Agricultural Modeling Subcommittee Update to Ag Workgroup

09072016

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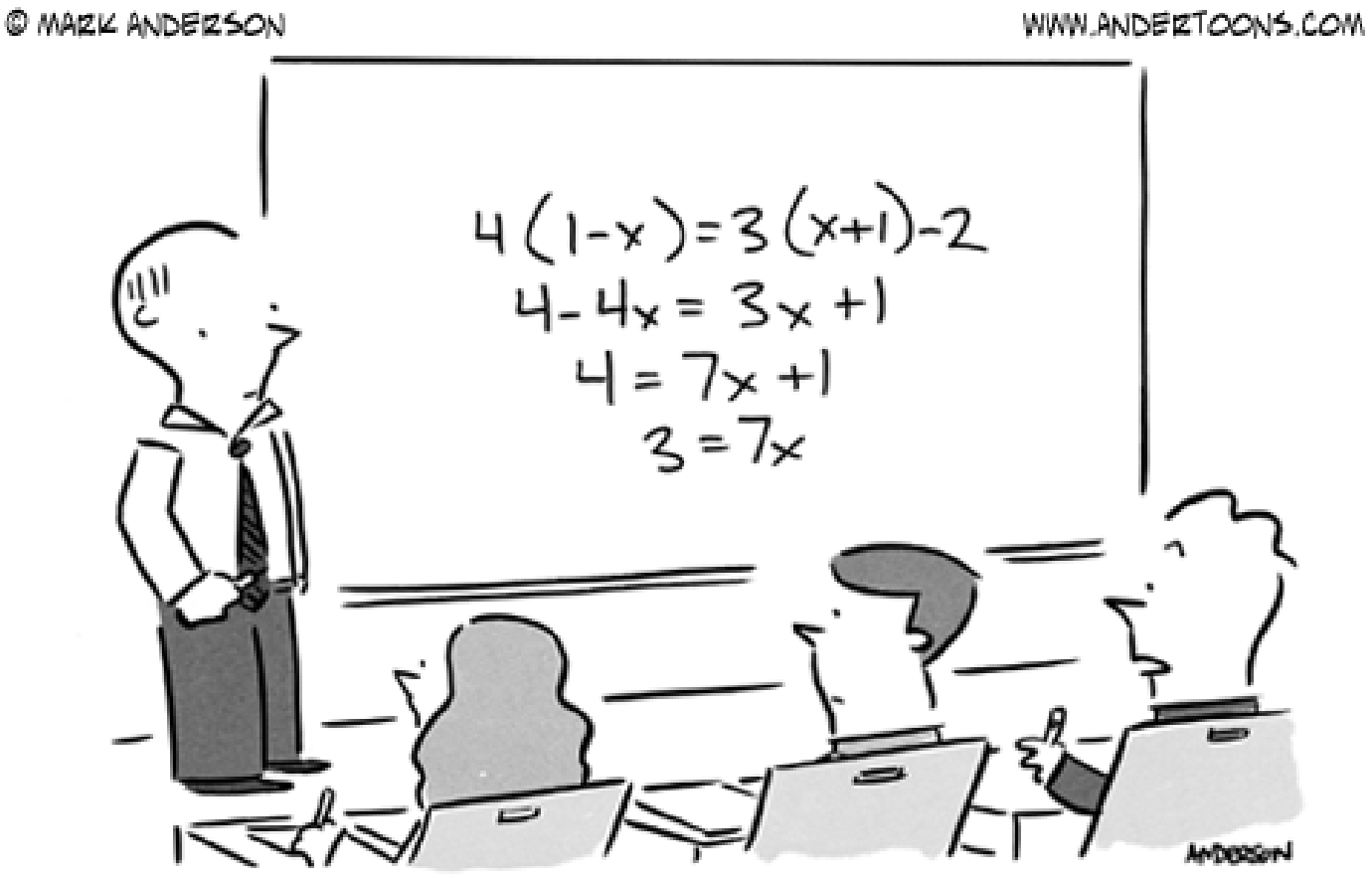
Issues pending approval or under development

- Nutrient spread curves (solution recommended)
- Size of other cattle (solution recommended)
- Yield goal multiplier (solution recommended)
- Ammonia volatilization (solution recommended)
- Double crops (solution recommended)
- Accounting for manure transport (feedback requested)
- Confinement fractions (under review)
- Biosolids (under development/review)
- Outliers in Ag Census data (under development/review)
- STAC Review results (under development/review)

