
Soft rock phosphate	0	15-30*	0
Potassium-magnesium sulfate	0	0	22
Cocoa shells	1	1	3
Cottonseed meal	6	2	2
Granite dust	0	0	5
Hoof & horn meal	11	2	0
Seaweed, ground	1	0.2	2
Muriate of potash (KCl)	0	0	60

* Note: all analyses are % by weight, as specified in state fertilizer laws. For liquids, product density (weight per gallon) should be used to calculate nutrient application rate: (g/ac)*(lb nutrient/g)=(lb nutrient/ac)

* *Soft rock phosphate provides only 1-3% of its P in acid soils, and little or no P in soils with pH over 7.

Generic Materials Search: hay

2 results

2 items found.

print page

View the OMRI Generic Materials List Glossary in PDF format here.
Click on the arrow or the material name to view more details about each material.

Open All | Close All

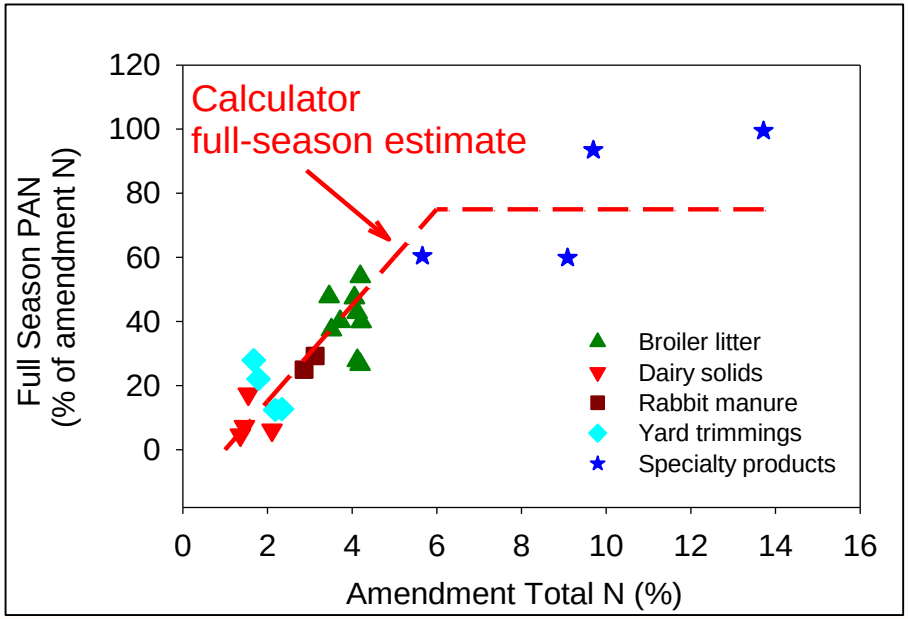
▼ Bedding

Status: Allowed
Class: Livestock Management Tools and Production Aids
Origin: Nonsynthetic
Description: Roughage (e.g. hay, straw, corn stalks, rice hulls, peanut hulls) used as bedding must be organically produced. Wood products used as bedding may not contain prohibited substances.
NOP Rule:

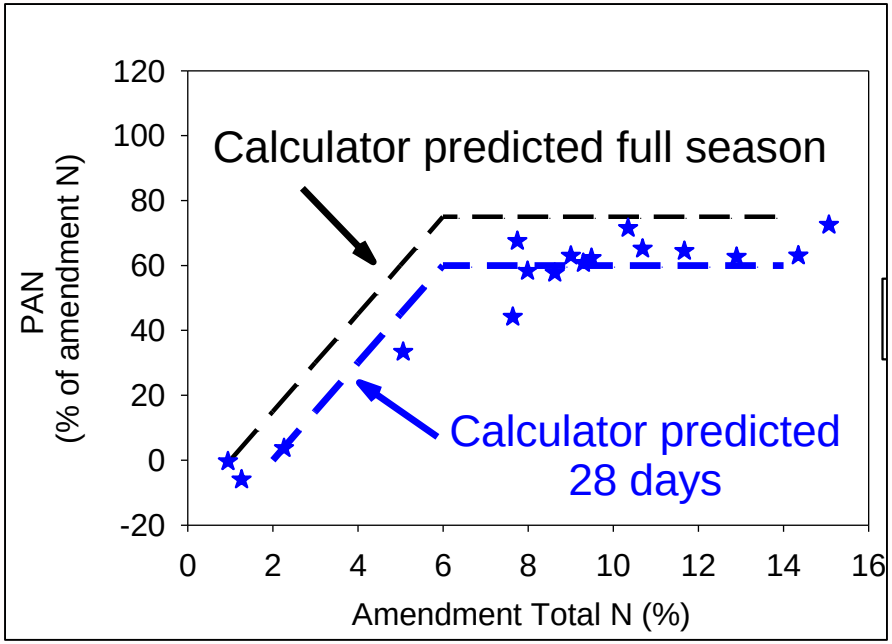
▼ Plants

Status: Allowed
Class: Crop Fertilizers and Soil Amendments, Crop Management Tools and Production Aids
Origin: Nonsynthetic
Description: Includes aquatic or terrestrial plants or parts of plants such as cover crops, green manures, crop wastes, hay, leaves, meals and straw. Parts of plants used as soil amendments and foliar feeds are permitted. May be from nonorganic sources. Specific materials must be evaluated using the OMRI GMO Decision trees to determine compliance. See also COCOA BEAN HULLS, COTTON GIN TRASH, COTTONSEED MEAL, PLANT EXTRACTS, and individual plant listings.
NOP Rule: 205.203(c)(3) Uncomposted plant materials.

Organic Fertilizer N Mineralization



Gale et al. (2006). J Env Qual 35:2321-2332



PAN estimates are approx. 75%.

