Tasks to Complete:

- Field 2C:
  - Apply nutrients using litter based on Soil Test Phosphorus recommendation OR Phosphorus Threshold Method
- Field 2A:
  - Apply litter to meet phosphorus need
- Field 10:
  - Use maximum amount of dairy manure using Threshold Method
  - BONUS! Apply nutrients with only commercial fertilizer
- Field 14A:
  - Fertilizer recommendations - no manure

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Field Name	Ac.	Crop Rotation	Expctd Yield (bu or tons)	Nutrient Needs (from soil test & expctd yield) $N\text{-}P_2O_5\text{-}K_2O$	Nitrogen Residual (leg./ organic)	Days before Incorp	Organic Material Applied (1000 gal. or tons/ac)	Org. Nut. Applied $N\text{-}P_2O_5\text{-}K_2O$	$N\text{-}P_2O_5\text{-}K_2O$ Need or (Surplus)	$N\text{-}P_2O_5\text{-}K_2O$ (commercial)	Notes
HF-1	8	Orchard-grass Pasture	2.94 ac/au	50-40-70	0/14	----	-----	----			
HF-2A	16	Corn (grain)	121 bu/ac	120-80-100	0/14	>7					
HF-2B (P-1.5x) P-Index	12	Corn (grain)	90 bu/ac	90-0-0	0/0	>2					
HF-2C (N-based) Thres.	9	Orchard-grass Hay (maint.)	3.3 t/ac	140-40-95	0/0						
HF-3A	11	Corn (grain)	100 bu/ac	100-100-80	0/14	>1					
HF-3B	11.3	Corn (silage)	22.5 t/ac	165-120-240	0/7	>2					

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Field Name	Ac.	Crop Rotation	Expctd Yield (bu or tons)	Nutrient Needs (from soil test & expctd yield) $N\text{-}P_2O_5\text{-}K_2O$	Nitrogen Residual (leg./ organic)	Days before Incorp	Organic Material Applied (1000 gal. or tons/ac)	Org. Nut. Applied $N\text{-}P_2O_5\text{-}K_2O$	$N\text{-}P_2O_5\text{-}K_2O$ Need or (Surplus)	$N\text{-}P_2O_5\text{-}K_2O$ (commercial)	Notes
HF-4B	25	Hay/ Pasture	SPG II	120-60-120	0/0	>7					
HF-5	12	Corn (grain)	150 bu/ac	150-80-100	70/0	------	----	-----			
HF-10 (P-1x) Thresh	34	Corn (grain)	180 bu/ac	180-0-40	0/0	---	--------	--------			
HF-11	11	Soybeans	45.8 bu/ac	0-0-30	0/0	----	------	------			
HF-14A	23	Tomatoes	20 t/ac		0/0	------	-----	------			
HF-14B (P-1x) P-Index	18	Corn (silage)*	22.7 t/ac	170-0-210	0/0	>7					

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Field Name	Crop	Expected Yield	Virginia Tech Soil Test Value					Va Tech Buffer pH	Lime Needs (tons/ac)	Nutrient Needs			Environmental Sensitivity
			P #/ac		K #/ac		pH			N	P_2O_5	K_2O	
HF-1	Orchard-grass Pasture	2.94 ac/au	11	L+	30	L	6.3	6.38	0	50	40	70	L
HF-2A	Corn (grain)	121 bu/ac	15	M-	40	L	6.2	6.34	0	120	80	100	M
HF-2B	Corn (grain)	90 bu/ac	340	VH	320	VH	6.3	6.34	0	90	0	0	L
HF-2C	Orchard-grass Hay	3.3 tons/ac	45	H-	130	M	6.2	6.32	0	70	40	95	L
HF-3A	Corn (grain)	100 bu/ac	6	L	62	L+	5.8	6.14	1.5	100	100	80	L
HF-3B	Corn (silage)	22.5 tons/ac	30		90		6.3	6.34	0	165	120	240	L

