Agricultural Modeling Subcommittee Update to Ag Workgroup

08242016

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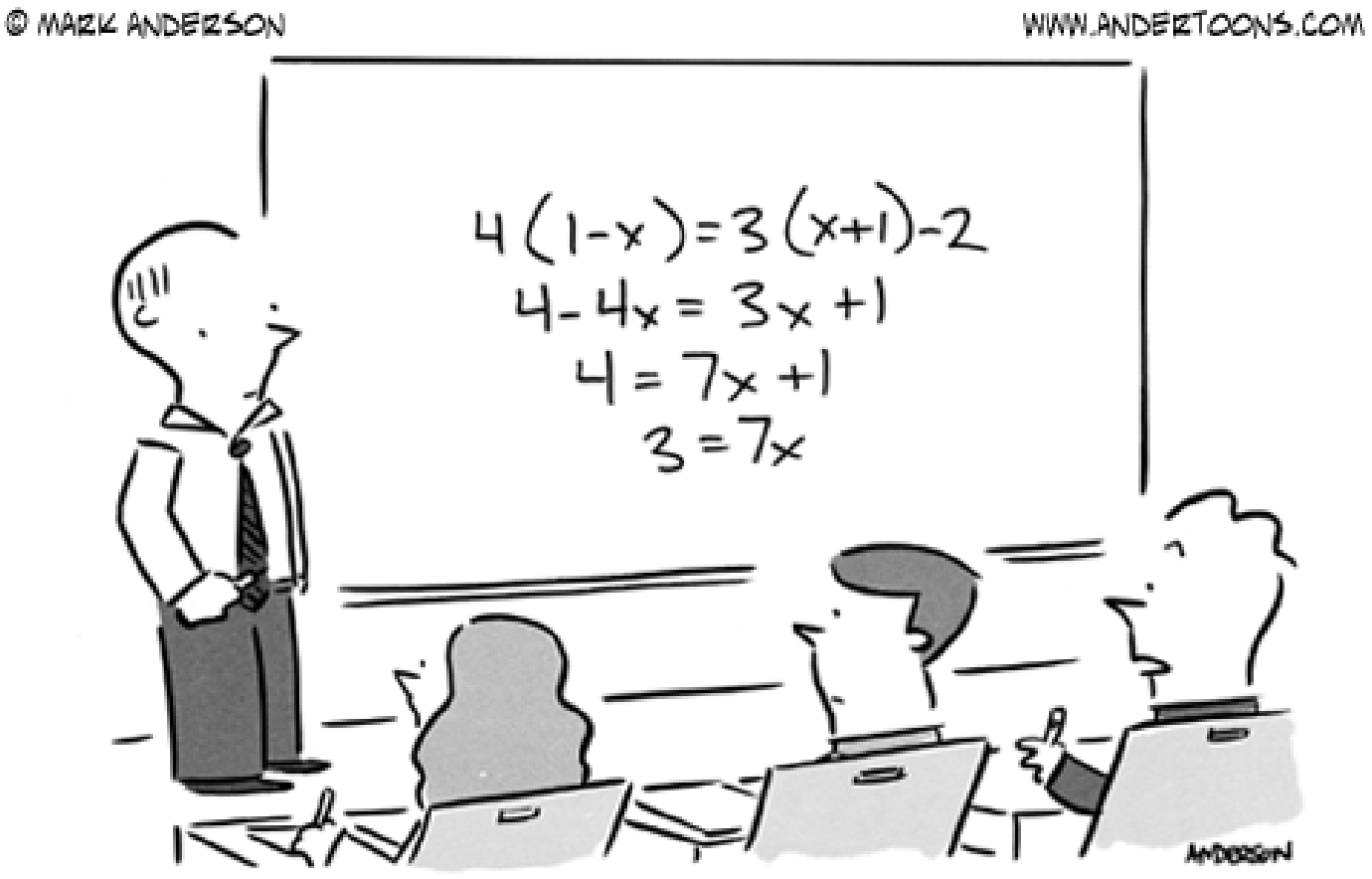
Issues under review/solution recommended

- Nutrient spread curves (solution recommended)
- Size of other cattle (solution recommended)
- Yield goal multiplier (solution recommended)
- Ammonia volatilization (under review)
- Double crops (under review)
- Biosolids (under review)
- Confinement fractions (under review)