Courtesy of Nick Andrews, OSU Extension

Monitor soil N min

End of season “report card” (at harvest, before winter rain).

	NO_3-N (ppm)
Low	<10
Medium	10-20
High	20-30
Excessive	>30

Courtesy of Nick Andrews, OSU Extension

Questions?

http://smallfarms.oregonstate.edu/calculator

Organic Fertilizer and Cover Crop Calculator

This free online tool compares the nutrient value and cost of cover crops, organic and synthetic fertilizers and compost. Use this Excel Calculator to develop well balanced and cost effective nutrient management programs for your farm. Developed by Nick Andrews, Dan Sullivan, Jim Julian and Kristin Pool.

Download the Calculator

- Quick Guide & Records Sheet - the quick guide illustrates the main steps used to use the calculator, the records sheet identifies all the information needed to use the calculator.
- Cover Crop Sampling Instructions - these instructions explain how to sample cover crops in your field.
- Estimating plant available nitrogen release from cover crops (PNW 636) - this PNW Extension Publication introduces a shortcut method for estimating cover crop plant-available nitrogen (PAN) release, describes the science behind cover crop PAN estimates, and uses on-farm case studies to address other frequently asked questions about cover crop PAN.
- Research Background - these papers and eOrganic webinar provide more information about the research supporting the PAN estimates provided in the calculator.

Fertilizer Analysis & PAN

	A	B	C	E	F	G	H	I	J	K	L	M
1	***ENTER FERTILIZER ANALYSES & SEE FERTILIZER, COMPOST AND COVER CROP PAN ESTIM***											
2	***Enter your information in yellow cells. Results are in green cells.***											
3	**MATERIAL**	**FERTILIZER ANALYSIS (%) (ppm/10,000=%)**										
4	OREGON TILTH ® / OSU Oregon State University Extension Service	**Total % N from label ("as-is" basis; % of product)**	**Total % dry matter (% of product)**	**%PAN at 28 days (% of amendment total N, dry wt basis)**	**%PAN after full season (% of amendment total N, dry wt basis)**	**PAN at 28 days (lb N per 100lb amendment "as-is" basis)**	**PAN after full season (lb N per 100lb amendment "as-is" basis)**	**P_2O_5 (%)**	**K_2O (%)**	**Ca (%)**	**Mg (%)**	**S (%)**
5	**ORGANIC FERTILIZERS**											
6	Blood meal (12.5-1.5-0.6)	12.5	91	60	75	7.50	9.38	1.5	0.6			
7	Bone meal (3-20-0.5)	3.0	95	17	32	0.52	0.97	20.0	0.5			
8	Chicken manure - dried (3.5-2-2)	3.5	85	32	47	1.11	1.64	2.0	2.0	7.0	1.0	0.5
9	Feather meal (granulated) (13-0-0)	13.0	97	60	75	7.80	9.75	0.0	0.0			
10	Fish meal (10-6-2)	10.0	92	60	75	6.00	7.50	6.0	2.0			
11	Meat and bone meal (7-8-0)	7.0	93	60	75	4.20	5.25	8.0	0.0			
12	Muriate of potash (KCl) (0-0-60)	0.0	100	0	0	0.00	0.00	0.0	60.0			
13	Soy meal (6.5-1.5-2.4)	6.5	90	60	75	3.90	4.88	1.5	2.4		3.0	
14	Sulfate of potash (0-0-50)	0.0	99	0	0	0.00	0.00	0.0	50.0		0.0	17.0
15	Sulfate of potash magnesia (0-0-22)	0.0	99	0	0	0.00	0.00	0.0	22.0		10.8	22.0
16	New fertilizer (5-3-3)			0	0	0.00	0.00					
17				0	0	0.00	0.00					
18	**SYNTHETIC FERTILIZERS**											
19	Triple super phosphate (0-40-0)	0.0	N/A	100	100	0.00	0.00	40.0	0.0			
20	Urea (46-0-0)	46.0	N/A	100	100	46.00	46.00	0.0	0.0			
21			N/A	100	100	0.00	0.00					
22			N/A	100	100	0.00	0.00					

Fertilizer Analysis | Cover Crop Analysis | Your Costs | Cost Comparisons | Nutrients Provided

Courtesy of Nick Andrews, OSU Extension

Cover Crop Analysis & PAN

	A	B	C	D	E	F	G	H	I	J
1	***ENTER YOUR COVER CROP INFORMATION FROM THE FIELD AND THE LAB***									
2	***Enter your information in yellow cells. Results are in green cells.***									
3	OREGON TILTH / OSU Oregon State University Extension Service	**Area sampled (ft^2)**	**Fraction of acre sampled**	**Fresh weight of field sample (x.x lb)**	**% N from lab (x.x%)**	**% dry matter from lab (xx.x%)**	**fresh weight (lbs/A)**	**Total dry weight (lb/A)**	**Total N (lb/A)**	**PAN (lb/A)**
4	**COVER CROPS**									
5	Common vetch	16	0.000367	8.0	3.5	22.0	21780	4792	168	79
6	Rye vetch	16	0.000367	8.0	2.5	22.0	21780	4792	120	38
7	Common vetch (seed only)	16	0.000367	8.0	3.5	22.0	21780	4792	168	79
8	**Comments to:**	nick.andrews@oregonstate.edu								

Fertilizer Analysis | **Cover Crop Analysis** | Your Costs | Cost Comparisons | Nutrients Provided