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Field Name	Crop	Expected Yield	Virginia Tech Soil Test Value					Va Tech Buffer pH	Lime Needs (tons/ac)	Nutrient Needs			Environmental Sensitivity
			P #/ac		K #/ac		pH			N	P_2O_5	K_2O	
HF-4B	Hay/Pasture	*SPG II**	41	H-	115	M	5.6	6.02	2	120	60	120	(FF)
HF-5	Corn (grain)	150 bu/ac	26	M	62	L+	6.5	6.4	0	150	80	100	L
HF-10	Corn (grain)	180 bu/ac	168	VH	256	H	6.1	6.28	0	180	0	40	L
HF-11	Soybeans	45.8 bu/ac	428	VH	219	H	5.8	6.1	1.5	0	0	30	M
HF-14A	Tomatoes	20 tons/ac	170	VH	50	L	6.6	6.5	0	75	(20)	250	L
HF-14B	Corn (silage)	22.7 tons/ac	310	VH	125	M	5.5	5.9	2.5	170	0	210	H

Nitrogen Calculations for Ammonium, Organic and Residual Nitrogen Based on Analysis of Material

Material: Broiler Litter

Analysis:

TKN	NH_4-N	P_2O_5	K_2O
66.00	15.62	55.00	53.33

ton or 1,000 gals.

Days before Incorporation: (circle one)
Injected, Broadcast-Immediate Incorp., >2, >4, >7 or No Incorp., Irrigate-(No Incorp.)
Litter surface applied to all crops

Previous Application: 0-1 yr. of the last 5, 2-3 yrs. of the last 5, 4-5 yrs. of the last 5

First Year - Plant Available Nitrogen (PAN)

66.00 TKN/unit				
- 15.62 NH_4-N/unit	X	.50 x availability coefficient	=	7.81 #/unit
50.38 Organic N/unit	X	.60 x availability coefficient	=	30.23 #/unit
		TOTAL PAN		38.04 #/unit

Availability Coefficients from Standards and Criteria

Manure	Biosolids
Table 8-1	Table 9-2
Table 8-2	Table 9-1

Applications made to Spring Crops

_____ #N/ac. needed ÷ 38.04 PAN#/ 1,000 gallons or tons = _____ 1,000 gallons or tons / acre

Unit = Ton or 1,000 Gallons

Residual - Plant Available Nitrogen (for following year)

50.38 Organic N/unit	X	.1 / .2 availability coefficient	=	5.04 / 10.01 #/unit

Manure	Biosolids
Table 8-3	Table 9-1

_____ #/unit x _____ units/ac. = _____ # Residual Nitrogen/ac.

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Nitrogen Calculations for Ammonium, Organic and Residual Nitrogen Based on Analysis of Material

Material: Dairy Slurry

Analysis:

TKN	NH_4-N	P_2O_5	K_2O
21.43	9.87	11.58	17.85

\ ton or 1,000 gals.

Days before incorporation: (circle one)
Injected, Broadcast-Immediate Incorp., (>2,)>4, >7 or No Incorp., Irrigate-No Incorp.

Days Manure incorporated 3 days after Application

Previous Application: 0-1 yr. of the last 5, 2-3 yrs. of the last 5, 4-5 yrs. of the last 5

First Year - Plant Available Nitrogen (PAN)

21.43 TKN/unit				
- 9.87 NH_4-N/unit	X	.65 x availability coefficient	=	6.4 #/unit
11.56 Organic N/unit	X	.35 x availability coefficient	=	4.0 #/unit
		TOTAL PAN		10.4 #/unit

Availability Coefficients from Standards and Criteria

Manure	Biosolids
Table 8-1	Table 9-2
Table 8-2	Table 9-1

____ #N/ac. needed ÷ ____ PAN#/ 1,000 gallons or tons = ____ 1,000 gallons or tons / acre

Unit = Ton or 1,000 Gallons

Residual - Plant Available Nitrogen (for following year)

Field 3B - 6,000 gal - Frequent
Fields 1, 2A, 3A - 6,000 gal - Continuously

11.56 Organic N/unit	X	.1 / .2 x availability coefficient	=	1.16 / 2.3 #/unit

Manure	Biosolids
Table 8-3	Table 9-1

2.3 / 1.16 #/unit x 6 / 6 units/ac. = 13.8 / 6.9 ~ 7 # Residual Nitrogen/ac.

