Act 38 Nutrient Balance Sheet (NBS) Development; Requirement to Include All Nutrient Sources; and Other Important Issues

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What Types of Nutrient Balance Sheets (NBS) are there?

- Act 38 (Nutrient and Odor Management Act)
 - Option 1 (P removal)
 - Option 2 (N based)
 - Option 3)P-Index)
- Act 49 (Commercial Manure Hauler and Broker)
 - ▶ Same as Act 38
- ▶ MMP (Chapter 91)
 - ▶ Similar to Act 38, but do not include items like the winter matrix

Why Does it Matter?

- ▶ When developing NBS's for exported manure, the NBS must include all sources of organic nutrients that will be applied to the importing operations crop management units (CMUs or fields).
- ▶ Planning anything less is misleading, does not provide the operation with an accurate picture of Nutrient Balance, places the operation out of compliance, and may lead to surface or groundwater pollution (The whole reason we develop NBSs in the 1st place)
- Examples of other organic nutrient sources include, but are not limited to, other imported manure types, manure generated by the importer's own animals, food processing residuals and biosolids. The NBSs must also include any commercial fertilizer (starter and other) that the importer utilizes.

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Questions need to be Asked before Development!

- ▶ Planners <u>MUST</u> ask importing operations questions such as:
 - What manure is actually planned to be applied?
 - Specifically identify all sources of nutrients that are being used.
 - Manure?
 - Starter?
 - Sidedress?
 - Foliar applications?
 - Biosolids?
 - Food Processing Residual?
 - Etc
 - Does the operator receive manure from more than one source?
 - Who, What(Manure Type), When(Season Applied), where(Fields applied), how?
 - Is it spread on the same fields as other manures or nutrient sources?
 Does the importer have their own animals and manure that needs to be included?
 - Do you have animal on your farm?
 - What happens with that manure?
 - Will it be spread on the same fields as imported manure?

Act 38 Regulations

- ▶ The Nutrient Management Regulations under § 83.301 Excess Manure Utilization Plans describe that the land application of manure exported from an NMP operation must address the risk and impacts of nitrogen and phosphorous loss to waters.
- ▶ It's a regulatory requirement and by not writing an ACCURATE NBS puts both You and the Operation at a risk of compliance and enforcement?
 - ▶ Operation = Fine
 - ▶ Plan Writer = Loss of Certification

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Technical Manual Reference

▶ The guidance provided in Appendix 8 Importer/Broker Agreement and NBSs – Page 2 of the Nutrient Management Technical Manual on this issue is as follows: "Nutrient Balance Sheets (NBS) required under the Program must follow the standardized NBS form and process provided by the Commission. Supplement 3: Nutrient Balance Sheet User Guide provides the format, calculation process, and accepted figures to use when completing a NBS for an importing operation". Supplement 3 provides guidance for and examples of developing NBS with multiple manure applications to pasture and cropland.

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What is Being Seen?

- An increasing number of NBSs are being developed that do not include all nutrient sources utilized on the importing operation.
- ▶ Some common examples seen by reviewers include:
 - NBSs for an importer that imports manure from multiple exporting operations but each individual NBS provided by the exporting operation does not account for the manure from the other source(s)
 - NBSs for exported manure applied to pasture without including the uncollected manure applied by the importers grazing animals.
 - NBSs that do not include starter and/or commercial fertilizer that is applied by the importer.
 - Food Processing Residuals (FPR) imported to a field(s) that receive manure (or several manures) from the importer's own animals.

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Example NBS (Other Nutrient Sources) (EXCEL) How to account for commercial fertilizer (starter or other) in a NBS Enter commercial fertilizer in the starter (Other) Fertilizer column Crop Removal **Crop Information** Nitrogen History Copy Selected Rows Insert Empty Rojete Active Mehlich 3 Soil Test P Starter Starte Residual - For Option 2 P₂O₅ lbs/A Crop Group ID K₂O Carryover Legume N Manure N requently Corn Grain after Corn for Grain 250 100 75 10 10 Sovbeans, 50 bu/A bu/A Summer Crop Starter or other fertilizer used. Does not include supplemental fertilizer after manure. Multiples - when completing multiple manure applications, any starter or other fertilizer needs to be entered into the first instance of a field only. All other instances of the multiple should have the starter listed as zero or blank.