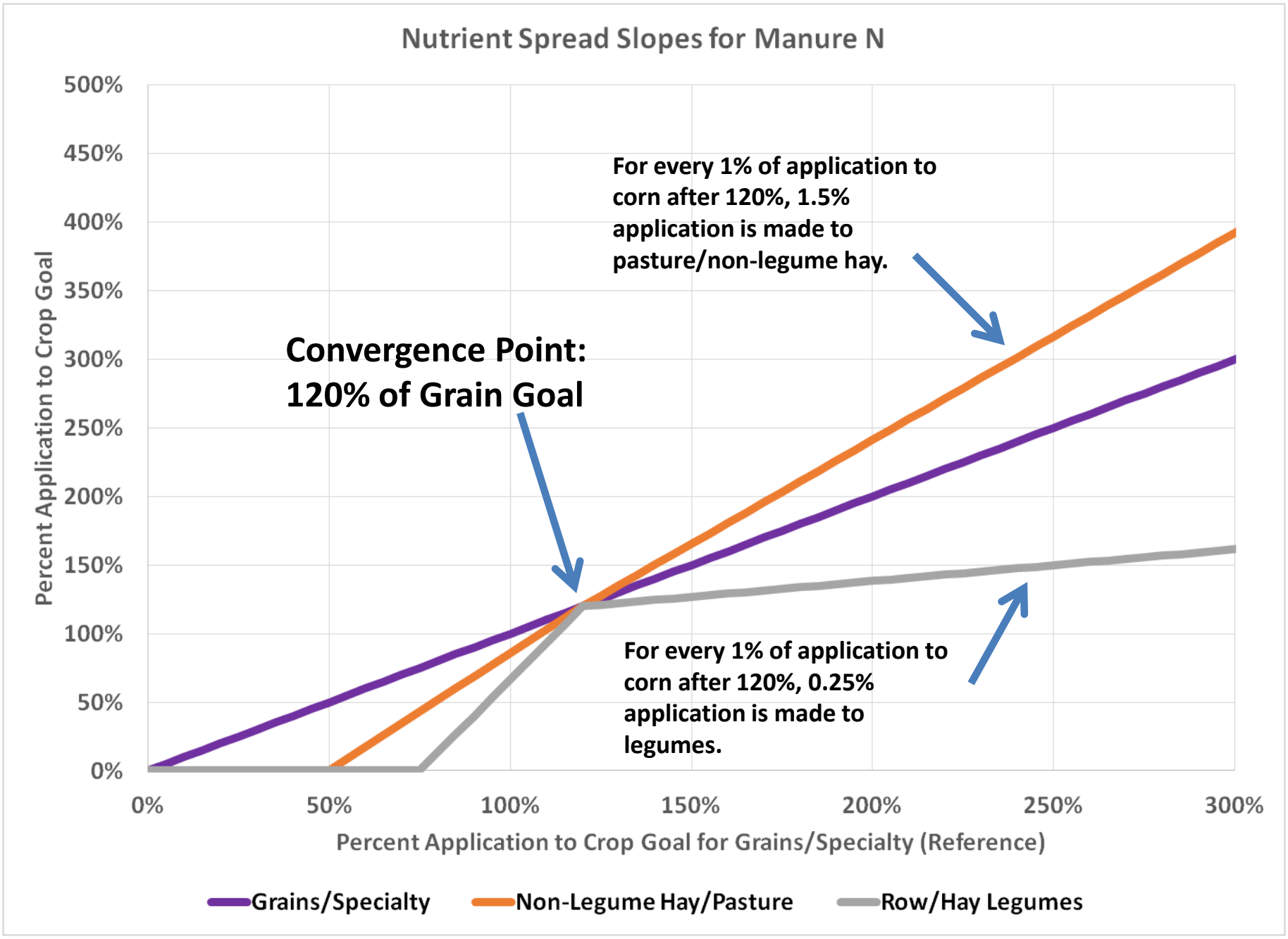
Nutrient Spread Curves

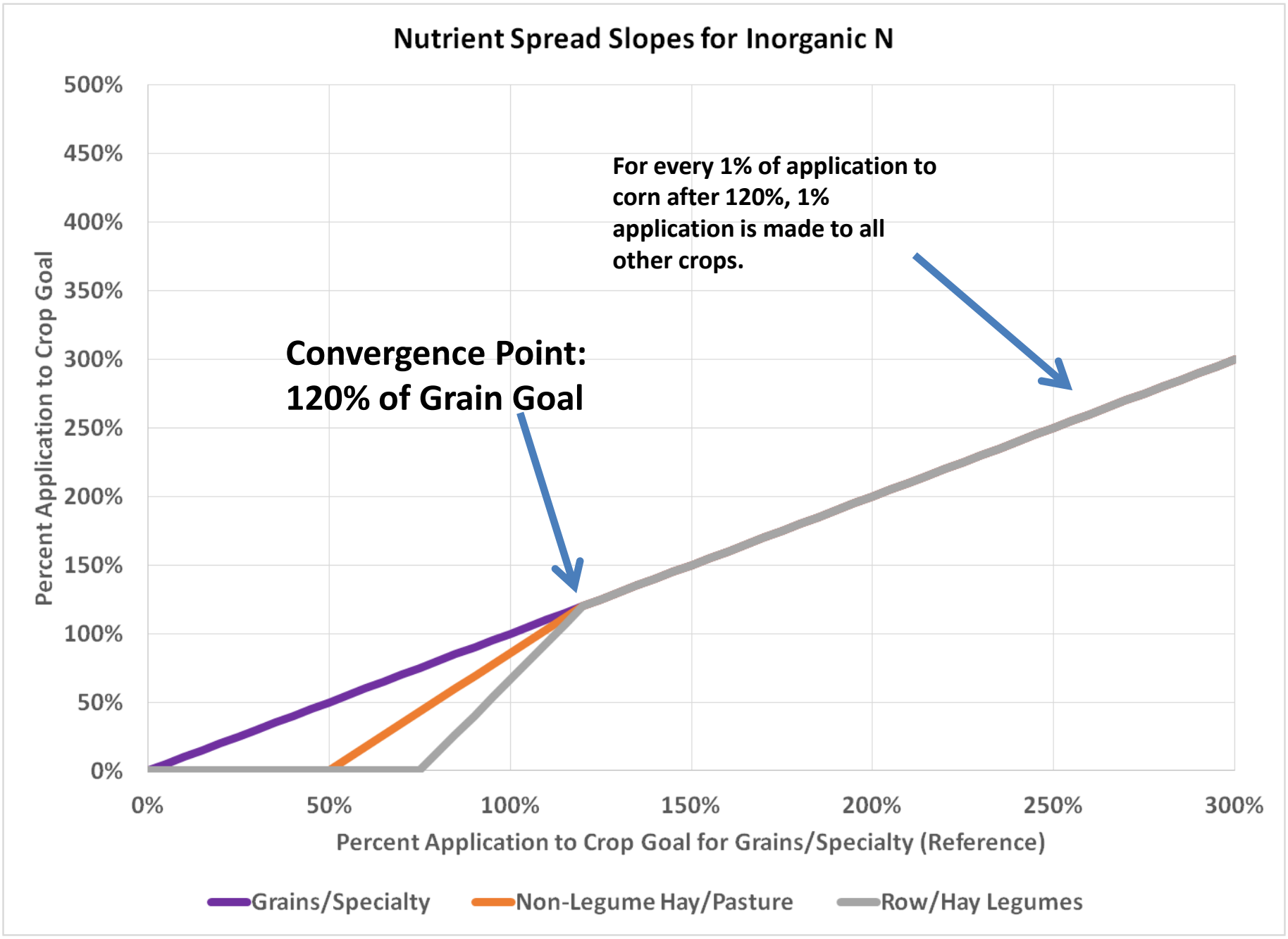
- Issue: Too many curves complicated results and led to confusing changes between applications on land uses from year to year.

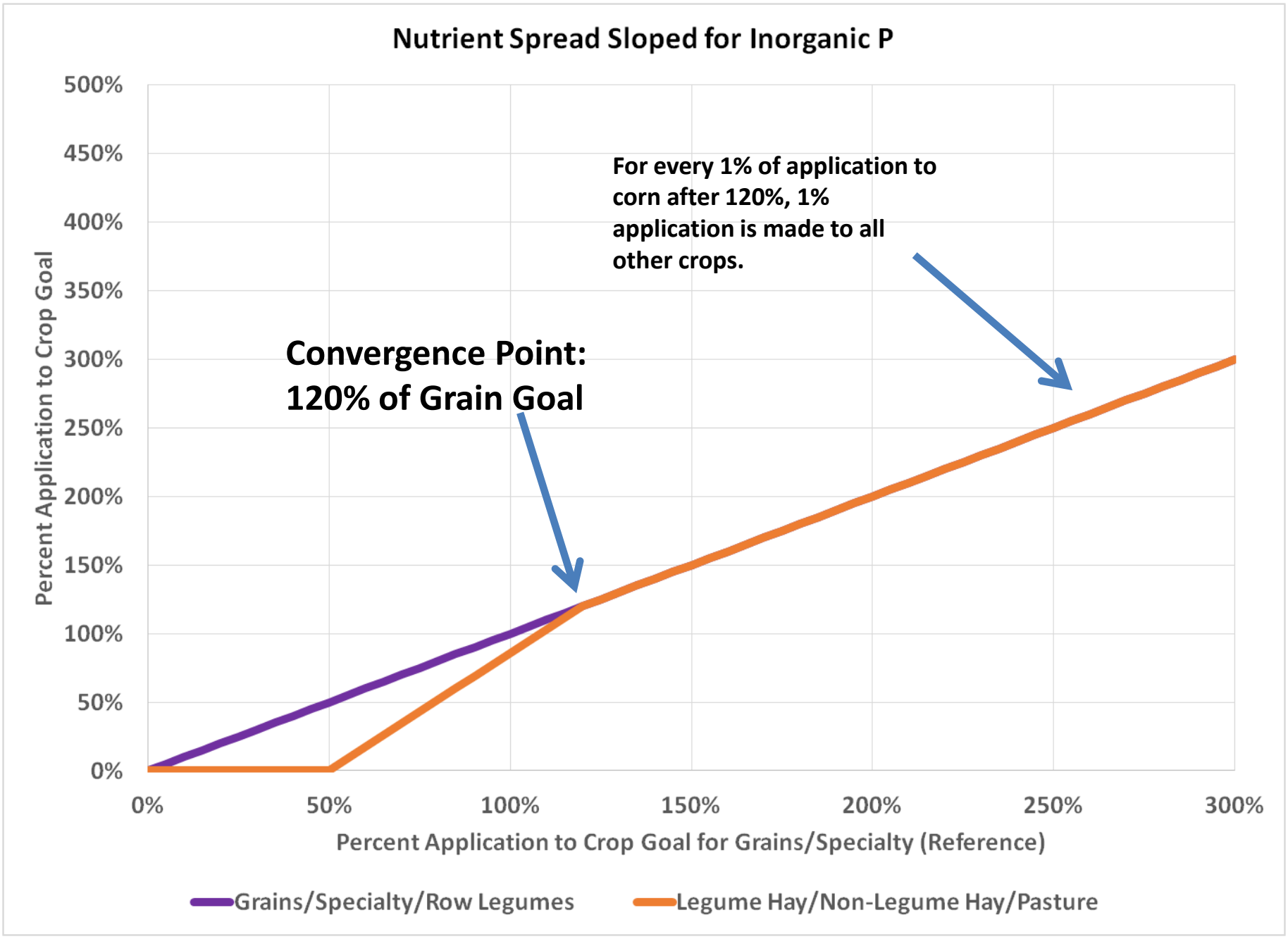
Recommended Solution: Simplify!



"Wouldn't it be more efficient to just find who's complicating equations and ask them to stop?"


Nutrient Spread Slopes for Manure N
500%
450%
400%
350%
300%
250%
200%
150%
100%
50%
0%
Percent Application to Crop Goal
For every 1% of application to corn after 120%, 1.5% application is made to pasture/non-legume hay.
Convergence Point: 120% of Grain Goal
For every 1% of application to corn after 120%, 0.25% application is made to legumes.
0%
50%
100%
150%
200%
250%
300%
Percent Application to Crop Goal for Grains/Specialty (Reference)
Grains/Specialty
Non-Legume Hay/Pasture
Row/Hay Legumes


Nutrient Spread Slopes for Inorganic N
500%
450%
400%
350%
300%
250%
200%
150%
100%
50%
0%
Percent Application to Crop Goal
For every 1% of application to corn after 120%, 1% application is made to all other crops.
Convergence Point: 120% of Grain Goal
0%
50%
100%
150%
200%
250%
300%
Percent Application to Crop Goal for Grains/Specialty (Reference)
Grains/Specialty
Non-Legume Hay/Pasture
Row/Hay Legumes


Nutrient Spread Sloped for Inorganic P
500%
450%
400%
350%
300%
250%
200%
150%
100%
50%
0%
Percent Application to Crop Goal
For every 1% of application to corn after 120%, 1% application is made to all other crops.
Convergence Point: 120% of Grain Goal
0%
50%
100%
150%
200%
250%
300%
Percent Application to Crop Goal for Grains/Specialty (Reference)
Grains/Specialty/Row Legumes
Legume Hay/Non-Legume Hay/Pasture

Size of Other Cattle

- Issue: Other cattle appear to be producing too much manure in Beta 3.
- Recommended Solution: Adjust size of other cattle based upon Ag Census information about this animal group.