References Needed

- Field 2C: Apply nutrients using litter based Soil Test Recommendation or Phosphorus Environmental Threshold Application
  - Standards & Criteria (page 48)
  - Poultry Litter Analysis (Plant Available Nitrogen [P.A.N] calculation)
  - Balance Sheet

Option 1: Soil Test

- Crop: Orchard Grass Hay
- Nutrient Applications: Broiler Litter and Supplemental Fertilizer
- Litter Analysis: 38.04 N- 55 P_2O_5- 53.33 K_2O
- Nutrient Needs: 140- 40- 95

- Litter Analysis:
  - 38.04 N- 55 P_2O_5- 53.33 K_2O
- Need to calculate tons of litter required to meet P needs
  - 40 lbs P_2O_5 are required and there are 55 lbs P_2O_5 in litter
  - 40 lbs / 55 lbs= 0.73 tons litter/ac to meet P_2O_5 needs
  - Not practical application!!!

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Field 2C: Soil Test Method Manure Application

Field Name	Ac.	Crop Rotation	Expctd Yield (bu or tons)	Nutrient Needs (from soil test & expctd yield) $N\text{-}P_2O_5\text{-}K_2O$	Nitrogen Residual (leg./ organic)	Days before Incorp	Organic Material Applied (1000 gal. or tons/ac)	Org. Nut. Applied $N\text{-}P_2O_5\text{-}K_2O$	$N\text{-}P_2O_5\text{-}K_2O$ Need or (Surplus)	$N\text{-}P_2O_5\text{-}K_2O$ (commercial)	Notes
HF-1	8	Orchard-grass Pasture	2.94 ac/au	50-40-70	0/14	----	-----	----			
HF-2A	16	Corn (grain)	121 bu/ac	120-80-100	0/14	>7					
HF-2B (P-1.5x) P-Index	12	Corn (grain)	90 bu/ac	90-0-0	0/0	>2					
HF-2C (N-based) Thres.	9	Orchard-grass Hay (maint.)	3.3 t/ac	140-40-95	0/0		0.73			---------	
HF-3A	11	Corn (grain)	100 bu/ac	100-100-80	0/14	>1					
HF-3B	11.3	Corn (silage)	22.5 t/ac	165-120-240	0/7	>2					

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Option 2: Phosphorous Environmental Threshold

- Allows for higher P application than crops require for certain circumstances
- Need to convert P lb/ac to P ppm
- Nutrient need table shows Field 2C with a soil test P level of 45 lb/ac
  - To convert to ppm see page 39 of S&C
  - Divide lb/ac by 2 (or multiply by 0.5)
  - 45/2= 23 ppm P

- Based on the table 4-2, S&C pg. 48, or the Middle/Upper Coastal Plain we can apply **manure to meet N needs, not restricted by P**

- Litter Analysis:
  - 38.04 N- 55 P_2O_5- 53.33 K_2O
- Applying litter to meet N needs
- 140 lbs of N are required and there are 38.04 lbs/ton of P.A.N.
  - 140 lbs N/ac. ÷ 38.04 lbs/ton of N= 3.68 tons/ ac
  - Much more acceptable rate to spread to get even pattern than under a ton of litter/ ac

- Organic Nutrient Application:
- 3.68 tons/ac x 55 lbs/ton P_2O_5 =
  202 lbs P_2O_5 / ac
- 3.68 tons/ac x 53.33 lbs/ton K_2O =
  196.3 lbs K_2O / ac
  140 N-202 P_2O_5 -196.3 K_2O
  (nutrients from litter)

- Any additional fertilizer required?
  - Nutrient needs of
    - 140 N-40 P_2O_5 -95 K_2O
  - 140- 202 -196.3 nutrients from litter
  - N: 140− 140= 0 - No additional N required
  - P_2O_5 : 40- 202= (162) – over application of P_2O_5
  - K_2O : 95- 193.3= (100) – over application of K_2O