Example NBS (Other Nutrient Sources) (EXCEL)

- ▶ How to account for Other Organic sources in a NBS
- ▶ Enter the other organic source as a manure group in a NBS
- ▶ Use the manure analyzes results(if available)
- ▶ Book Values Penn State Agronomy Guide Table 1.2-10 or Tech Manual Supplement 1

Clear Manure Group Information	Manure Group Identification	Manure Report Date (most recent)	Laboratory Name	Manure Type	Manure Unit (lbs/ton or 1000 gal)	Total Nitrogen (N) Ibs / ton or Ibs / 1000 gal	Ammonium N (NH4-N) Ibs / ton or Ibs / 1000 gal	Total Phosphate (P2O5) Ibs / ton or Ibs / 1000 gal	Total Potash (K2O) Ibs / ton or Ibs / 1000 gal	Percent Solids	PSC Value (Enter analytical or book value)	Organic N Ibs / ton or Ibs / 1000 gal
Clear Manure Group 1	Beef Steer Book Values	Book Values	Penn State Agronomy Guide	Other	lb/ton	14.00	1.00	5.00	8.00	8.00	0.80	13.00
Clear Manure Group 2	Poultry Broiler Litter	2/21/2023	AASL	Poultry	lb/ton	45.30	24.20	37.21	40.60	53.30	0.80	21.10
Clear Manure Group 3	Swine Liquid	3/24/2023	AASL	Swine	lb/1000 gal	14.26	6.75	1.01	11.55	0.88	1.00	7.51

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Example NBS (Other Nutrient Sources) (EXCEL)

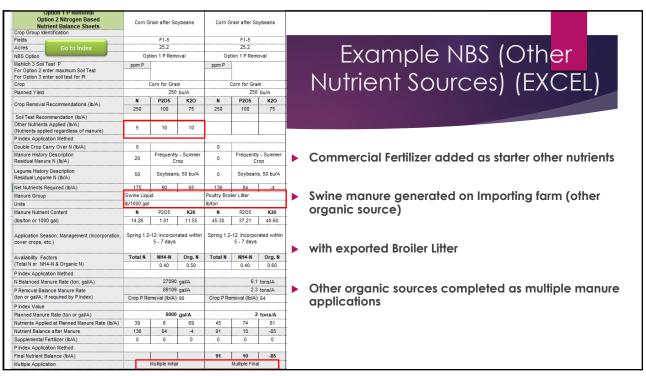
- ▶ For situations where NBS's are developed for CMU's that will receive more than one organic nutrient source, they must be treated as multiple applications in the NBS.
- ▶ Enter the appropriate information and manure application in the beginning row with the initial multiple application (Mi). Enter the starter or other fertilizer on this row.
- ► Each additional application of an organic source is completed as a succeeding row in the input sheet and listed as either a middle (M) or final (Mf) manure application.

Example NBS (Other Nutrient Sources) (EXCEL)

▶ Swine manure generated on Importing Farm(Other Organic Source) with exported Broiler Litter

Gc	Crop I	nformat	ion	Crop	Remo	/al		. '	Manure and Application		Bala	anced Manure I	Rate	Balance after Manure		
Insert Em	ive	Copy :	Selected	Rows	Inser	t Selec					•					
Crop Group ID	Crop	Crop Yield	Crop Yield Units	N Ibs/A	P ₂ O ₅ Ibs/A	K₂O		Planned Applicati on Season	Planned Application Management	Multiple Application	Nitrogen Balanced Manure Rate	Crop Phosphorous Removal Manure Rate	Planned Manure Rate	N Balance	P ₂ O ₅ Balance	K₂O Balance
Corn Grain after Soybeans	Corn for Grain	250	bu/A	250	100	75	Swine Liquid	Spring: 1.2-12	Spring 1.2-12: Incorporated within 5 - 7 days	Mi		89109	6000			
Corn Grain after Soybeans	Corn for Grain	250	bu/A	250	100	75	Poultry Broiler Litter	Spring: 1.2-12	Spring 1.2-12: Incorporated within 5 - 7 days	Mf		2.3	2.0	91	10	-85
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Manure Management Plans and Winter Application

- NBSs can be used for nutrient application in an operators Manure Management Plan (MMP). This has been approved by DEP
- ▶ Winter manure applications need to be more closely "watched".
- ▶ If a MMP operation would like to winter spread manure, they must use Option 3 (P-Index). Winter application was removed from Option 1 (P removal) and Option (2) N Recommendations in the Excel balance sheets.