Other Cattle (Phase 5)

- Beef calves (4 animals/AU)
- Beef heifers for replacement herds (1.14 animals/AU)
- Beef breeding herds (cows and bulls) (1 animal/AU)
- Beef stockers and grass fed beef (1.73 animals/AU)
- Dairy calves (4 animals/AU)
- Dairy heifers for replacement herds (0.94 animals/AU)
- Dairy stockers and grass-fed animals marketed as beef (1.73 animals/AU)

- Phase 5 used an average AU of all these types. That worked out to 2.08 animals/AU

Kellogg et al, 2000. Manure Nutrients Relative to the Capacity of Cropland and Pastureland to Assimilate Nutrients…

Potential Other Cattle (Phase 6)

- Beef calves (4 animals/AU)
- Beef heifers for replacement herds (1.14 animals/AU)
- Beef breeding herds (cows and bulls) (1 animal/AU)
- ~~Beef stockers and grass fed beef (1.73 animals/AU)~~
- Dairy calves (4 animals/AU)
- Dairy heifers for replacement herds (0.94 animals/AU)
- ~~Dairy stockers and grass-fed animals marketed as beef (1.73 animals/AU)~~

Fraction of Other Cattle by Type in 2012 Ag Census

State	Bulls	Beef Calves	Dairy Calves	Beef Heifers for Replacement	Dairy Heifers for Replacement
DE	0.06	0.40	0.38	0.07	0.09
MD	0.06	0.39	0.40	0.07	0.09
NY	0.02	0.12	0.68	0.02	0.16
PA	0.03	0.21	0.59	0.04	0.14
VA	0.10	0.68	0.08	0.12	0.02
WV	0.11	0.72	0.03	0.13	0.01
Total	**0.06**	**0.41**	**0.37**	**0.07**	**0.09**

Weighted Average of Other Cattle based upon 2012 Ag Census (all Bay states)

Other Cattle Type	Animals/AU	Fraction 2012 Other Cattle	Weighted Animals/AU
Bulls	1	0.06	0.06
Beef Calves	4	0.41	1.64
Dairy Calves	4	0.37	1.48
Beef Heifers for Replacement	1.14	0.07	0.08
Dairy Heifers for Replacement	0.94	0.09	0.08
		Total Average	**3.34**

Yield Goal Multiplier

- Issue: Best 3 of 5 year yields were multiplied by 1.1, but this led to higher than expected application goals in some areas.
- Recommended solution: Multiply by 1.

Modification of Ammonium Volatilization Factors

- SB currently assumes 65% of manure NH_3 content volatilized from both barnyard/storage and after field application
- Problems:
  - Volatilization rates/factors typically reported as a fraction of the total ammoniacal N (NH_3 +NH_4^+)
  - Lab data for field applied manure analysis readily available, but N data for as-excreted manure is limited
  - Back calculation from field applied manure to as-excreted values not straight forward (N mineralization rates must considered).
- New Approach:
  - Use literature values for ammonium conservation/volatilization in the barnyard.
    - Back-calculate to determine ammoniacal N in manure in the barnyard.
  - Use UMD Extension values for ammonium conservation/volatilization in the field.
    - Back-calculate to determine ammoniacal N in manure in the field.

Draft volatilization factors on total excreted N basis

Animal	Fraction of total excreted N volatilized from housing and storage[1]	Fraction of total excreted N volatilized in field without incorporation[2]	Total As-Excreted N volatilized before available to crops
Beef and Other Cattle (solid)	35%	4%	39%
Dairy (liquid)	27%	18%	45%
Hogs (liquid)	30%	27%	57%
Poultry	40%	6%	46%
Horses	35%	4%	39%
Sheep	35%	6%	41%
Goats	35%	6%	41%

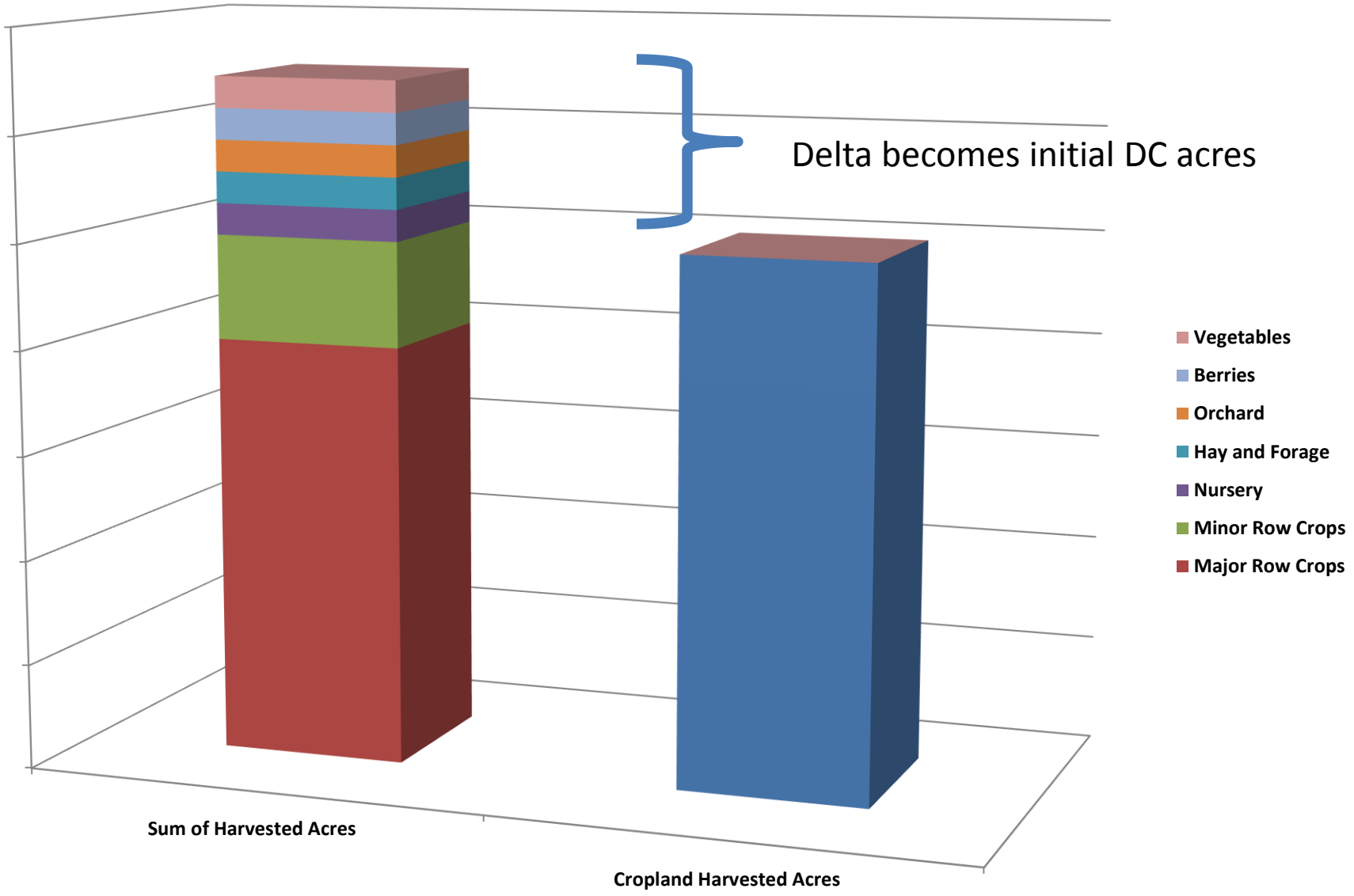
[1]Rotz, 2003. Mean of housing and storage types. Horses, sheep, and goats assumed same as solid cattle manure.

[2] Based upon UMD Extension ammonium conservation values.