Your Costs: seed, fuel, labor

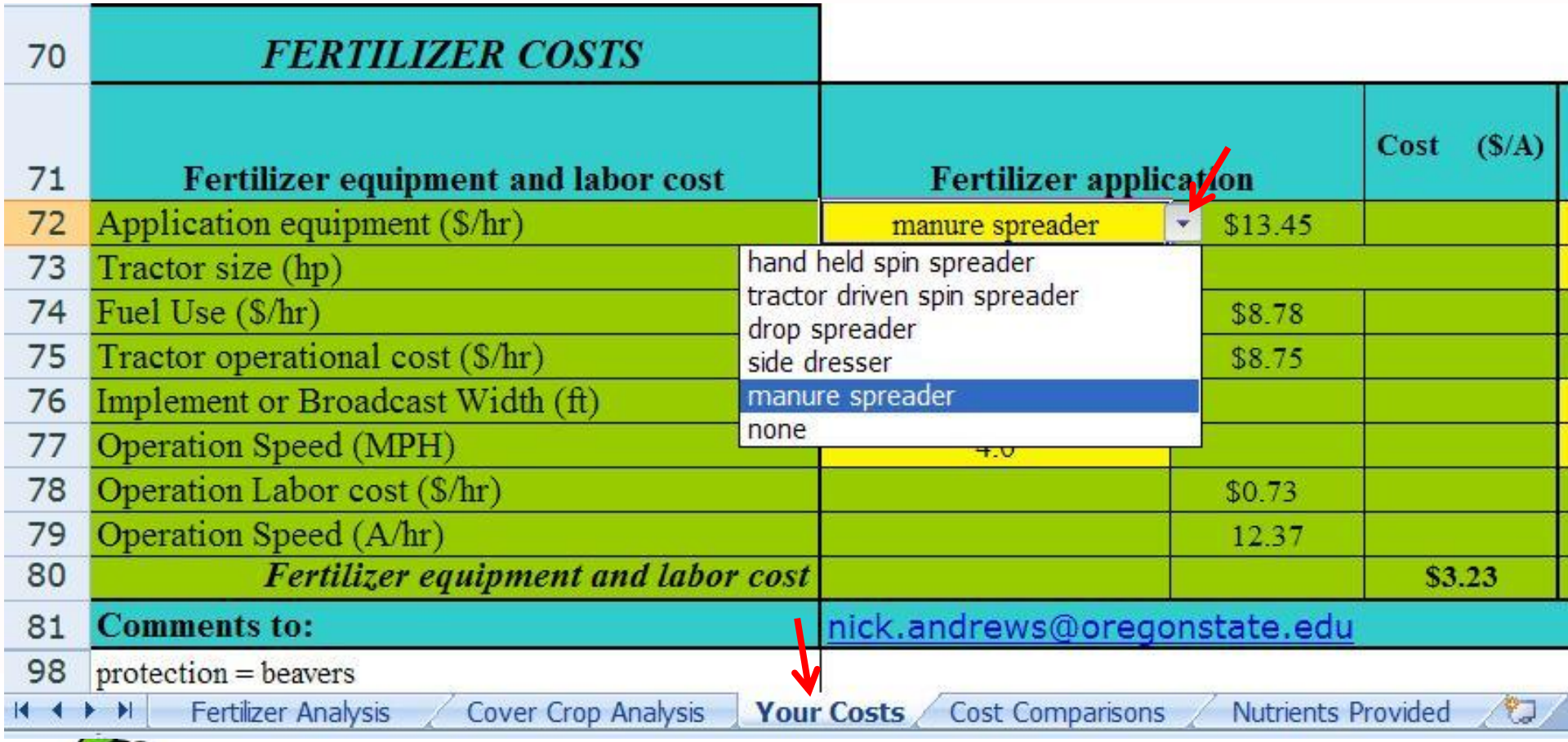
	A	B	C	D
1	***ENTER YOUR COSTS SPECIFIC TO COVER CROPS (ROWS 7-69) AN***			
2		***Enter your information in yellow cell***		
3		**Field 1**		
4		**Common vetch**		
5	***COVER CROP COSTS***	**Your Information**		**Cost ($/A)**
6	**Input costs**			
7	Mixture or species 1 seed cost ($/lb)	$0.70		
8	Mixture or species 1 seed rate (lbs/A)	70	$49.00	
9	Species 2 seed cost ($/lb)			
10	Species 2 seed rate (lbs/A)		$0.00	
11	Species 3 seed cost ($/lb)			
12	Species 3 seed rate (lbs/A)		$0.00	
13	Inoculum	$2.00	$2.00	
14	*Total seed and inoculum cost ($/A)*			$51.00
15	Fuel cost ($/gal)	$2.85		
16	Labor cost ($/hr)	$9.00		
17	**Cover crop seeding**			
18	Seeding method ($/hr)	tractor driven spin spreader	$6.73	
19	Tractor size (hp)			
20	Fuel Use ($/hr)		$8.78	
21	Tractor operational cost ($/hr)		$8.75	

drill
drop spreader
tractor driven spin spreader
hand held spin spreader

Your Costs – establishment

	A	B	C	D
1	ENTER YOUR COSTS SPECIFIC TO COVER CROPS (ROWS 7-69) AN			
2		Enter your information in yellow cell		
3		Field 1		
4		Common vetch		
5	COVER CROP COSTS	Your Information		Cost ($/A)
17	Cover crop seeding			
18	Seeding method ($/hr)	tractor driven spin spreader	$6.73	
19	Tractor size (hp)	70		
20	Fuel Use ($/hr)		$8.78	
21	Tractor operational cost ($/hr)		$8.75	
22	Implement or broadcast width (ft)	30		
23	Operation Speed (MPH)	4.0		
24	Operation Labor cost ($/A)		$0.73	
25	Operation Speed (A/hr)		12.37	
26	*Seeding equipment and labor cost*			$2.69
27	Cover Crop Establishment			
28	Seed incorporation	separate operation	$1.00	
29	Tractor size (hp)	70		
30	Fuel Use ($/hr)		$8.78	
31	Tractor operational cost ($/hr)		$8.75	
32	Implement Width (ft)	12		
33	Operation Speed (MPH)	4.0		
34	Operation Labor cost ($/A)		$1.82	
35	Operation Speed (A/hr)		4.95	
36	# irrigations to establish cover crop	1		$25.00
37	*Establishment equipment and labor cost*			$30.56