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Nutrient Balance Sheets and Pasture

▶ How do you develop a planned application rate when exporting manure to a pasture.

For example a farmer wants to apply poultry litter to a pasture used by 10 beef finishers.

How to complete a NBS for a pasture with uncollected manure and imported manure using Option 1 P removal or Option 2 N based planning.

Step 1 – Talk to the importing farmer and get the grazing and field particulars.

- Collect the following information
- Animal using the pasture. Animal weight or ages.
- Grazing Information. When the animals are on pasture (months of the year, days and hours per day)
- Field information, soil test, crop, streams, etc.
- Imported manure information (analyses results)



Create a Nutrient Balance Sheet for imported poultry litter applied to a pasture

Example: A farmer wants to import poultry litter in late fall at a rate of at least 2 ton/A to a pasture. The 10 acre pasture has other sources of nutrients including uncollected manure from grazing beef animals. The animals include 10 steers grazing for 240 days during the year. They have free access to a pasture and are fed in the barn with water tank available in southwest corner of pasture. No surface water, ground water, or wells within setback restrictions. The pasture is mixed grasses and with an estimated 3 ton/ Acre yield. The farmer applies 3 - 50 lb. bags / acre of triple 15 fertilizer in the spring.

(This is the information you need to glean from the farmer)

Calculate how much uncollected steer manure is applied and how much poultry litter can be applied.

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Nutrient Balance Sheets and Pastures

Field Information

Field Size 10 Acres

Crop Established Pasture - Grass Hay (No Legume)

Distance to water None within setbacks (setback for mechanically applied manure only)

Soil Test Info. Yes $P_2O_5-22\ PPM$ $K_2O-52\ ppm$ (Will try Option 1 P removal NBS as a teachable moment)

Other Fertilizer applied 3 bags(50 lb.) 15-15-15 per acre

$$\frac{3 \text{ bags fertilizer}}{Acre} \times \frac{50 \text{ lbs fertilizer}}{1 \text{ bag}} \times \frac{0.15 \text{ lbs N}}{1 \text{ lb Fertilizer}} = \frac{22.5 \text{ lbs N}}{Acre} = \frac{23 \text{ lbs N}}{Acre}$$

$$150 \; lbs \; fertilizer \times \frac{0.15 \; lbs \; P_2O_5}{1 \; lb \; Fertilizer} = \frac{22.5 \; lbs \; P_2O_5}{Acre} = \frac{23 \; lbs \; P_2O_5}{Acre}$$

$$150 \; lbs \; fertilizer \times \frac{0.15 \; lbs \; K_2O}{1 \; lb \; Fertilizer} = \frac{22.5 \; lbs \; K_2O}{Acre} = \frac{23 \; lbs \; K_2O}{Acre}$$

Grazing Information

Days on pasture 240 days Hrs. Day on pasture 18 hours

Animals have free access to pasture (Fed in barn. Water available in pasture)

Where animals have unrestricted access to a pasture and barn use the following guidelines:

Fed in barn <u>and water available in the pasture</u>

Fed and watered in barn

18 hours / day on pasture
12 hours / day on pasture.

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Nutrient Balance Sheets and Pastures

To determine: Animal Weights

Use farm records or Agronomy Facts 54 Tech Manual Supplement 5

Species: Beef Steers - Finishers

Weight: 950 lbs.