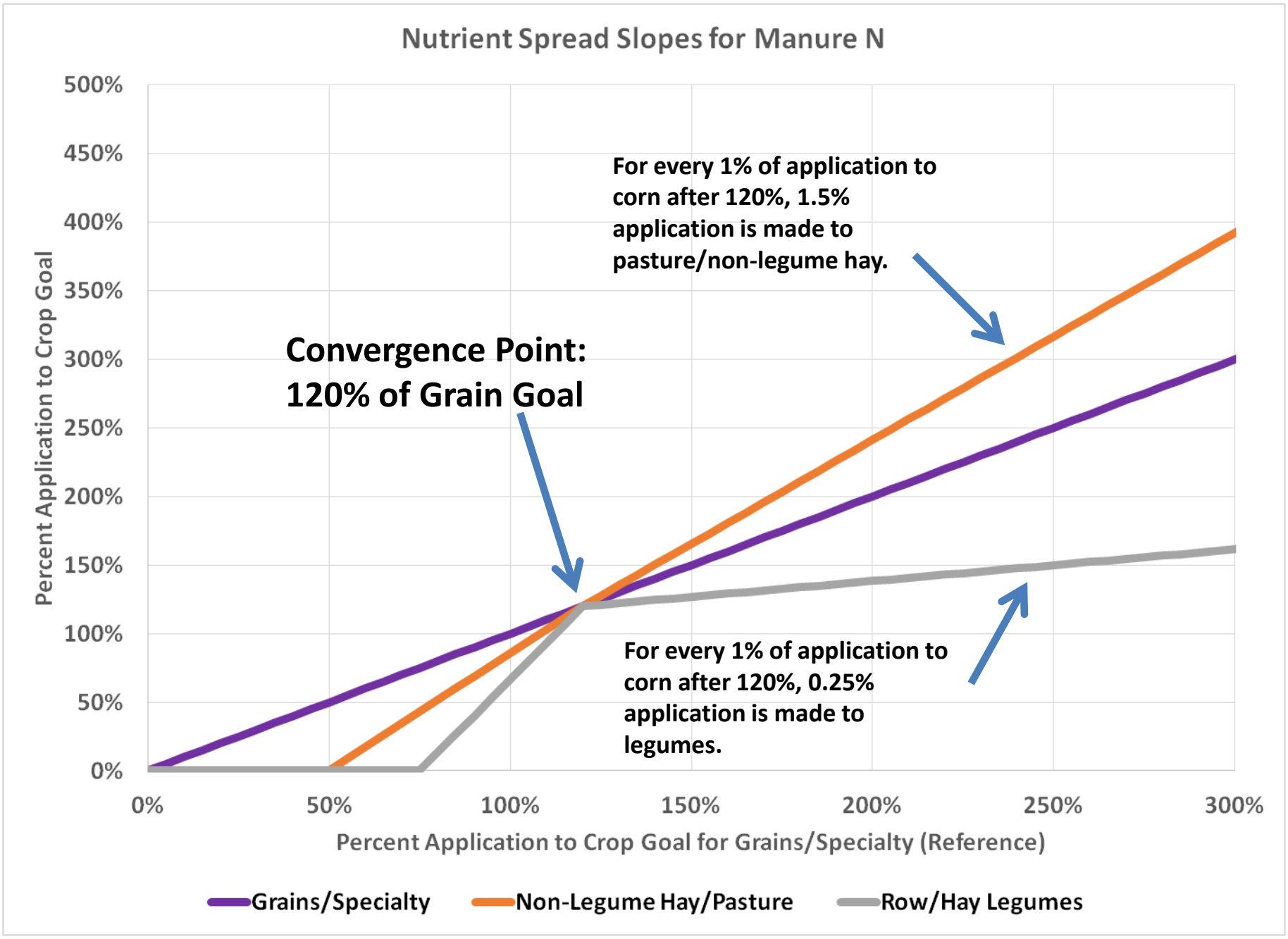
Nutrient Spread Curves

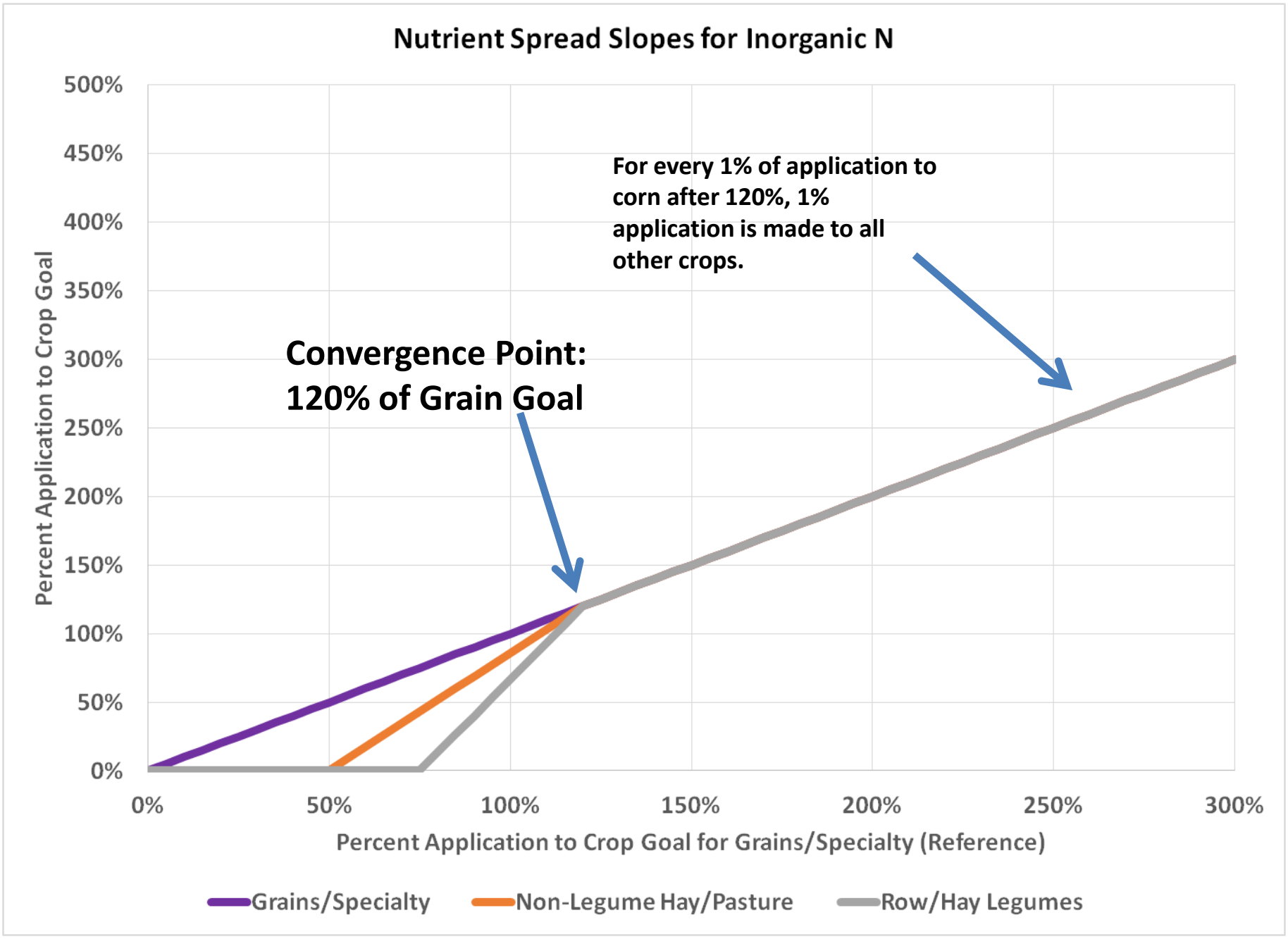
- Issue: Too many curves complicated results and led to confusing changes between applications on land uses from year to year.