Your Costs: fertilizer app'n

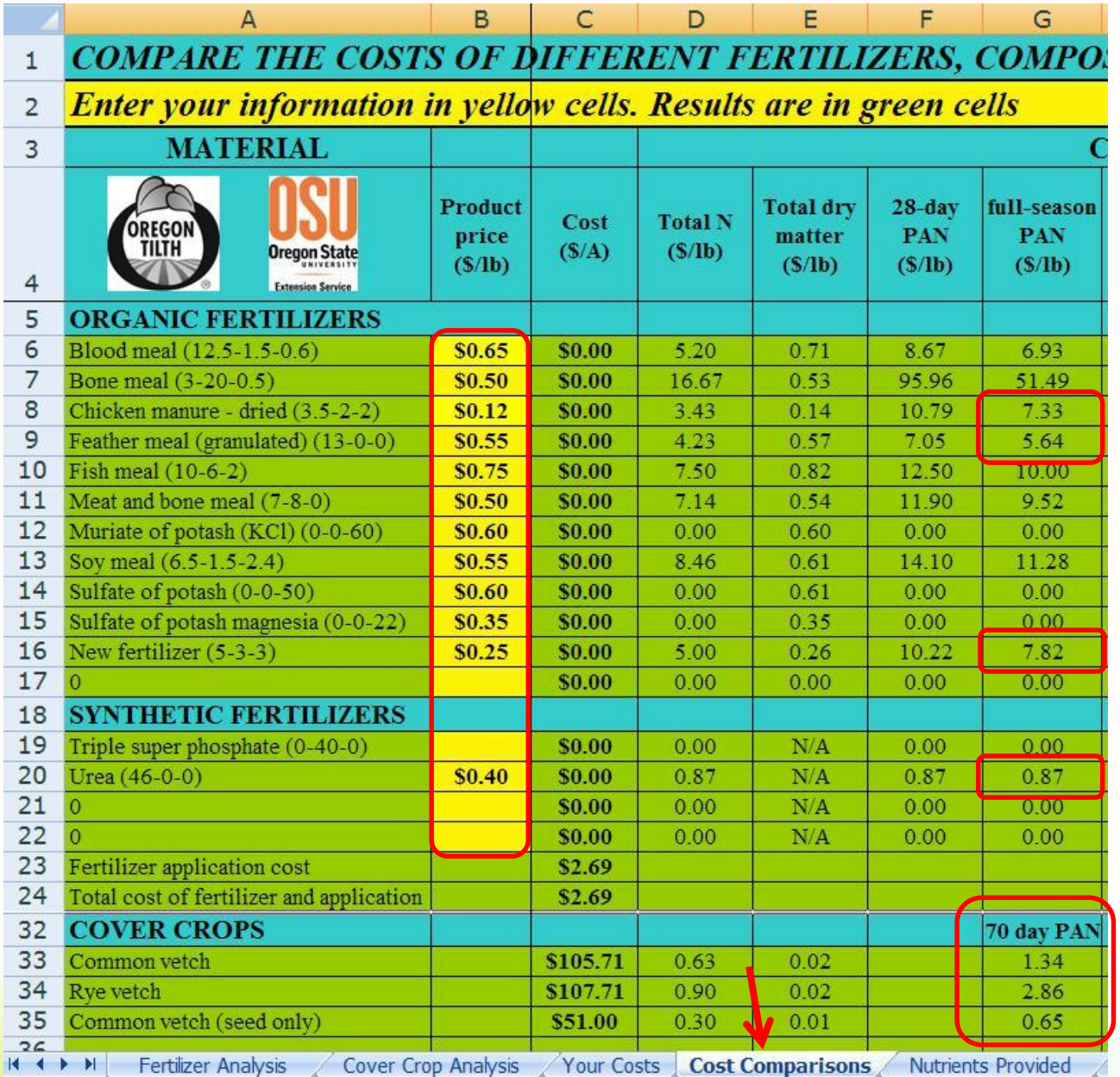


70	***FERTILIZER COSTS***			
71	**Fertilizer equipment and labor cost**	**Fertilizer application**		**Cost ($/A)**
72	Application equipment ($/hr)	manure spreader	$13.45	
73	Tractor size (hp)			
74	Fuel Use ($/hr)		$8.78	
75	Tractor operational cost ($/hr)		$8.75	
76	Implement or Broadcast Width (ft)			
77	Operation Speed (MPH)			
78	Operation Labor cost ($/hr)		$0.73	
79	Operation Speed (A/hr)		12.37	
80	***Fertilizer equipment and labor cost***			**$3.23**
81	**Comments to:**	nick.andrews@oregonstate.edu		
98	protection = beavers			

hand held spin spreader
tractor driven spin spreader
drop spreader
side dresser
manure spreader
none

Fertilizer Analysis | Cover Crop Analysis | **Your Costs** | Cost Comparisons | Nutrients Provided