TYPE OF ANIMAL	STANDARD WEIGHT (LB) DURING PRODUCTION (RANGE)	TYPE OF ANIMAL	STANDARD WEIGHT (LB) DURING PRODUCTION (RAN		
Dairy, Holstein/Brown Swiss		Poultry, Turkey			
Calf: 0-1 year	420 (90-750)	Tom brooder: 0-6 weeks	3.36 (0.22-6.5)		
Heifer: 1-2 years	1,000 (750-1,250)	Hen brooder: 0-6 weeks	2.74 (0.22-5.25)		
Cow	1,450	Hen regular: 6-12 weeks	11.13 (5.25-17)		
Bull	1,700	Hen heavy: 6-16 weeks	14.63 (5.25-24)		
Dairy, Guernsey/Ayrshire		Tom: 6-18 weeks	25.25 (6.5-44)		
Calf: 0-1 year	350 (70-630)	Poultry, Duck			
Heifer: 1–2 years	865 (630-1,100)	Starter: 0-17 days	1,36 (0,22-2,5)		
Cow	1,200	Finisher: 17-38 days	4,88 (2,5-7,25)		
Bull	1,600	Developer: 0-196 days	3,21 (0,22-6,2)		
Dairy, Jersey		Layer	6.85 (6.2-7.5)		
Calf: 0-1 year	275 (50-500)	Poultry, Game Birds			
Heifer: 1–2 years	675 (500-850)	Guinea, growing: 0-14 weeks	1,91 (0,06-3,75)		
Cow	1,000	Guinea, mature	3,75		
Bull	1,200	Pheasant, growing: 0-13 weeks	1.53 (0.05-3.0)		
Beef		Pheasant, mature	3.0		
Calf: 0-8 months	300 (100-500)	Chukar, growing: 0-13 weeks	0.52 (0.04-1.0)		
Replacement heifer: 8 months to 1 year	500 (300-700)	Chukar, mature	1.0		
Finishing: 8–24 months	950 (500-1,400)	Quail, growing: 0-13 weeks	0.26 (0.02-0.5)		
Replacement heifer: 1–2 years	875 (700-1,050)	Quail, mature	0,5		
Bull	1,500	Swine			
Cow	1,400	Nursery pig	35 (13-57)		
Backgrounding cattle	500 (300-700)	Wean to finish	143 (13-273)		

To determine
Manure Production & Nutrient
Values

PSU Agronomy Guide Table 1.2-10 Tech Manual Supplement 1)

Animal Type	Daily Production	Manure Percent Dry Matter	Analysis Units	Ammonium Nitrogen (NH ₄ +)	Organic Nitrogen	P ₂ O ₅	K ₂ C
Beef							
Cow, solid	90 lb/AU/day	12	lb/ton	1	10	7	10
Cow, liquid	11 gal/AU/day		lb/1,000 gal	10	22	16	27
Calf	106 lb/AU/day	12	lb/ton	2	9	7	10
Finishing cattle, solid	49 lb/AU/day	8	lb/ton	1	13	5	8

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Nutrient Balance Sheets and Pastures

Determine amount of uncollected manure generated during the year:
Uncollected manure generated by ten steers grazing for 18 hours per day for 240 days

$$10 \text{ steers} \times \frac{950 \text{ lbs}}{\text{steer}} \times \frac{1 \text{ AU}}{1,000 \text{ lbs}} \times \frac{49 \text{ lbs manure}}{\text{AU/day}} \times 240 \text{ days} \times \frac{18 \text{ hrs}}{24 \text{ hrs}} \times \frac{1 \text{ ton}}{2000 \text{ lbs}} = 41.9 \text{ tons manure}$$

Determine amount uncollected manure application rate (tons /A)
Uncollected manure application rate = tons uncollected beef manure ÷ field acres

$$\frac{41.9 tons uncollected beef manure}{10 Acres} = 4.19 tons/Acre$$

Now we can complete the Nutrient Balance Sheet

Create a manure group in the NBS for the uncollected manure and imported manure

Beef Steer Book Values – PSU Agronomy Guide Table 1.2-10 Tech Manual Supplement 1

Imported Poultry Litter – Manure Analysis (or Possibly Book Values)

