Preparing for Beta 3 Nutrient Spread

Update from Agricultural Modeling Subcommittee to Ag Workgroup

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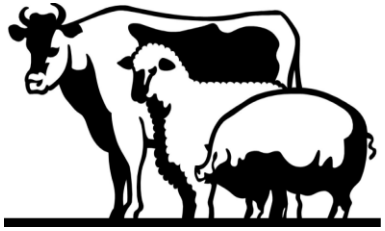
Phase 6 Scenario Builder Conceptual Model

Livestock Manure (and Biosolids)



Barnyard

Fertilizer

Nutrient Application Prescription

Pasture

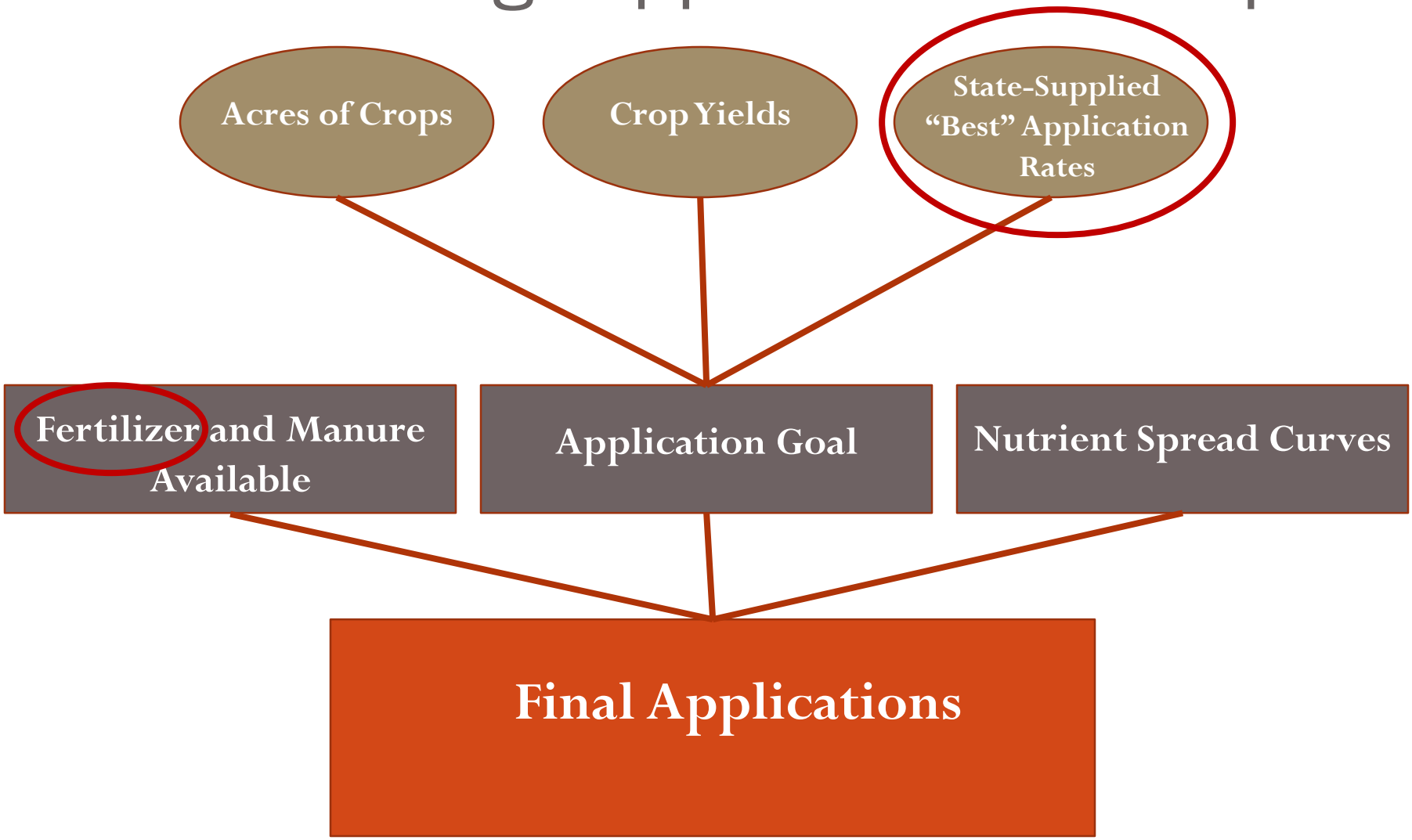
Access Area

River

Crops

Image Credits
https://utextension.tennessee.edu/lincoln/4-H/Pages/Livestock-Skillathons-%28Beef,-Sheep-and-Swine%29.aspx
Rehelwoodranch.com
Seaburst.com
http://pubw.cect.vt.edu/442/442-308/442_308.html
http://nh.water.usgs.gov/project/champlain_bmp/ag.htm