Cost Comparisons



	A	B	C	D	E	F	G
1	***COMPARE THE COSTS OF DIFFERENT FERTILIZERS, COMPO***						
2	***Enter your information in yellow cells. Results are in green cells***						
3	**MATERIAL**						C
4		**Product price ($/lb)**	**Cost ($/A)**	**Total N ($/lb)**	**Total dry matter ($/lb)**	**28-day PAN ($/lb)**	**full-season PAN ($/lb)**
5	**ORGANIC FERTILIZERS**						
6	Blood meal (12.5-1.5-0.6)	**$0.65**	**$0.00**	5.20	0.71	8.67	6.93
7	Bone meal (3-20-0.5)	**$0.50**	**$0.00**	16.67	0.53	95.96	51.49
8	Chicken manure - dried (3.5-2-2)	**$0.12**	**$0.00**	3.43	0.14	10.79	7.33
9	Feather meal (granulated) (13-0-0)	**$0.55**	**$0.00**	4.23	0.57	7.05	5.64
10	Fish meal (10-6-2)	**$0.75**	**$0.00**	7.50	0.82	12.50	10.00
11	Meat and bone meal (7-8-0)	**$0.50**	**$0.00**	7.14	0.54	11.90	9.52
12	Muriate of potash (KCl) (0-0-60)	**$0.60**	**$0.00**	0.00	0.60	0.00	0.00
13	Soy meal (6.5-1.5-2.4)	**$0.55**	**$0.00**	8.46	0.61	14.10	11.28
14	Sulfate of potash (0-0-50)	**$0.60**	**$0.00**	0.00	0.61	0.00	0.00
15	Sulfate of potash magnesia (0-0-22)	**$0.35**	**$0.00**	0.00	0.35	0.00	0.00
16	New fertilizer (5-3-3)	**$0.25**	**$0.00**	5.00	0.26	10.22	7.82
17	0		**$0.00**	0.00	0.00	0.00	0.00
18	**SYNTHETIC FERTILIZERS**						
19	Triple super phosphate (0-40-0)		**$0.00**	0.00	N/A	0.00	0.00
20	Urea (46-0-0)	**$0.40**	**$0.00**	0.87	N/A	0.87	0.87
21	0		**$0.00**	0.00	N/A	0.00	0.00
22	0		**$0.00**	0.00	N/A	0.00	0.00
23	Fertilizer application cost		**$2.69**				
24	Total cost of fertilizer and application		**$2.69**				
32	**COVER CROPS**						**70 day PAN**
33	Common vetch		**$105.71**	0.63	0.02		1.34
34	Rye vetch		**$107.71**	0.90	0.02		2.86
35	Common vetch (seed only)		**$51.00**	0.30	0.01		0.65

Fertilizer Analysis | Cover Crop Analysis | Your Costs | **Cost Comparisons** | Nutrients Provided

Develop a Fertilizer Program

	A	B	C	D	E	F	G	H
1	***COMPARE THE NUTRIENT VALUE OF DIFFERENT FERTILIZERS, CO***							
2	***Enter your information in yellow cells. Results are in green cells.***							
3	**MATERIAL**	**APP'N RATE**	**POUNDS OF EACH**					
4		**App'n rate "as-is" basis (lb/ac)**	**Total N applied (lb/ac)**	**Total dry matter applied (lb/ac)**	**Estimated PAN after 28 days (lb/ac)**	**Estimated PAN after full season (lb/ac)**	**P_2O_5 (lb/ac)**	**K_2O (lb/ac)**
14	Sulfate of potash (0-0-50)		0	0	0	0	0	0
22	0		0	N/A	0	0	0	0
23	**COMPOST**							
24	Composted manure (1.5-0.5-0.5)		0	0	0	0	0	0
25	0		0	0	0	0	0	0
26	0		0	0	0	0	0	0
27	**COVER CROP FIELD**							
28		21780	168	4792		FALSE		
29								
30	**Total applied**		168	4792	0	0	0	0
31								
32	**Fertilizer recommendation**					100	50	50
33								
34	**Balance**		168	4792	0	-100	-50	-50
35								

Fertilizer recommendation determined from soil test results and University fertilizer and nutrient management guides

Fertilizer Analysis | Cover Crop Analysis | Your Costs | Cost Comparisons | Nutrients Provided

Nutrients Provided

Excess P_2O_5 & K_2O

100-50-50

	A	B	C	D	E	F	G	H
1	***COMPARE THE NUTRIENT VALUE OF DIFFERENT FERTILIZERS, CO***							
2	***Enter your information in yellow cells. Results are in green cells.***							
3	**MATERIAL**	**APP'N RATE**	**POUNDS OF EACH**					
4		**App'n rate "as-is" basis (lb/ac)**	**Total N applied (lb/ac)**	**Total dry matter applied (lb/ac)**	**Estimated PAN after 28 days (lb/ac)**	**Estimated PAN after full season (lb/ac)**	**P_2O_5 (lb/ac)**	**K_2O (lb/ac)**
5	**ORGANIC FERTILIZERS**							
6	Blood meal (12.5-1.5-0.6)		0	0	0	0	0	0
7	Bone meal (3-20-0.5)		0	0	0	0	0	0
8	Chicken manure - dried (3.5-2-2)	6000	210	5100	67	98	120	120
9	Feather meal (granulated) (13-0-0)		0	0	0	0	0	0
10	Fish meal (10-6-2)		0	0	0	0	0	0
11	Meat and bone meal (7-8-0)		0	0	0	0	0	0
12	Muriate of potash (KCl) (0-0-60)		0	0	0	0	0	0
13	Soy meal (6.5-1.5-2.4)		0	0	0	0	0	0
14	Sulfate of potash (0-0-50)		0	0	0	0	0	0
15	Sulfate of potash magnesia (0-0-22)		0	0	0	0	0	0
16	New fertilizer (5-3-3)		0	0	0	0	0	0
17	0		0	0	0	0	0	0
18	**SYNTHETIC FERTILIZERS**							
19	Triple super phosphate (0-40-0)		0	N/A	0	0	0	0
20	Urea (46-0-0)		0	N/A	0	0	0	0
21	0		0	N/A	0	0	0	0
22	0		0	N/A	0	0	0	0
23	**COMPOST**							
24	Composted manure (1.5-0.5-0.5)		0	0	0	0	0	0
25	0		0	0	0	0	0	0
26	0		0	0	0	0	0	0

Fertilizer Analysis | Cover Crop Analysis | Your Costs | Cost Comparisons | **Nutrients Provided**