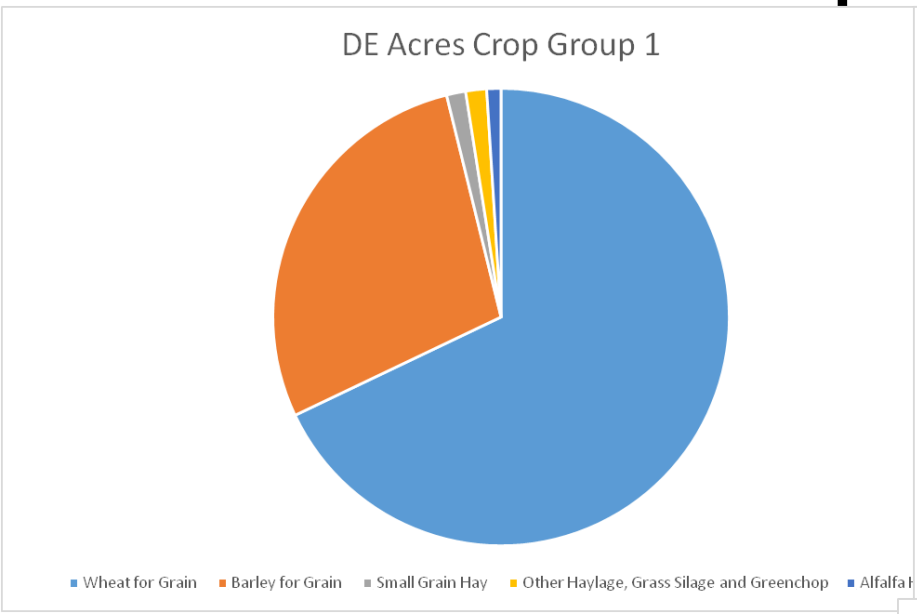
Double Crops

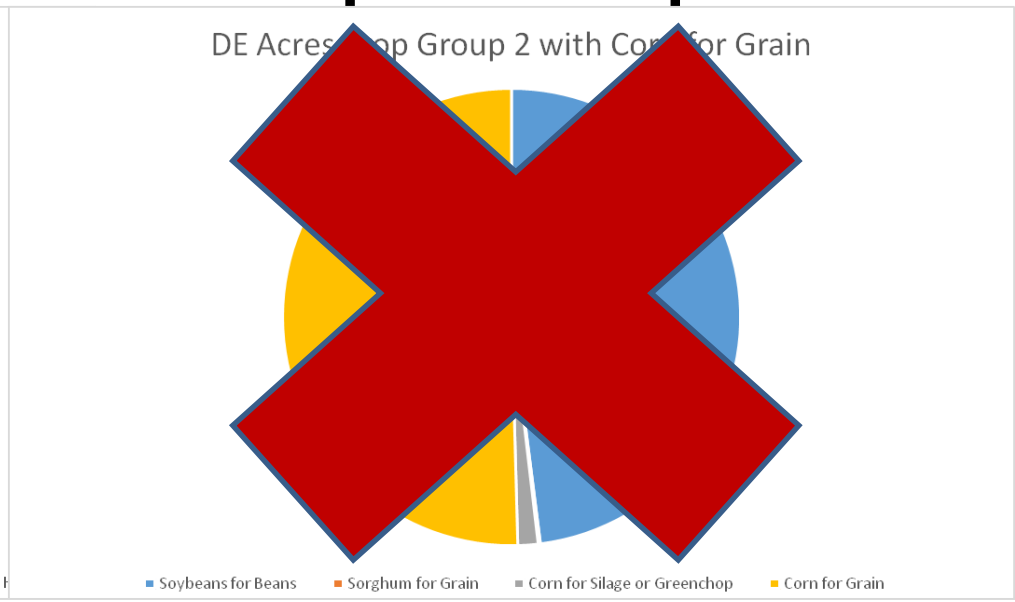
- Issue: Double cropping acres did not account for forage/hay/silage cropping routines very well.
- Recommended solution:
  - Include hay, forage and silage crops in calculation of total double-cropped acres.
  - Do not include corn for grain in double crops.
  - Proportion acres into two crop harvest groups according to state recommendations.

Setting Total DC Acres

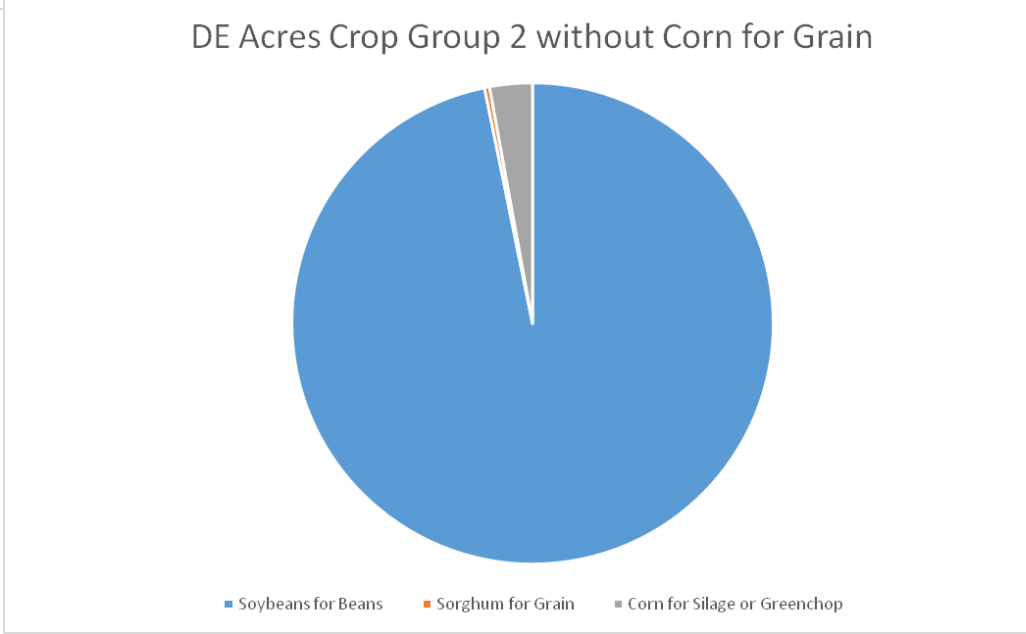


DE 2012 Crops in Crop Groups

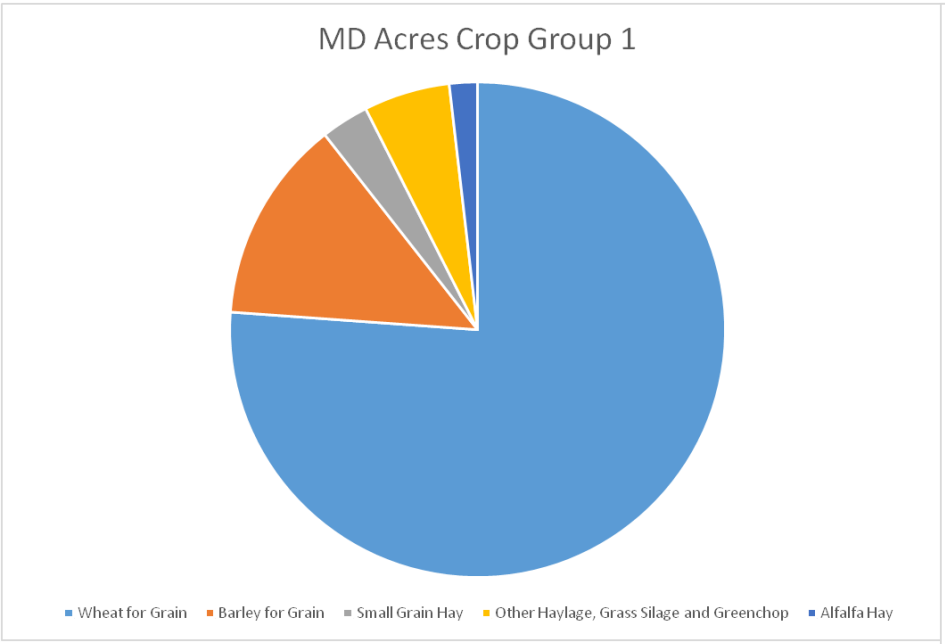


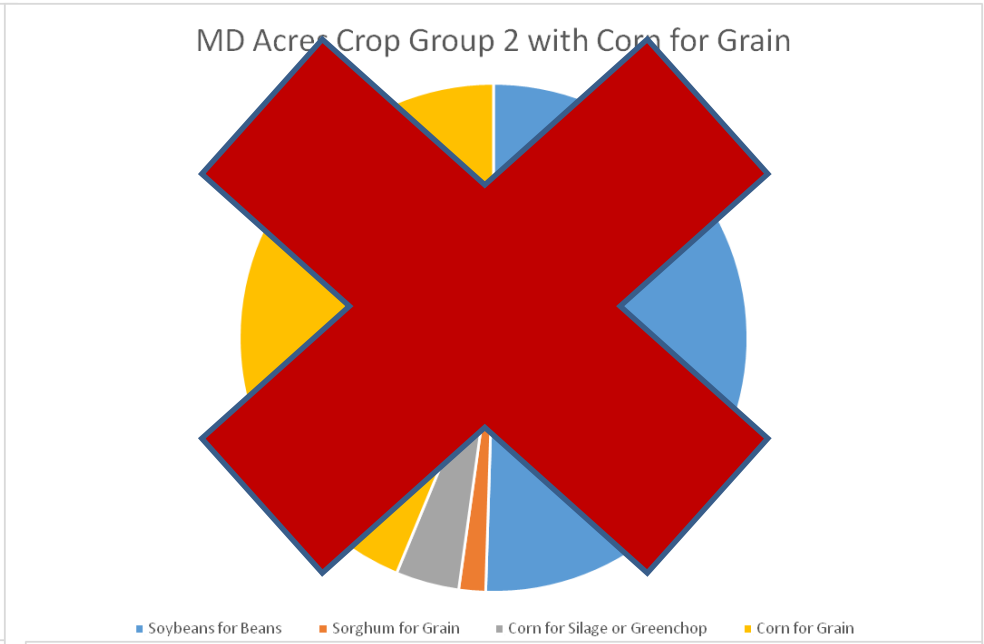


Scenario	Total Double-Cropped Acres
With Corn for Grain	105,985
Without Corn for Grain	105,985