“Prescribing” Applications to Crops



Plan

- CBPO Staff will run nutrient spread two ways:
  - Beta 3a: Utilize fertilizer sales data as used in previous beta runs.
  - Beta 3b: Apply fertilizer to fulfill crop application goal after manure is applied (no fertilizer sales data)
  - Both runs will use revised application table and NM and non-NM acres
- AMS will review results of beta runs prior to July Ag Workgroup meeting.
  - Outlier counties will be identified where methods did not work and remedial measures will be proposed.
- Ag Workgroup to determine which nutrient spread to use for final calibration at July Ag Workgroup meeting.
  - If consensus cannot be reached, question to be raised to WQGIT.

What's new in Beta 3?

- **Crop Application Goals**
  - Group of Agricultural Workgroup state representatives worked with the AMS to revise crop application goals so they better reflect land-grant university recommendations.
- **Non-Nutrient Management Application Goal Multiplier**
  - Subgroup of Nutrient Management expert panel currently working on revisions based upon new Crop Application Goals.
- **Legume Fixation**
  - AMS approved use of new equation to estimate legume fixation based upon estimates of nitrogen from soils, manure and inorganic fertilizer.
- **Crop Removal**
  - AMS reviewed existing crop removal/uptake values, and agreed to adjust values for corn, beans, pasture and non-legume hay.
- **Barnyard Area for Other Cattle**
  - Area will be adjusted so it better reflects NRCS estimates of area used by cattle

Crop Application Goal

- Differences across states were mainly removed.
- Major commodity crops match very closely to land-grant university recommendations.
  - Thus, this represents the nutrient management condition.
  - Acres on non-nutrient management to have different applications.
  - Acres of Nutrient Management to be provided by states in NEIEN.
- Pasture and hay applications do NOT match land-grant university recommendations as those are often much higher than the average application for these crops.

Crop Application Goal on Major Crops

Crop	DoubleCrop	Nutrient	Yield Unit	DE_1	MD_1	NY_1	PA_1	VA_1	WV_1
Alfalfa Hay Harvested Area	N	TN	dry tons	1	1	1	1	1	1
Alfalfa Hay Harvested Area	N	TP	dry tons	5	5	5	6	5	5
Corn for Grain Harvested Area	N	TN	bushels	0.92	0.92	0.92	0.92	0.92	0.92
Corn for Grain Harvested Area	N	TP	bushels	0.12	0.12	0.12	0.12	0.12	0.12
Corn for Grain Harvested Area	Y	TN	bushels	0.92	0.92	0.92	0.92	0.92	0.92
Corn for Grain Harvested Area	Y	TP	bushels	0.12	0.12	0.12	0.12	0.12	0.12
Wheat for Grain Harvested Area	**N**	**TP**	**bushels**	**0.31**	**0.31**	**0.31**	**0.31**	**0.31**	**0.31**
Wheat for Grain Harvested Area	N	TN	bushels	1.25	1.25	1	1	1.25	1.25
Wheat for Grain Harvested Area	**Y**	**TP**	**bushels**	**0.465**	**0.465**	**0.465**	**0.465**	**0.465**	**0.465**
Wheat for Grain Harvested Area	Y	TN	bushels	1.25	1.25	1	1	1.25	1.25
Pastureland and rangeland other than cropland and woodland pastured Area	**N**	**TN**	**acres**	**15**	**15**	**15**	**15**	**15**	**15**
Pastureland and rangeland other than cropland and woodland pastured Area	**N**	**TP**	**acres**	**4**	**4**	**4**	**4**	**4**	**4**
Soybeans for beans Harvested Area	N	TN	bushels	0.12	0.12	0.12	0.12	0.12	0.12
Soybeans for beans Harvested Area	N	TP	bushels	0.33	0.33	0.33	0.33	0.33	0.33
Soybeans for beans Harvested Area	**Y**	**TN**	**bushels**	**0**	**0**	**0**	**0**	**0**	**0**
Soybeans for beans Harvested Area	**Y**	**TP**	**bushels**	**0**	**0**	**0**	**0**	**0**	**0**

Non-Nutrient Management Application Multiplier

- Original table will be modified by Nutrient Management Panel based upon new crop application goals by end of week.