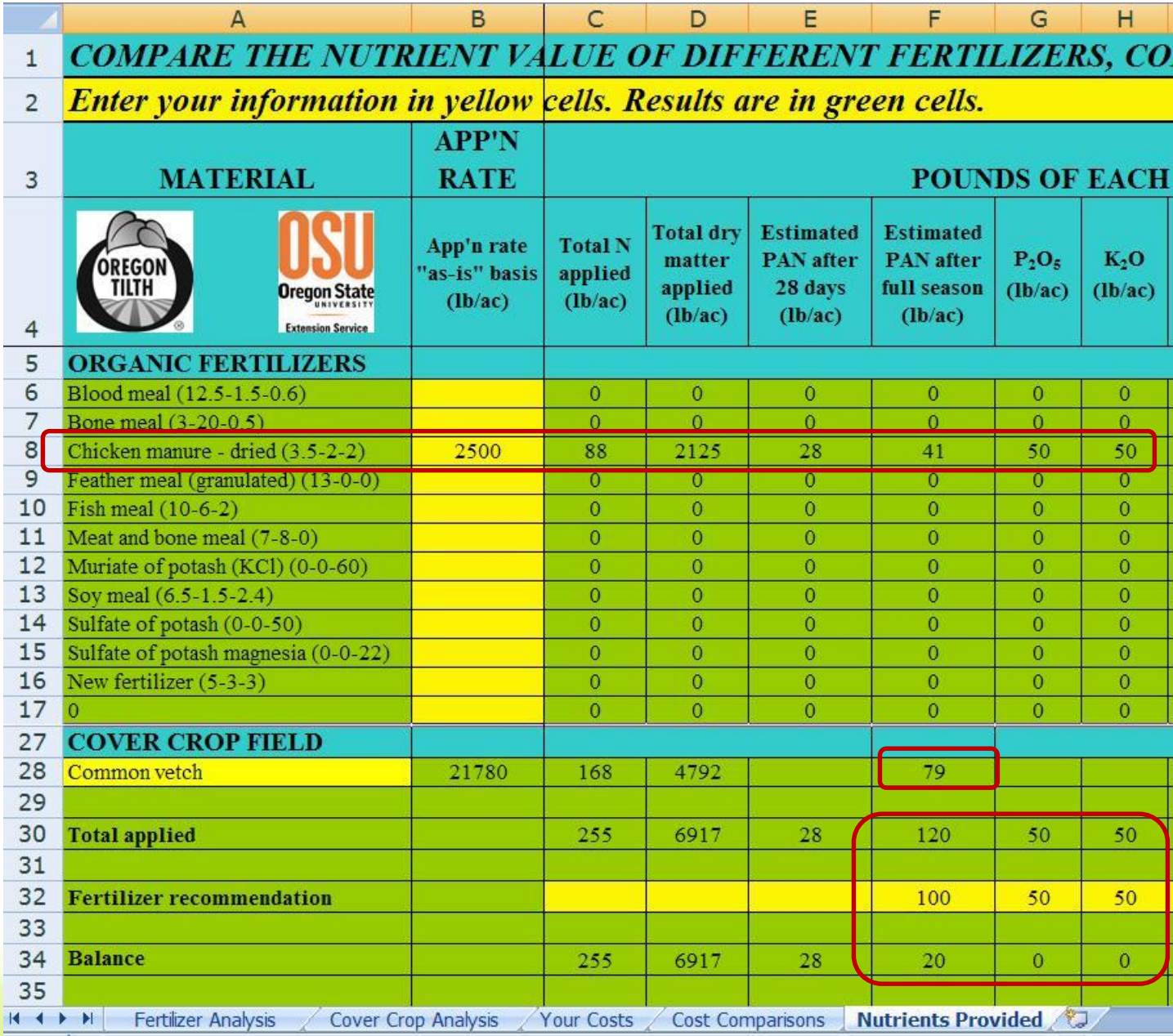
Cost of (Excess) Nutrients Provided

6000 lbs chicken manure supplied 98-120-120 for $722.69 per acre.

70 lbs per acre excess P_2O_5 & K_2O

	A	B	C
1	***COMPARE THE COSTS OF DIFFER***		
2	***Enter your information in yellow cells.***		
3	**MATERIAL**		
4		**Product price ($/lb)**	**Cost ($/A)**
5	**ORGANIC FERTILIZERS**		
6	Blood meal (12.5-1.5-0.6)	**$0.65**	**$0.00**
7	Bone meal (3-20-0.5)	**$0.50**	**$0.00**
8	Chicken manure - dried (3.5-2-2)	**$0.12**	**$720.00**
9	Feather meal (granulated) (13-0-0)	**$0.55**	**$0.00**
10	Fish meal (10-6-2)	**$0.75**	**$0.00**
11	Meat and bone meal (7-8-0)	**$0.50**	**$0.00**
12	Muriate of potash (KCl) (0-0-60)	**$0.60**	**$0.00**
13	Soy meal (6.5-1.5-2.4)	**$0.55**	**$0.00**
14	Sulfate of potash (0-0-50)	**$0.60**	**$0.00**
15	Sulfate of potash magnesia (0-0-22)	**$0.35**	**$0.00**
16	New fertilizer (5-3-3)	**$0.25**	**$0.00**
17	0		**$0.00**
18	**SYNTHETIC FERTILIZERS**		
19	Triple super phosphate (0-40-0)		**$0.00**
20	Urea (46-0-0)	**$0.40**	**$0.00**
21	0		**$0.00**
22	0		**$0.00**
23	Fertilizer application cost		**$2.69**
24	Total cost of fertilizer and application		**$722.69**