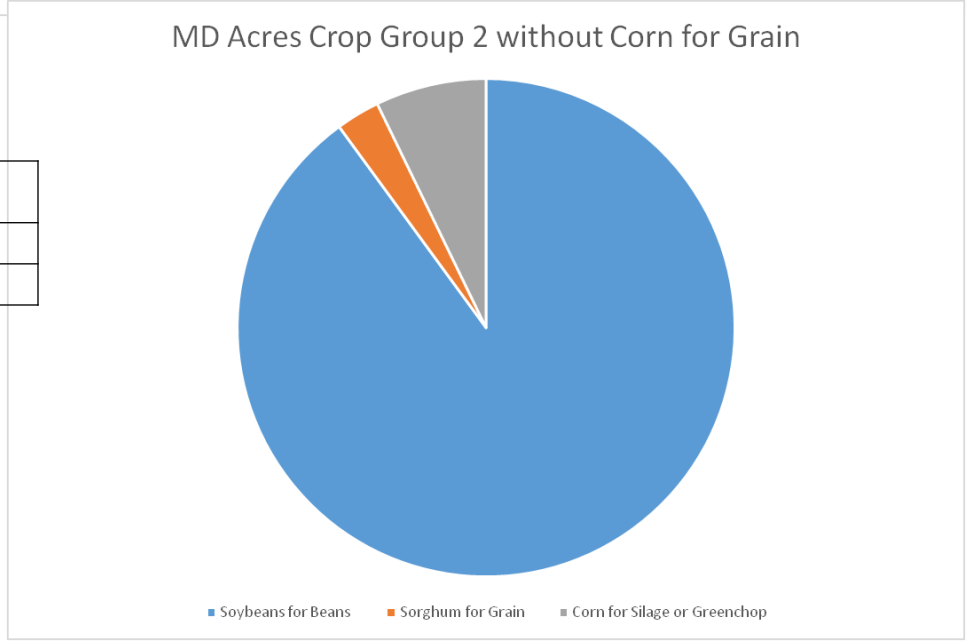


MD 2012 Crops in Crop Groups

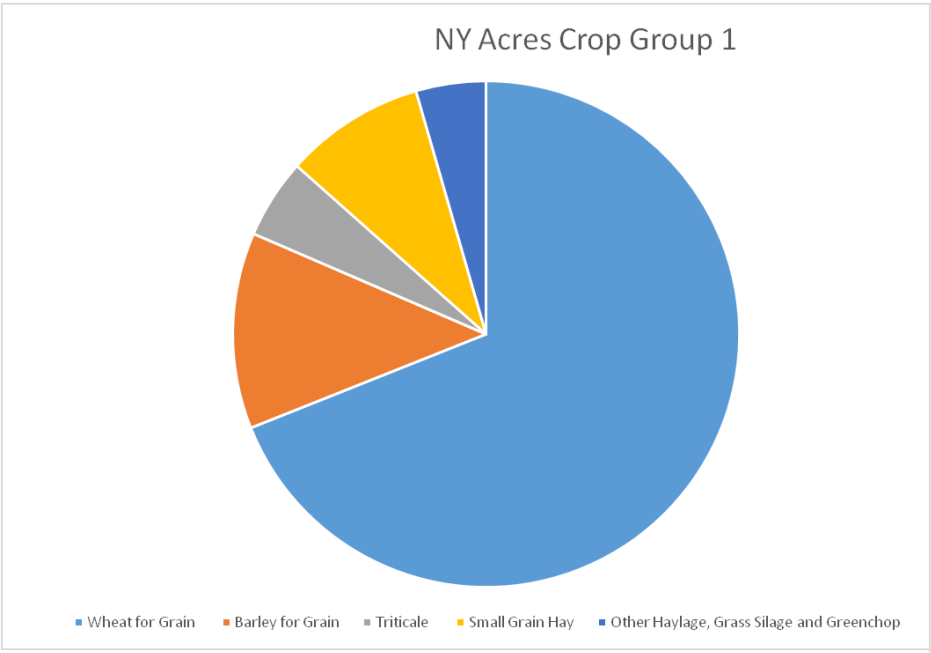


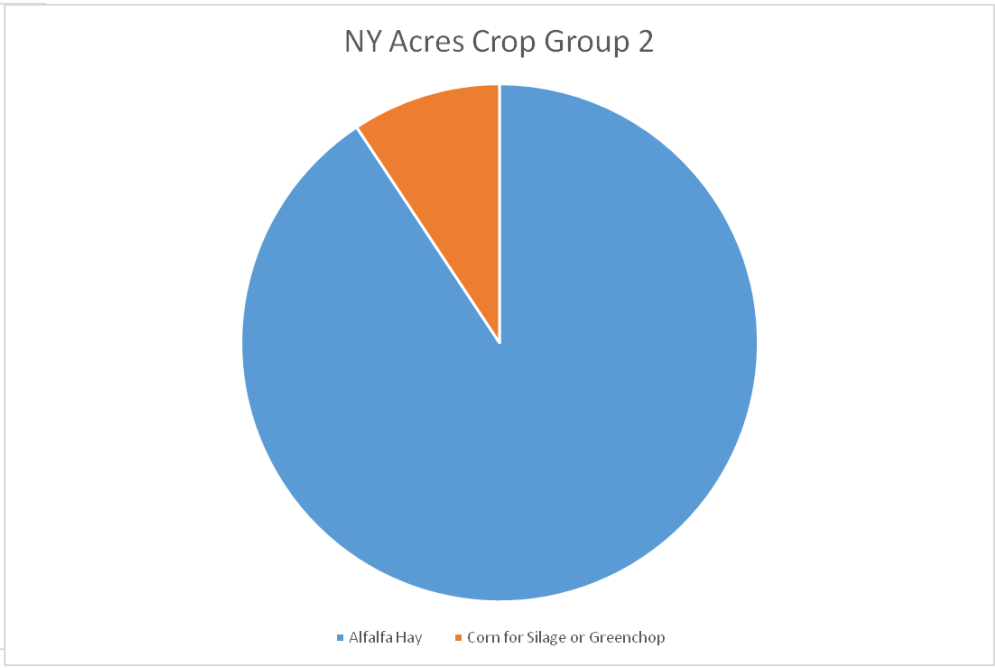


Scenario	Total Double-Cropped Acres
With Corn for Grain	195,337
Without Corn for Grain	195,337