Clear Manure Group Information	Manure Group Identification	Manure Report Date (most recent)	Laboratory Name	Manure Type	Manure Unit (lbs/ton or 1000 gal)	Total Nitrogen (N) Ibs / ton or Ibs / 1000 gal	Ammonium N (NH4-N) Ibs / ton or Ibs / 1000 gal	Total Phosphate (P2O5) lbs / ton or lbs / 1000 gal	Total Potash (K2O) Ibs / ton or Ibs / 1000 gal		PSC Value (Enter analytical or book value)	Organic N lbs / ton or lbs / 1000 gal
Clear Manure Group 1	Beef Steer Book Values	Book Values	Penn State Agronomy Guide	Other	lb/ton	14.00	1.00	5.00	8.00	8.00	0.80	13.00
Clear Manure Group 2	Poultry Broiler Litter	2/21/2023	AASL	Poultry	lb/ton	45.30	24.20	37.21	40.60	53.30	0.80	21.10

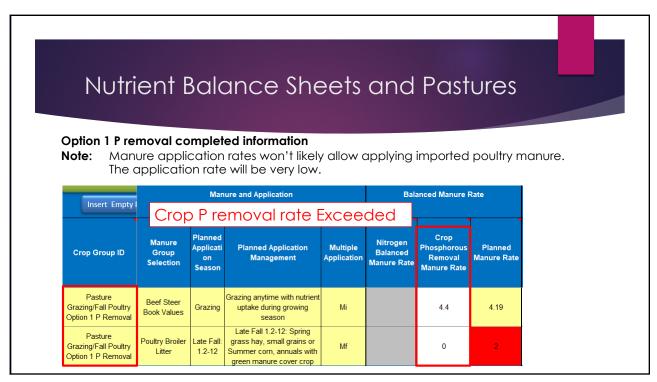
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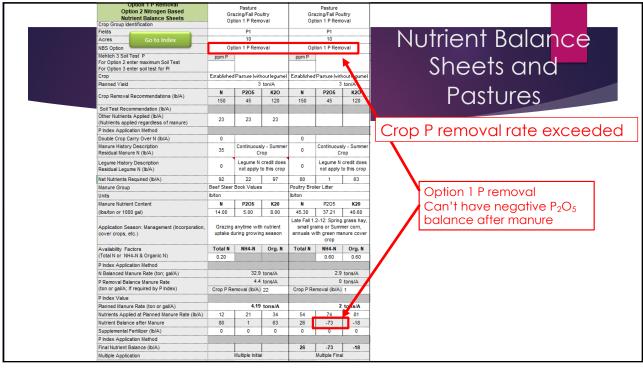
Nutrient Balance Sheets and Pastures

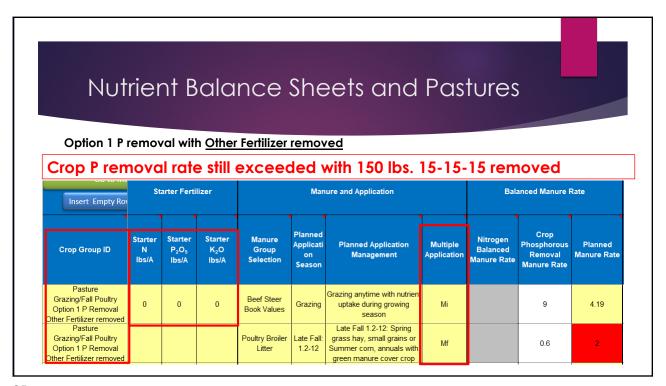
Each manure application is completed as separate row in the input sheet

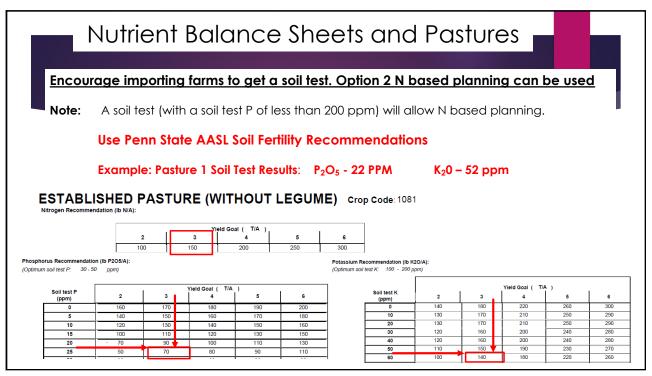
The Crop Group ID <u>must be identical for multiple manure applications to work</u> Check the Crop Group Id Count column. Exact field IDs will end in 1. .2 for each replicate