Field 2C: Threshold Method Manure Application

Field Name	Ac.	Crop Rotation	Expctd Yield (bu or tons)	Nutrient Needs (from soil test & expctd yield) $N\text{-}P_2O_5\text{-}K_2O$	Nitrogen Residual (leg./ organic)	Days before Incorp	Organic Material Applied (1000 gal. or tons/ac)	Org. Nut. Applied $N\text{-}P_2O_5\text{-}K_2O$	$N\text{-}P_2O_5\text{-}K_2O$ Need or (Surplus)	$N\text{-}P_2O_5\text{-}K_2O$ (comm ercial)	Notes
HF-1	8	Orchard-grass Pasture	2.94 ac/au	50-40-70	0/14	----	-----	----			
HF-2A	16	Corn (grain)	121 bu/ac	120-80-100	0/14	>7					
HF-2B (P-1.5x) P-Index	12	Corn (grain)	90 bu/ac	90-0-0	0/0	>2					
HF-2C (N-based) Thres.	9	Orchard-grass Hay (maint.)	3.3 t/ac	140-40-95	0/0	>7	3.68 t/ac	140-202-196	0- (162)-(101)	---------	3
HF-3A	11	Corn (grain)	100 bu/ac	100-100-80	0/14	>1					
HF-3B	11.3	Corn (silage)	22.5 t/ac	165-120-240	0/7	>2					

3. Nitrogen needs are shown for 2 cuttings of hay: 140 lbs N applied before spring green-up if organic source is used; 70 lbs N applied at spring green-up and 70 lbs after first cutting if commercial fertilizer is used.

References Needed

- Field 2A: Apply litter to meet phosphorus need
  - Balance Sheet
  - Poultry Litter Analysis (P.A.N calculation)

- Crop: Corn Grain
- Nutrient Applications: Broiler Litter and Supplemental Fertilizer
- Litter Analysis:
  - 38.04 N- 55 P_2O_5- 53.33 K_2O
- Nutrient Needs:
  - 120 N-80 P_2O_5-100 K_2O

- Litter Analysis:
  - 38.04 N- 55 P_2O_5- 53.33 K_2O
- Need to calculate tons of litter required to meet P_2O_5 needs
  - 80 lbs/ac P_2O_5 are required and there are 55 lbs/ton P_2O_5 in litter
  - 80 lbs/ac P_2O_5 ÷ 55 lbs/ton P_2O_5 = 1.45 tons litter/ac to meet P_2O_5 needs

- Organic Nutrient Application:
- 1.45 tons x 38.04 lbs/ton N=

  55.1 lbs N/ ac
- 1.45 tons/ac x 53.33 lbs/ton K_2O= 77.3 lbs K_2O / ac

  55.1-80-77.3 nutrients from litter

- Any additional fertilizer required?
- Nutrient needs of 120 N-80 P_2O_5 -100 K_2O
  - 55.1 - 80 - 77.3 from litter
  - N: 120- 14 (residual)- 55.1 (organic)= 51 lbs N needed
  - P_2O_5 : 80- 80= No Additional P_2O_5 required
  - K_2O: 100- 77.3= 23 lbs K_2O needed
    - Commercial Fertilizer needs: 51 lbs N and 23 lbs of P_2O_5

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Field 2A: Soil Test Method Manure Application

Field Name	Ac.	Crop Rotation	Expctd Yield (bu or tons)	Nutrient Needs (from soil test & expctd yield) $N\text{-}P_2O_5\text{-}K_2O$	Nitrogen Residual (leg./ organic)	Days before Incorp	Organic Material Applied (1000 gal. or tons/ac)	Org. Nut. Applied $N\text{-}P_2O_5\text{-}K_2O$	$N\text{-}P_2O_5\text{-}K_2O$ Need or (Surplus)	$N\text{-}P_2O_5\text{-}K_2O$ (commercial)	Notes
HF-1	8	Orchard-grass Pasture	2.94 ac/au	50-40-70	0/14	----	-----	----			
HF-2A	16	Corn (grain)	121 bu/ac	120-80-100	0/14	>7	1.45 tons/ac	55-80-77.3	51-0-23	0-023 br 20-0-0 ba 31-0-0 sd	1 2
HF-2B (P-1.5x) P-Index	12	Corn (grain)	90 bu/ac	90-0-0	0/0	>2					
HF-2C (N-based) Thres.	9	Orchard-grass Hay (maint.)	3.3 t/ac		0/0	>7				---------	
HF-3A	11	Corn (grain)	100 bu/ac	100-100-80	0/14	>1					
HF-3B	11.3	Corn (silage)	22.5 t/ac	165-120-240	0/7	>2					