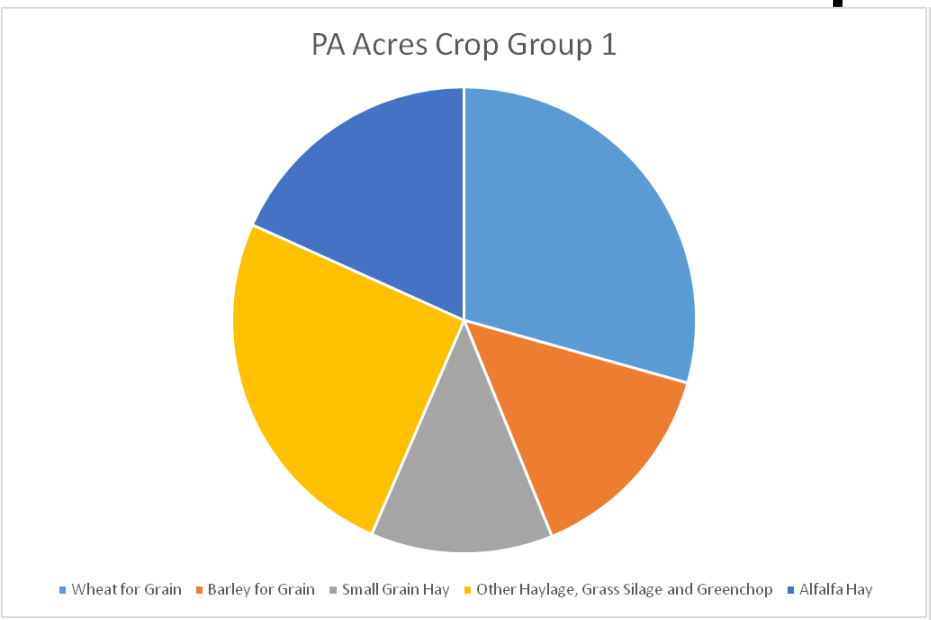
NY 2012 Crops in Crop Groups

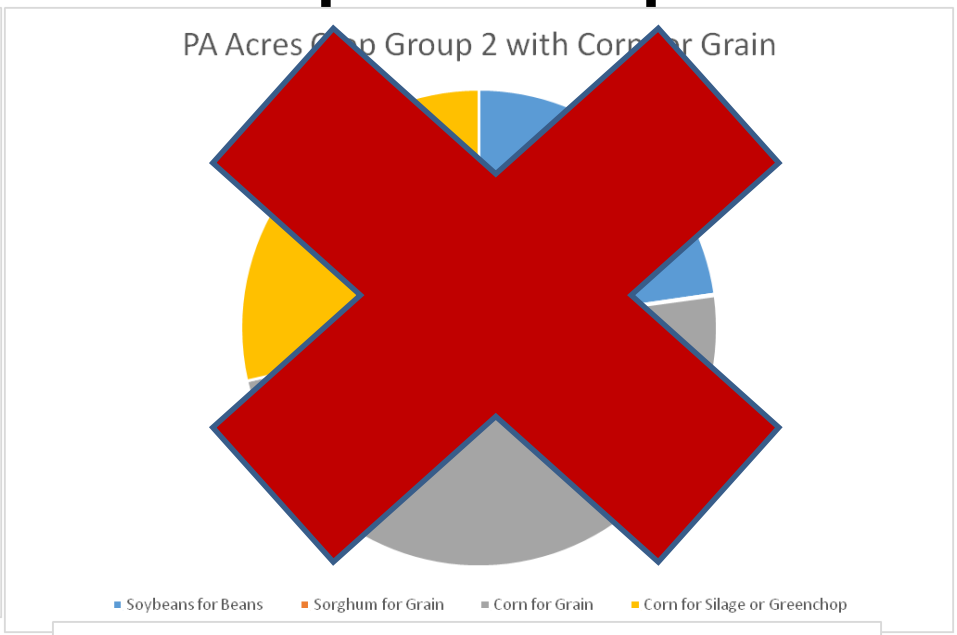




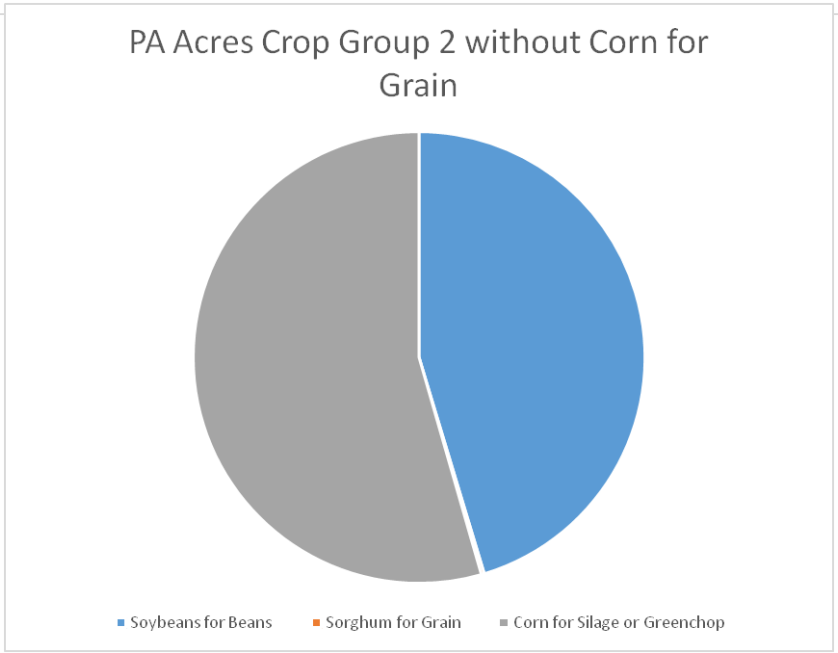
Total Double-Cropped Acres
48,146

PA 2012 Crops in Crop Groups

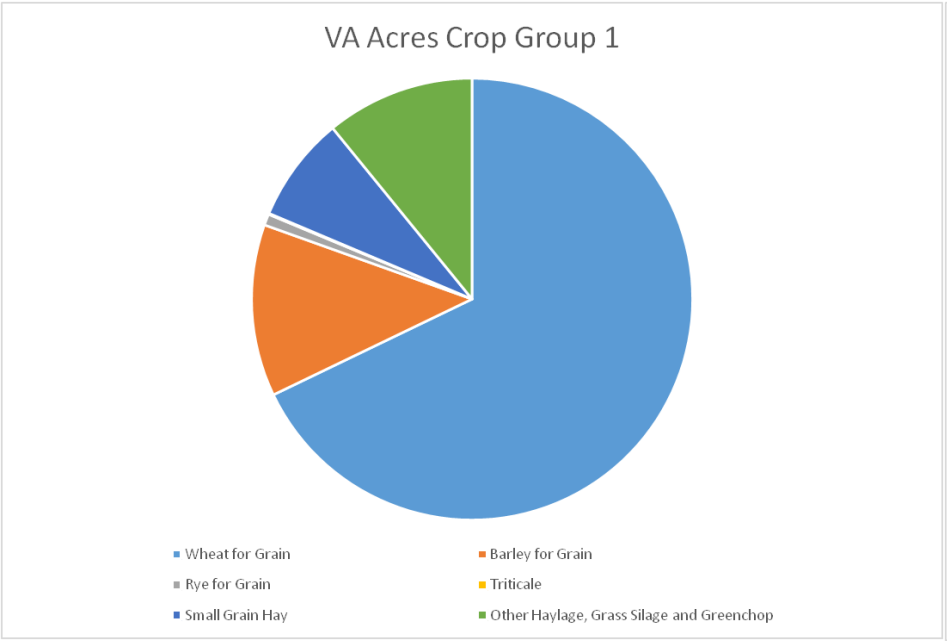


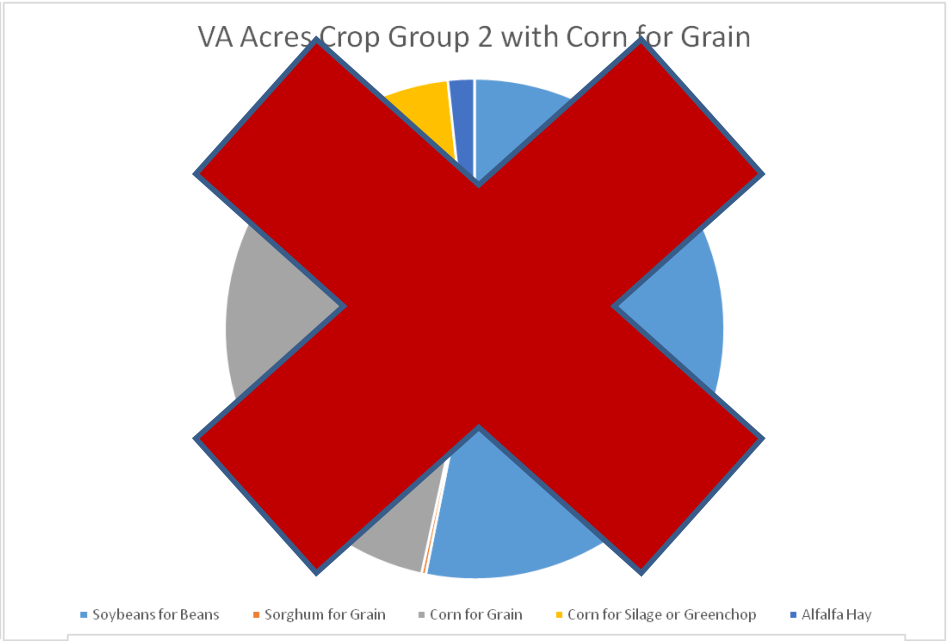


Scenario	Total Double-Cropped Acres
With Corn for Grain	186,949
Without Corn for Grain	186,651