	Go to Index Information Insert Empty Row Copy Row Down Delete Active Row			Copy Select	Crop Information lected Rows Insert Selected Row				p Remo	val	Starter Fertilizer			Field Residual and Carryover Nitrogen History		
Crop Group ID	Crop Group Id Count	Fields in Group	Acres	Manure Plan Option	Mehlich 3 Soil Test P - For Option 2 enter maximum Soil Test	Сгор	Crop Yield		N Ibs/A	P₂O₅ lbs/A	K ₂ O lbs/A	Starter N Ibs/A	Starter P ₂ O ₅ Ibs/A	Starter K ₂ O Ibs/A	Residual Manure N	Carryover Legume N
Pasture Grazing/Fall Poultry Option 1 P Removal	Pasture Grazing/Fall Poultry Option 1 P Removal.1	P1	10	Option 1 P Removal		Established Pasture (without legume)	3	ton/A	150	45	120	0	0	0	Continuously - Summer Crop	Legume N credit does not apply to this crop
Pasture Grazing/Fall Poultry Option 1 P Removal	Pasture Grazing/Fall Poultry Option 1 P Removal.2	P1	10	Option 1 P Removal		Established Pasture (without legume)	3	ton/A	150	45	120	0	0	0	Continuously - Summer Crop	Legume N credit does not apply to this crop









Nutrient Balance Sheets and Pastures Option 2 Nitrogen Based Planning Select Option 2 Nitrogen Requirement for Manure Plan Option Enter the Soil Test P value in ppm (Mehlich 3) **Enter the Soil Test Recommendations** Soil Test Recommendations Starter Fertilizer Delete Active Copy Row Down Copy Selected Rows Insert Empty Row Insert Selected Mehlich 3 Soil Test Soil Test oil Test Soil Test P Starter Starter Manure Plan Crop Yield Fields in Crop Group ID For Option 2 User User Group Option Units lbs/A lbs/A P_2O_5 lbs/A lbs/A lbs/A Ibs/A Ibs/A Established Pasture Option 2 Pasture Grazing/Fall Poultry 150 45 120 150 0 Nitrogen (without Option 2 N Based Requirement legume) Pasture Pasture Grazing/Fall Poultry 10 22 ton/A 150 45 120 150 70 140 0 0 0 (without Option 2 N Based Requirement legume)

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Nutrient Balance Sheets and Pastures Option 2 Nitrogen Based Planning · The nitrogen balanced manure application rate will be displayed Cannot exceed the N based manure application rates 3 ton/A poultry litter could be applied in this example Supplemental fertilizer after manure (N - P - K) completed in the final multiple Pasture razing anytime with nutrient 35.7 6 4.19 Late Fall 1.2-12: Spring Pasture Grazing/Fall Poultry Poultry Broiler grass hay, small grains or 3.2 0.2 2.0 -40 10 10 0 1.2-12 nmer corn, annuals with Option 2 N Based

Remember to include applicable Field notes

There are **four scenarios** that require notes to be included in the Nutrient Balance Sheet Summary Notes table.

- Crop Removal Recommendation Basis Use the following note: "Nutrient balances in Row M for P₂O₅ and K₂O are based on crop removal (Row A) and should not be used to determine additional fertilizer needs."
- Manure Applied to Pastures If uncollected manure is accounted for Row C –
 Other Organic Sources Applied, the following information should be included in the
 Nutrient Balance Sheet Summary Notes table: animal group(s) using the pasture;
 number of animals in each animal group; grazing season length; amount of
 hours/day animals are planned to spend on the pasture; and the location of feed
 and water in grazing scenarios where animals have unrestricted access to both a
 barn and/or lot where manure is collected and a pasture.
- 9,000 Gallon Rate Limit Explanation of how planned manure application rates
 that exceed a total of 9,000 gallons will be handled including a note that adequate
 drying time occur between the separate applications.
- Winter Manure Application see notes below

The NBS summary notes should also be utilized to assist the operator in implementing the planned NBS. Examples of such notes would include:

the planned NBS. Examples of such notes would include:

1. For the application of other organic sources, the notes must include the type of material and the application rate.

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Nutrient Balance Sheets and Pastures

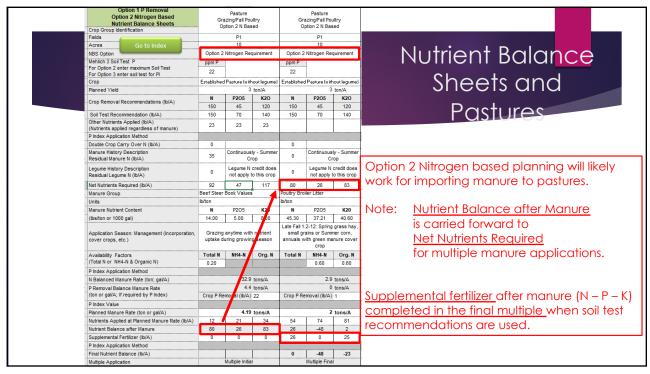
· Remember to enter applicable Field notes in the Input Page

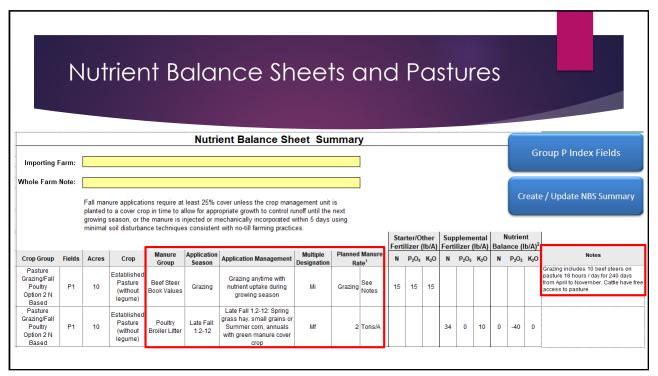
Go to	Balanced Manure Rate					anure	Supp	lemental Fe	ertilizer	Final Nutrient Balance			
Crop Group ID	Nitrogen Balanced Manure Rate	Crop Phosphorous Removal Manure Rate	Planned Manure Rate	N Balance	P₂O₅ Balance	K ₂ O Balance	Suppl. N	Suppl. P2O5	Suppl. K2O	Final Nitrogen Balance	Final P2O5 Balance	Final K2O Balance	
Pasture Grazing/Fall Poultry Option 2 N Based	35.7	6	4.19										
Pasture Grazing/Fall Poultry Option 2 N Based	3.2	0.2	2.0	34	-40	10	34	0	10	0	-40	0	

User Note - Enter notes directly for each Crop Group here. Note that are repeated can be copied from one CMU and pasted in another.

Grazing includes 10 beef steers on pasture 18 hours / day for 240 days from April to November. Cattle have free access to pasture.

Field Notes





How are Food Processing Residuals Handled?

- ▶ Food Processing Residuals (FPRs) are under the authority of DEPs Bureau of Waste. FPRs must be applied according to DEPs Food Processing Residual Manual. The SCC will assist as our authority allows but the take home is "this does not fall under our programs, and you have to contact DEP".
- ► The SCC has worked with DEP to develop a guidance document (Supplement to Nutrient management Technical Manual) for when FPR and manure are comingled.
- ▶ This supplement is intended to provide guidance for operators that utilize food processing waste and/or sewage sludge as a nutrient source or soil amendment for agronomic purposes. It discusses the statutory and regulatory requirements for the land application of these materials when used alone and when mixed with manure. These requirements include coverage under general permits for municipal and residual waste.

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Setback Guidance Document

- 2016 document titled A Comparison of Land Application Setback Requirements for Various Regulatory Programs in PA
- ▶ Includes all sensitive areas that may be encountered and the setbacks for the following programs:
 - ▶ NMP
 - ▶ NBS
 - ► MMP
 - Biosolids
 - ► Food Processing Residual

Conclusion

▶ In conclusion, NBS development must take into consideration all sources of nutrients that may be utilized on the importing operations fields. When more than one type of organic nutrient source (manure, biosolids, etc.) will be applied to any importing field, it must be planned as a multiple application in the NBS.