Cover Crop Nutrients



	A	B	C	D	E	F	G	H
1	***COMPARE THE NUTRIENT VALUE OF DIFFERENT FERTILIZERS, CO***							
2	***Enter your information in yellow cells. Results are in green cells.***							
3	**MATERIAL**	**APP'N RATE**	**POUNDS OF EACH**					
4	OREGON TILTH / OSU Oregon State University Extension Service	**App'n rate "as-is" basis (lb/ac)**	**Total N applied (lb/ac)**	**Total dry matter applied (lb/ac)**	**Estimated PAN after 28 days (lb/ac)**	**Estimated PAN after full season (lb/ac)**	**P_2O_5 (lb/ac)**	**K_2O (lb/ac)**
5	**ORGANIC FERTILIZERS**							
6	Blood meal (12.5-1.5-0.6)		0	0	0	0	0	0
7	Bone meal (3-20-0.5)		0	0	0	0	0	0
8	Chicken manure - dried (3.5-2-2)	2500	88	2125	28	41	50	50
9	Feather meal (granulated) (13-0-0)		0	0	0	0	0	0
10	Fish meal (10-6-2)		0	0	0	0	0	0
11	Meat and bone meal (7-8-0)		0	0	0	0	0	0
12	Muriate of potash (KCl) (0-0-60)		0	0	0	0	0	0
13	Soy meal (6.5-1.5-2.4)		0	0	0	0	0	0
14	Sulfate of potash (0-0-50)		0	0	0	0	0	0
15	Sulfate of potash magnesia (0-0-22)		0	0	0	0	0	0
16	New fertilizer (5-3-3)		0	0	0	0	0	0
17	0		0	0	0	0	0	0
27	**COVER CROP FIELD**							
28	Common vetch	21780	168	4792		79		
29								
30	**Total applied**		255	6917	28	120	50	50
31								
32	**Fertilizer recommendation**					100	50	50
33								
34	**Balance**		255	6917	28	20	0	0
35								

Fertilizer Analysis | Cover Crop Analysis | Your Costs | Cost Comparisons | **Nutrients Provided**

OREGON TILTH

Cost Comparison

Fertilizer cost ($302.69) +
Cover crop cost ($105.71)
= $408.40 per acre

$722.69 (cost without cover crop)
- 408.40 (cost with cover crop)
= $314.29 SAVINGS per acre

	A	B	C
1	COMPARE THE COSTS OF DIFFER		
2	Enter your information in yellow cells.		
3	MATERIAL		
4		Product price ($/lb)	Cost ($/A)
5	ORGANIC FERTILIZERS		
6	Blood meal (12.5-1.5-0.6)	$0.65	$0.00
7	Bone meal (3-20-0.5)	$0.50	$0.00
8	Chicken manure - dried (3.5-2-2)	$0.12	$300.00
9	Feather meal (granulated) (13-0-0)	$0.55	$0.00
10	Fish meal (10-6-2)	$0.75	$0.00
11	Meat and bone meal (7-8-0)	$0.50	$0.00
12	Muriate of potash (KCl) (0-0-60)	$0.60	$0.00
13	Soy meal (6.5-1.5-2.4)	$0.55	$0.00
14	Sulfate of potash (0-0-50)	$0.60	$0.00
15	Sulfate of potash magnesia (0-0-22)	$0.35	$0.00
16	New fertilizer (5-3-3)	$0.25	$0.00
17	0		$0.00
18	SYNTHETIC FERTILIZERS		
19	Triple super phosphate (0-40-0)		$0.00
20	Urea (46-0-0)	$0.40	$0.00
21	0		$0.00
22	0		$0.00
23	Fertilizer application cost		$2.69
24	Total cost of fertilizer and application		$302.69
32	COVER CROPS		
33	Common vetch		$105.71
34	Rye vetch		$107.71

Courtesy of Nick Andrews, OSU Extension

Scott Latham: Sauvie Island Organics
20 ac organic fresh vegetables
~400 CSA members, 25 restaurants

"We didn't give our cover crops enough N-credit. The Calculator showed us we were getting twice the N we thought. Now, no N is applied to our head lettuce, we get the same yield and save $275/ac on fertilizer."

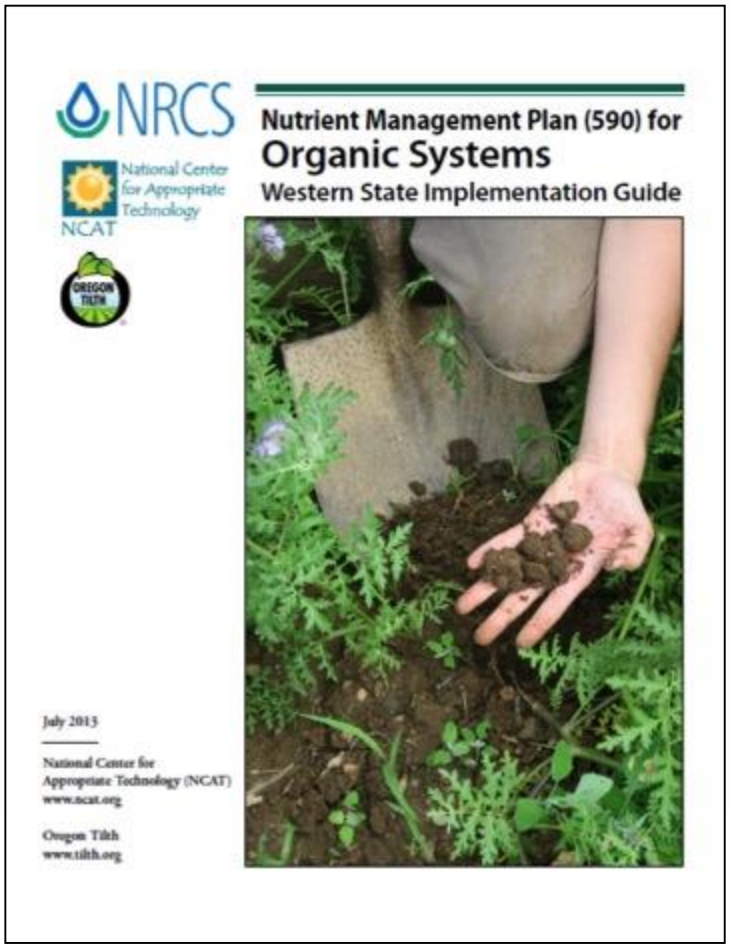
"We invest our savings in additional N to our broccoli field and get higher broccoli yields."