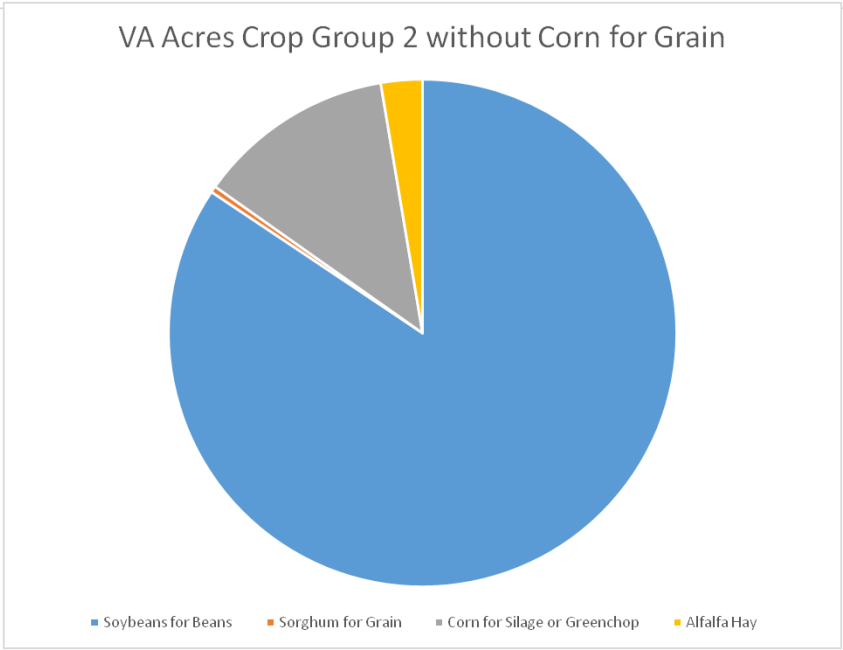


VA 2012 Crops in Crop Groups

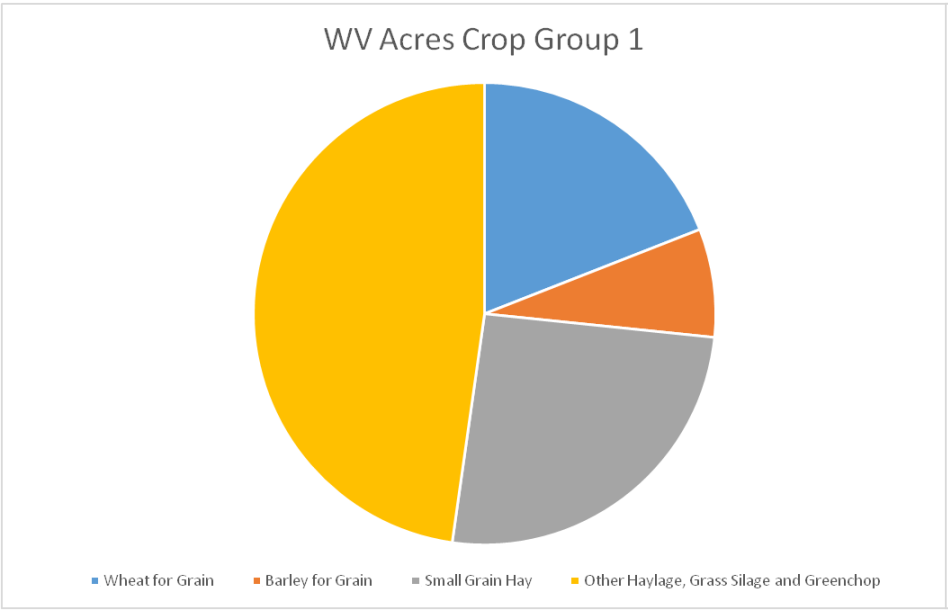


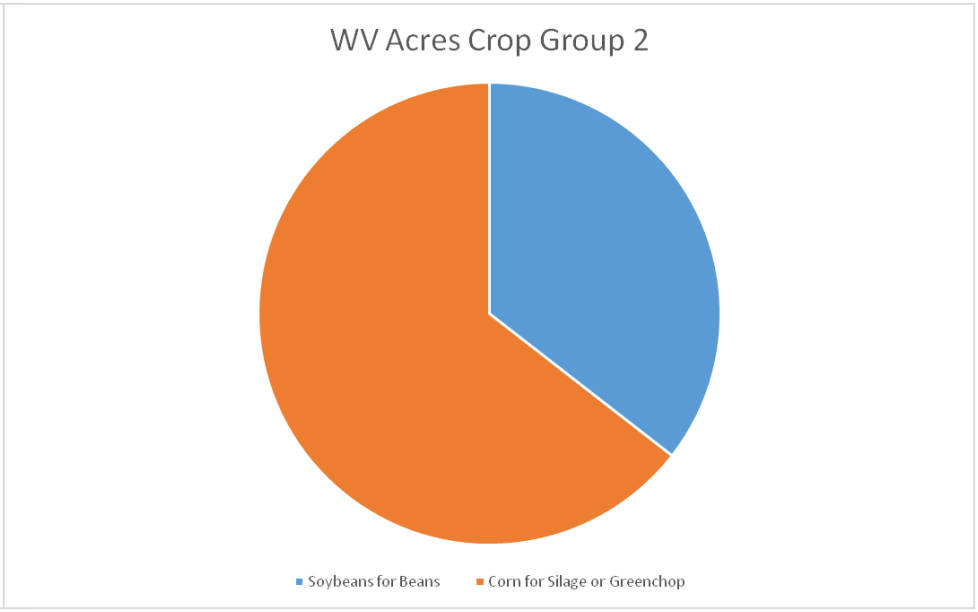


Scenario	Total Double-Cropped Acres
With Corn for Grain	179,284
Without Corn for Grain	178,749



WV 2012 Crops in Crop Groups





Total Double-Cropped Acres
2,759

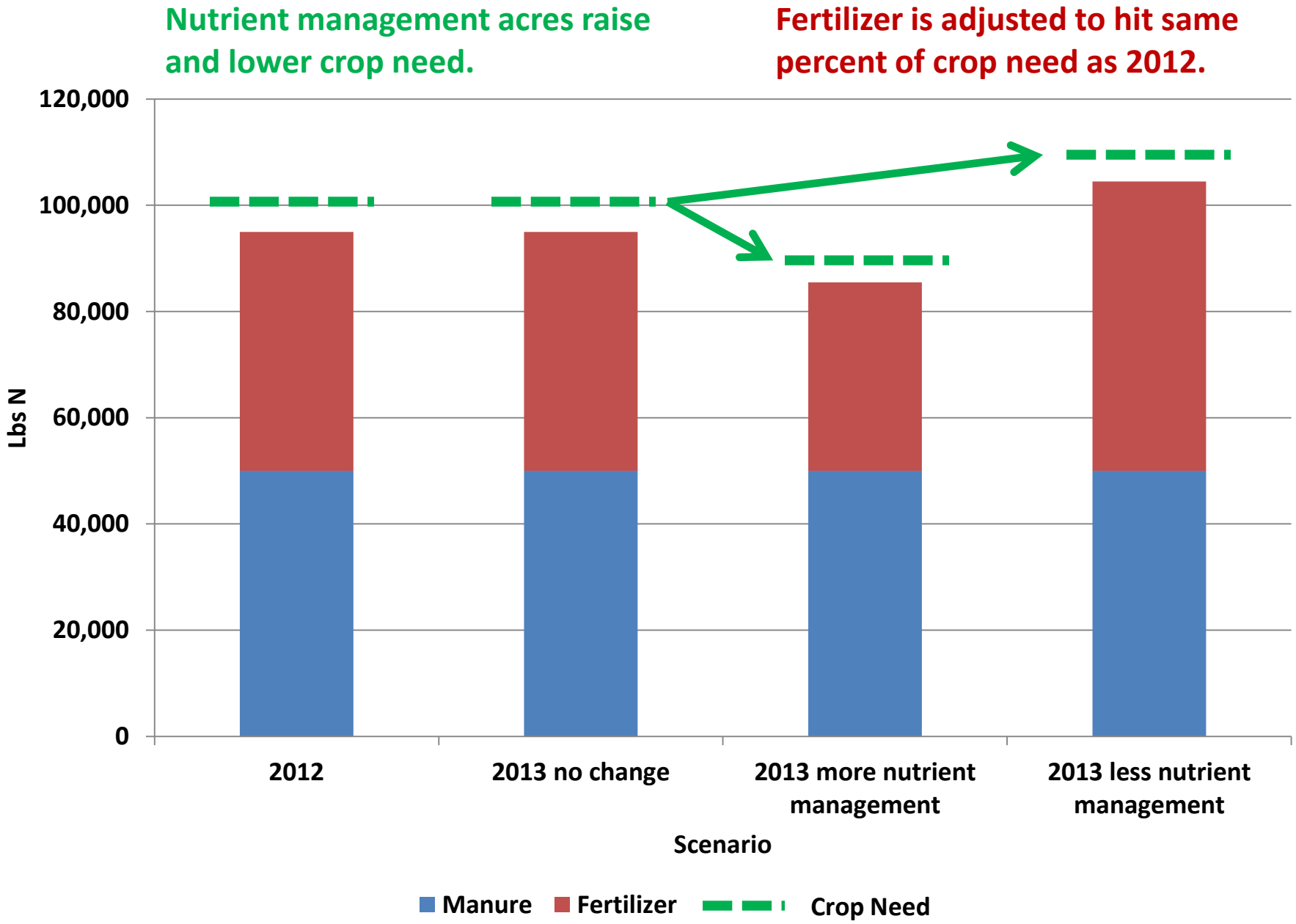
Crediting Nutrient Management and Manure Transport in Future Scenarios

- Issue: Fertilizer sales do not exist for future years.
- Recommendation: Nutrient Management Panel recommends core NM reduce applications.
- Issue: Manure Transport was “backfilled” 1:1 with fertilizer in Phase 5.

Questions for Ag Workgroup

- How should credit be given for additional acre of nutrient management (beyond 2012)?
- How should credit be given for additional manure transport (beyond 2012) in counties where nutrients exceed crop goal?
- How should credit be given for additional manure transport (beyond 2012) in counties where nutrients do not exceed crop goal?

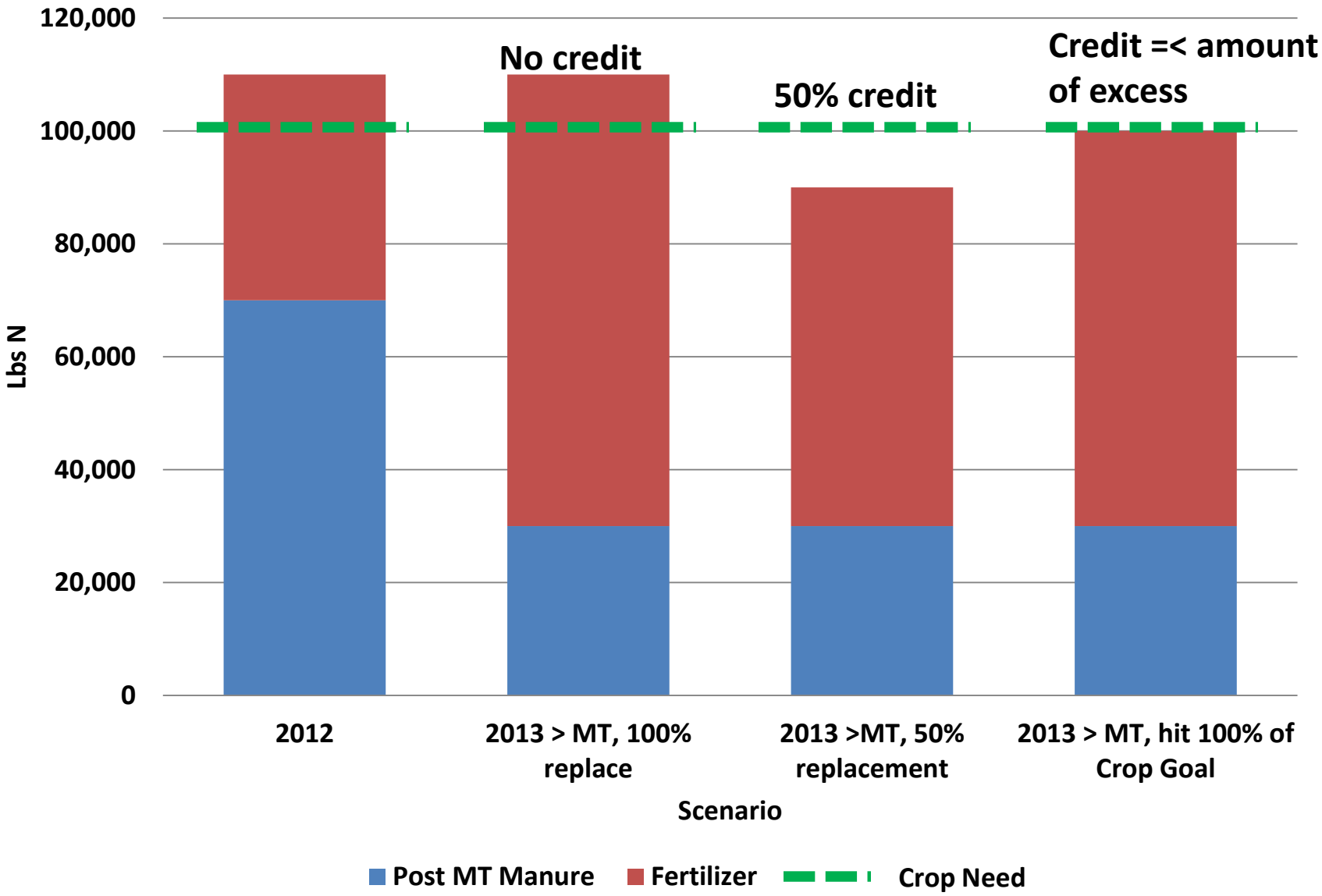
Crediting Nutrient Management with Constant % Application