Previous Draft Non-NM Multipliers

Land Use	N Core NM	N Non-NM	P Core NM	P Non-NM
Full Season Soybeans	1	1.2	1	1.5
Grain w/ Manure	1	1.3	1	3
Grain w/o Manure	1	1.2	1	1.5
Legume Hay	1	1.2	1	1
Silage w/ Manure	1	1.4	1	3
Silage w/o Manure	1	1.2	1	1.5
Small Grains and Grains	1	1.2	1	1.5
Small Grains and Soybeans	1	1.2	1	1.5
Specialty Crop High	1	1.3	1	2
Specialty Crop Low	1	1.2	1	2
Other Agronomic Crops	1	1.1	1	1.5
Other Hay	1	0.7	1	2
Pasture	1	0.25	1	1

Legume Fixation

† Available soil N equals percent organic matter times 30. Also add fertilizer N applied (if any) plus one-half of manure N (or three-fourths of poultry manure N) plus residual NO_3-N from prior crop. For soils with >3% organic matter, use values at lower end of range. Soils with <3% organic matter, use upper end of range.

Meisinger and Randall, 1991.

- **Short-Term Solution (Beta 3):**
  - Assume Average % Organic Matter = 1.5% for EVERY County
  - Assume 45 lbs N from Soil for EVERY County (1.5 X 30).
  - Add lbs PAN from Manure and Fertilizer
  - Use regression to determine % N2 fixed by crop.
    - With zero additional PAN applications, 77% N need will be fixed.
- **Long-Term Solution (Beta 3):**
  - % Organic Matter may vary by county
  - Crop removal will be updated

Legume Fixation for Beta 3

CROP	Yield Unit	N Removal/Yield Unit	Yield/Acre	N Fixation Need/Acre	Fraction from Fixation	N Fixed/Acre
Alfalfa Hay Harvested Area	dry tons	59.52	4	357.09	0.77	**274.96**
Alfalfa seed Harvested Area	acres	137.04	1	205.56	0.77	**158.28**
Birdsfoot trefoil seed Harvested Area	acres	76.61	1	114.91	0.77	**88.48**
Cropland used only for pasture or grazing Area	**acres**	**20.67**	**1**	**31.00**	**0.77**	**23.87**
Dry edible beans, excluding limas Harvested Area	acres	59.54	1	89.31	0.77	**68.77**
Green Lima Beans Harvested Area	acres	91.86	1	137.79	0.77	**106.10**
Haylage or greenchop from alfalfa or alfalfa mixtures Harvested Area	acres	103.34	1	155.01	0.77	**119.36**
Other haylage, grass silage, and greenchop Harvested Area	**acres**	**20.67**	**1**	**31.00**	**0.77**	**23.87**
Pastureland and rangeland other than cropland and woodland pastured Area	**acres**	**20.67**	**1**	**31.00**	**0.77**	**23.87**
Peanuts for nuts Harvested Area	acres	122.00	1	183.00	0.77	**140.91**
Peas, Chinese (sugar and Snow) Harvested Area	acres	91.86	1	137.79	0.77	**106.10**
Peas, Green (excluding southern) Harvested Area	acres	91.86	1	137.79	0.77	**106.10**
Peas, Green Southern (cowpeas) – Black-eyed, Crowder, etc. Harvested Area	acres	91.86	1	137.79	0.77	**106.10**
Red clover seed Harvested Area	acres	94.94	1	142.42	0.77	**109.66**
Snap Beans Harvested Area	acres	91.86	1	137.79	0.77	**106.10**
Soybeans for beans Harvested Area	bushels	4.18	80	501.18	0.77	**385.91**
Vetch seed Harvested Area	acres	168.79	1	253.19	0.77	**194.95**

Crop Removal

- Much work left to do!
- AMS agreed the Phase 5 values for crop removal/uptake need to be revisited.
- A subgroup of the AMS will focus on this task in the coming weeks.
- Short-term corrections were made for pasture, non-legume hay, beans and corn for grain.

Other Cattle Barnyard Area

- Barnyard area sets feeding operation land uses.
- Storage and handling loss is the assumed "load" from feeding operation land uses.
- BMPs, such as barnyard runoff control, reduce this load.
- NRCS assumes approximately 100 square ft/ cattle animal unit.
- Other Cattle values for manure and animals/AU are already approximated as the average between beef and dairy.
- MD proposes doing the same for barnyard area.

Cattle Barnyard Area

Animal Type	Sq Feet/Animal	Animals/ AU	Sq Feet/AU
Beef	82.31	1.14	93.84
Dairy	125.46	0.74	92.84
Other Cattle	~~63.48~~ **103.89**	0.94	~~59.67~~ **97.65**