Courtesy of Nick Andrews, OSU Extension

NRCS/Oregon Tilth Resource

Nutrient Management Plan for Organic Systems: Western State Implementation Guide

http://www.nrcs.usda.gov/organic/



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WESTERN SARE Sustainable Agriculture Research & Education

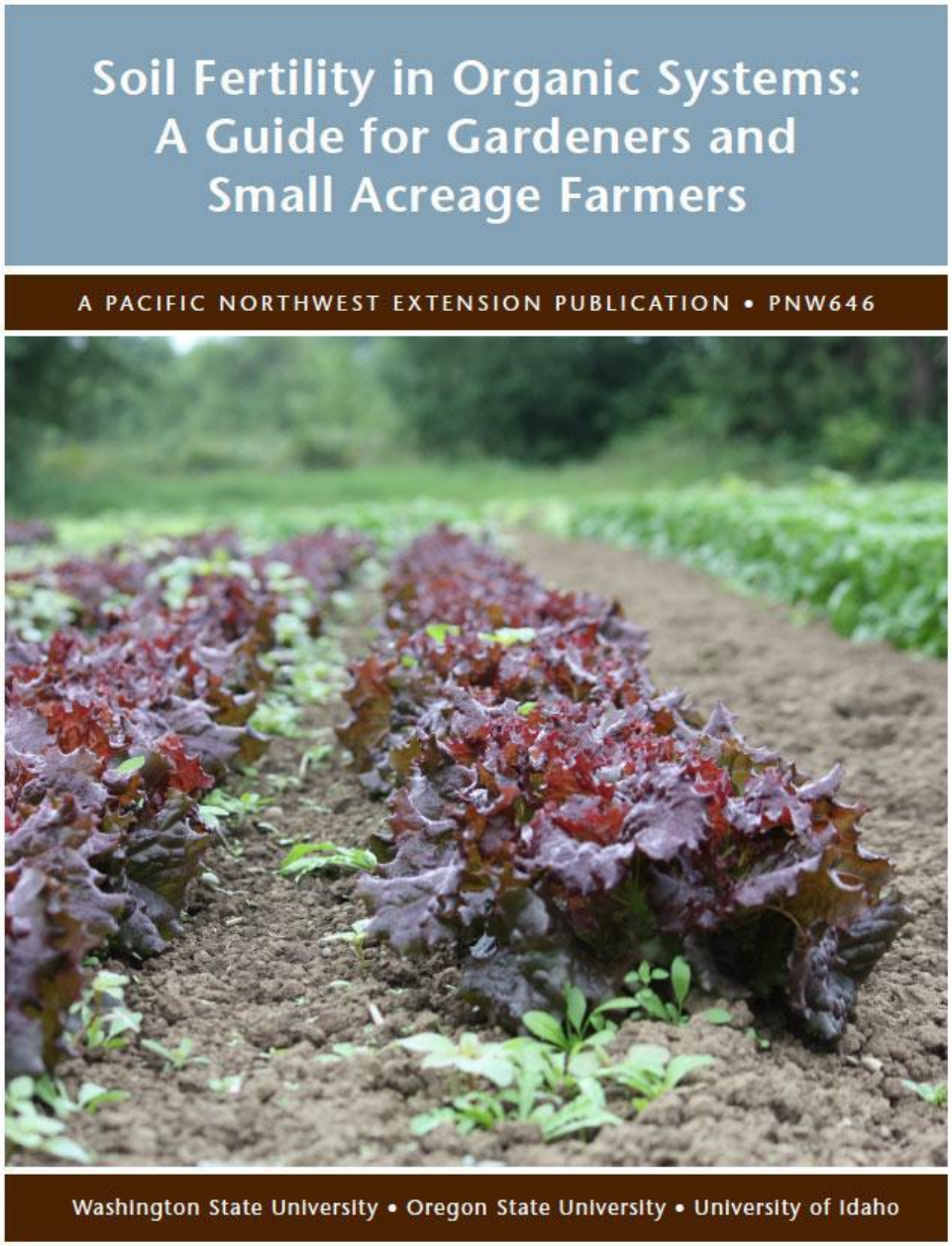
OREGON TILTH

WSU Resource

Soil Fertility in Organic Systems: A Guide for Gardeners and Small Acreage Farmers

PNW 646

http://bit.ly/1aUmtEb



Organic Nutrient Management Resources

- Cornell Organic Guides for Fruit, Vegetables, and Dairy
  http://nysipm.cornell.edu/organic_guide/
- Nutrient Management on Organic Vegetable Farms
  http://www.uvm.edu/vtvegandberry/factsheets/NutrientManagementonOrganicVegetableFarms.pdf
- Organic Alfalfa Management Guide
  http://cru.cahe.wsu.edu/CEPublications/EB2039E/EB2039E.pdf
- Soil Fertility Management for Organic Crops (CA)
  http://anrcatalog.ucdavis.edu/pdf/7249.pdf
- Determining Nutrient Applications for Organic Vegetables
  http://extension.psu.edu/business/start-farming/soils-and-soil-management/determining-nutrient-applications-for-organic-vegetables-basic-calculations-introduction-to-soils-fact-3

Questions?

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