Benefits of Constant % Application

- NM has direct impact on applications and loads
- Straightforward calculation
- Not likely to have outlier loading rates from diverging projections (cropland down, inputs up)
- Lb per acre export relatively constant unless management changes

Crediting Manure Transport in Counties with Excess



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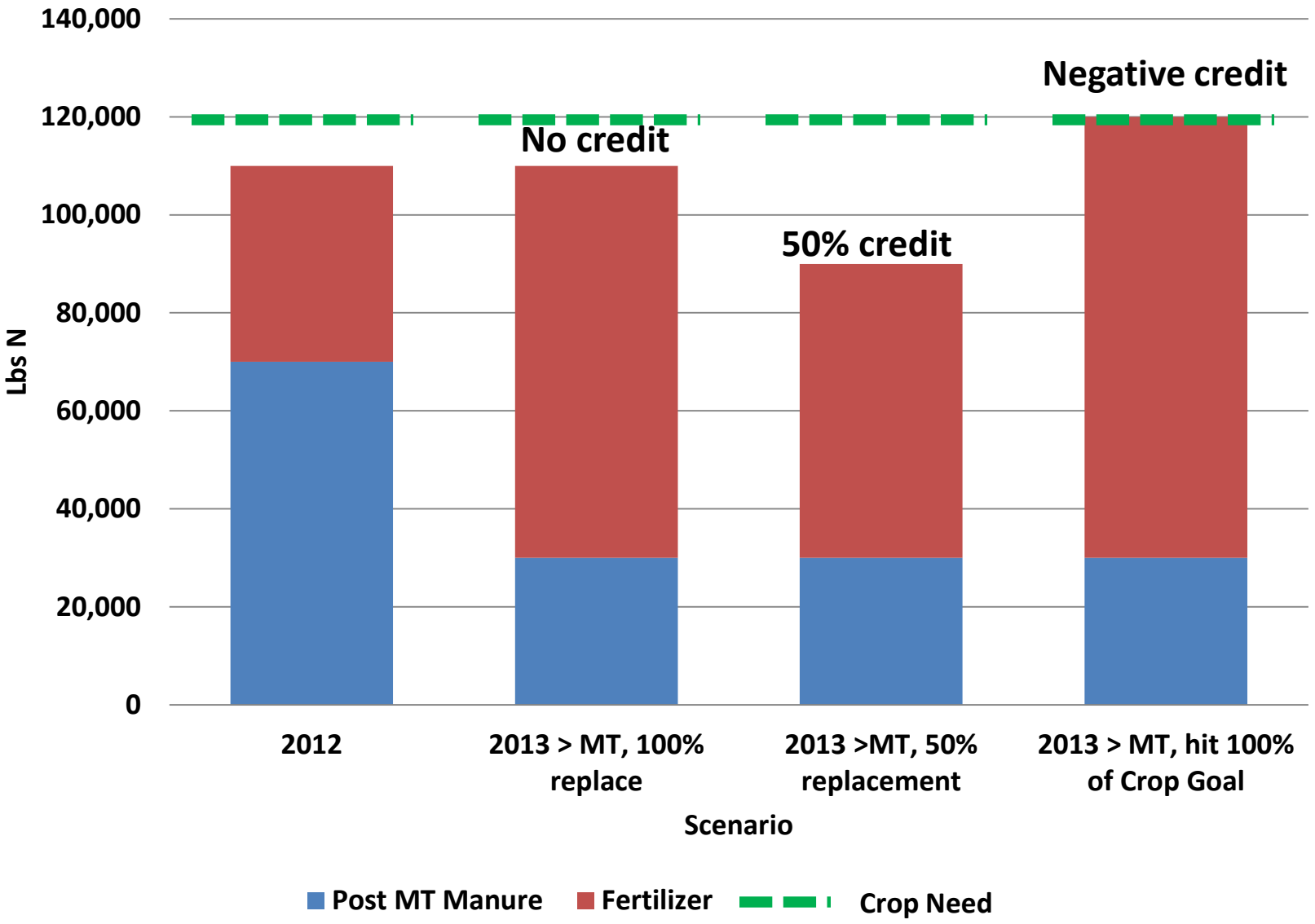
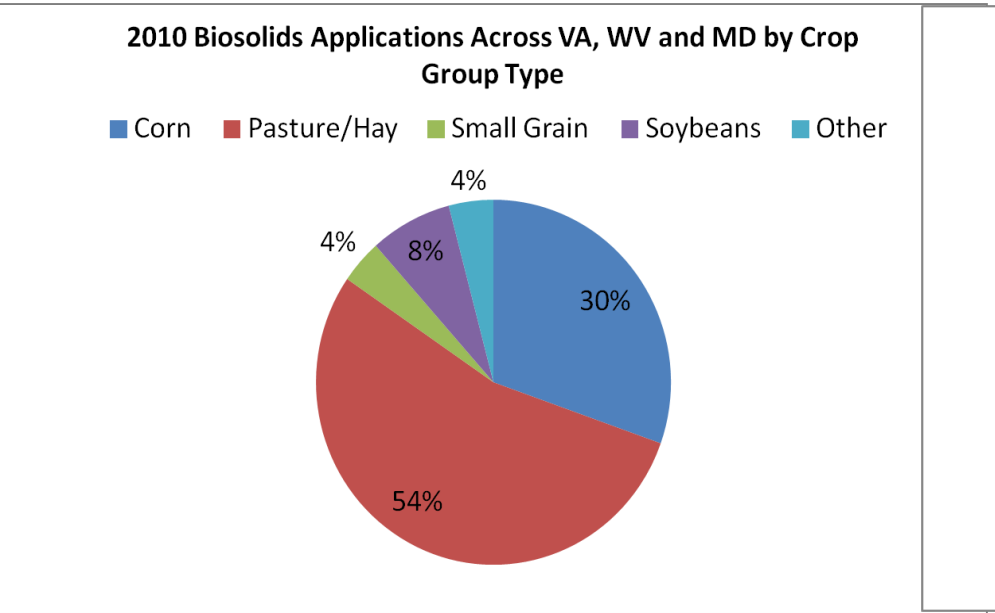


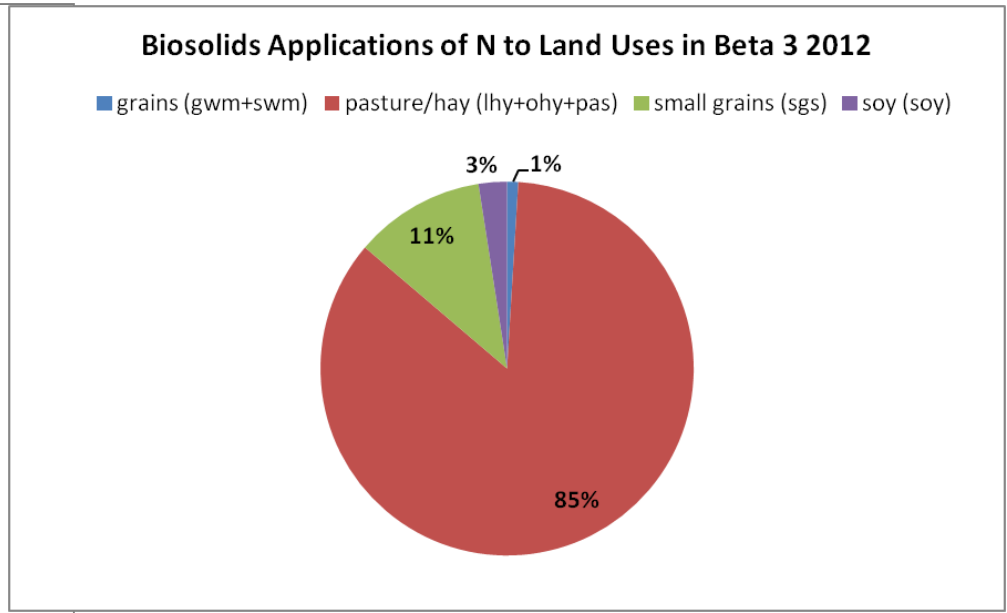
Confinement fractions

- Issue: Inequity between confinement fractions led to unexpected storage and handling loss estimates for dairy and other cattle.
- Under review:
  - VA provided new values for some animal types.
  - All states should review final values before AMS sign-off.

Biosolids

- Issue: Biosolids not being applied to grains in some areas, such as MD.
- Under review:
  - Biosolids taskforce to meet and discuss potential new way to distribute biosolids.





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