Application Methods: Ba= Banded, Br = Broadcast, Sd = Sidedress, Pd =Plow down, Di = Disk-in

1. Apply Litter as close to planting as possible.

2. Apply sidedress N when corn is between on 12 and 24 inches tall.

References Needed

- Field 10: Use maximum amount of dairy manure using Threshold Method
  - Standards & Criteria (page 48, 55)
  - Dairy Slurry Analysis (P.A.N. calculation)
  - Balance Sheet

- Crop: Corn Grain
- Nutrient Applications: Dairy Slurry and Supplemental Fertilizer
- Nutrient Needs:
  - 180 N-0 P_2O_5 -40 K_2O
- Manure Analysis:
  - 10.4 N-11.58 P_2O_5 -19.85 K_2O

- Need to convert P lb/ac to P ppm
- Nutrient need table shows field 10 with a soil test P level of 168 lb/ac
  - To convert to ppm see page 39 of S&C
  - Divide lb/ac by 2
  - 168 ÷ 2= 84 ppm P
    - Standards & Criteria page 48 Table 4-2: 55-136 ppm P for Middle/Upper coastal: N cannot exceed N needs; **P application shall not exceed crop removal**

- Crop removal: Found on page 55 table 4-7 of S&C
  - Corn Grain P removal= 0.38 lb P_2O_5/ bushel
  - 180 bu/ ac x 0.38 lb/bushel = 68.4 lbs P_2O_5 removed
- 68.4 lbs removed ÷ 11.58 P_2O_5 /kgal = 5.9k gal/ac of manure

- Manure Analysis: 10.4-11.58-19.85
- Organic Nutrient Application:
- 5.9k gal/ac x 10.4 lbs N/kgal =

  61lbs N/ ac
- 5.9k gal/ac x 19.85 lbs K_2O / kgal = 117 lbs K_2O/ ac

  61 N-68 P_2O_5 -117 K_2O nutrients from manure

- Any additional fertilizer required?
- Nutrient needs of 180-0-40
  - 61-68-117 nutrients from manure
  - N: 180- 61= 119 lbs/ac N needed
  - P_2O_5: 0- 68= (68) P_2O_5 over applied
  - K_2O: 40- 117= (77) K_2O over applied
    - Commercial Fertilizer needs: 119 lbs N/ac

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Field 10: Threshold Method Manure Application

Field Name	Ac.	Crop Rotation	Expctd Yield (bu or tons)	Nutrient Needs (from soil test & expctd yield) $N\text{-}P_2O_5\text{-}K_2O$	Nitrogen Residual (leg./ organic)	Days before Incorp	Organic Material Applied (1000 gal. or tons/ac)	Org. Nut. Applied $N\text{-}P_2O_5\text{-}K_2O$	$N\text{-}P_2O_5\text{-}K_2O$ Need or (Surplus)	$N\text{-}P_2O_5\text{-}K_2O$ (commercial)	Notes
HF-4B	25	Hay/ Pasture	SPG II	120-60-120	0/0	>7					
HF-5	12	Corn (grain)	150 bu/ac	150-80-100	70/0	------	----	-----			
HF-10 (P-1x) Thresh	34	Corn (grain)	180 bu/ac	180-0-40	0/0	>2	5.9k/ ac Dairy	61-68-117	119-(68)-(77)	30-0-0 ba 89-0-0 sd	2
HF-11	11	Soybeans	45.8 bu/ac	0-0-30	0/0	----	------	------			
HF-14A	23	Tomatoes	20 t/ac		0/0	------	-----	------			
HF-14B (P-1x) P-Index	18	Corn (silage)*	22.7 t/ac	170-0-210	0/0	>7					

Application Methods: Ba= Banded, Br = Broadcast, Sd = Sidedress, Pd =Plow down, Di = Disk-in

2. Apply sidedress N when corn is between on 12 and 24 inches tall.

BONUS ROUND!

- Just because you CAN apply P doesn't mean you SHOULD
- Fields high in P that do not have to be used for manure purposes can just receive commercial fertilizer

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Field Name	Ac.	Crop Rotation	Expctd Yield (bu or tons)	Nutrient Needs (from soil test & expctd yield) $N\text{-}P_2O_5\text{-}K_2O$	Nitrogen Residual (leg./ organic)	Days before Incorp	Organic Material Applied (1000 gal. or tons/ac)	Org. Nut. Applied $N\text{-}P_2O_5\text{-}K_2O$	$N\text{-}P_2O_5\text{-}K_2O$ Need or (Surplus)	$N\text{-}P_2O_5\text{-}K_2O$ (commercial)	Notes
HF-4B	25	Hay/ Pasture	SPG II	120-60-120	0/0	>7					
HF-5	12	Corn (grain)	150 bu/ac	150-80-100	70/0	------	----	-----			
HF-10 (P-1x) Thresh	34	Corn (grain)	180 bu/ac	180-0-40	0/0	---	--------	--------	180-0-40	30-0-40 br 150-0-0 sd	
HF-11	11	Soybeans	45.8 bu/ac	0-0-30	0/0	----	------	------			
HF-14A	23	Tomatoes	20 t/ac		0/0	------	-----	------			
HF-14B (P-1x) P-Index	18	Corn (silage)*	22.7 t/ac	170-0-210	0/0	>7					

References Needed

- Field 14A
  - Standards & Criteria (page 48)
  - Case Study Narrative Sheet
  - Case Study Vegetable Supplement
  - Balance Sheet

- Crop: Tomatoes- Processing
- Nutrient Application: Fertilizer- No Manure
- Nutrient Needs: 75 N-0 P_2O_5 -250 K_2O
  - These needs come from Nutrient Needs Table and are based off of criteria from page 20 in Vegetable Supplement

SPECIAL CONDITION

- Even though the soil test recommend no P page 22 paragraph 5 of the vegetable supplement has a caveat that if soil temps are BELOW 65 degrees F up to 20 lbs of P_2O_5 may be applied to match crop removal

Field 14A: Fertilizer Only Application

Field Name	Ac.	Crop Rotation	Expctd Yield (bu or tons)	Nutrient Needs (from soil test & expctd yield) $N\text{-}P_2O_5\text{-}K_2O$	Nitrogen Residual (leg./ organic)	Days before Incorp	Organic Material Applied (1000 gal. or tons/ac)	Org. Nut. Applied $N\text{-}P_2O_5\text{-}K_2O$	$N\text{-}P_2O_5\text{-}K_2O$ Need or (Surplus)	$N\text{-}P_2O_5\text{-}K_2O$ (commercial)	Notes
HF-4B	25	Hay/ Pasture	SPG II	120-60-120	0/0	>7					
HF-5	12	Corn (grain)	150 bu/ac	150-80-100	70/0	------	----	-----			
HF-10 (P-1x) Thres	34	Corn (grain)	180 bu/ac	180-0-40	0/0	>2					
HF-11	11	Soybeans	45.8 bu/ac	0-0-30	0/0	----	------	------			
HF-14A	23	Tomatoes	20 t/ac	75-0-250	0/0	------	-----	------	75-20-250	0-0-100 br/d 0-0-150 br/pd 25-20-0 ba 50-0-0 sd	6
HF-14B (P-1x) P-Index	18	Corn (silage)*	22.7 t/ac	170-0-210	0/0	>7					

Application Methods: Ba= Banded, Br = Broadcast, Sd = Sidedress, Pd =Plow down, D = Disk-in

6. Apply Phosphorus ONLY if soil temperature is below 65 degrees F at time of transplanting. (2005 Commercial Veg Guide, pg B5)