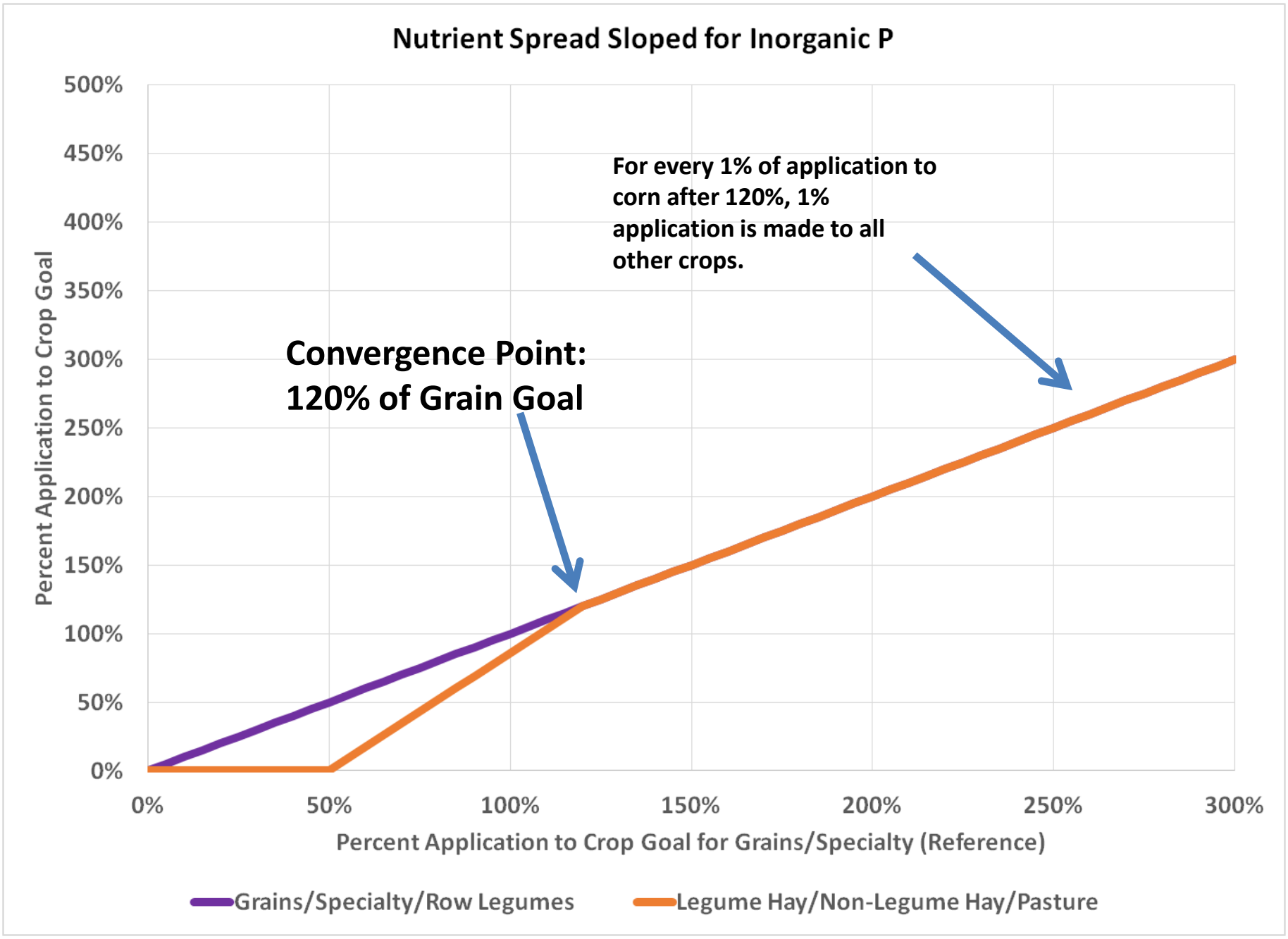
Recommended Solution: Simplify!



"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 Ammonia 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).

Draft Ammonia Volatilization Factors : Barnyard and Storage

Animal	Fraction of N lost from barnyard/storage (% of initial total N)[3]
Cattle (solid) [1]	40%
Cattle (liquid) [1,2]	32%
Hogs (liquid) [1]	32%
Poultry[1]	40%
Horses	40%
Sheep	40%
Goats	40%

[1] From Rotz, 2003.
[2]Mean of types of facilities
[3]Primarily NH_3, but includes other forms of N loss

Draft Ammonia Volatilization Factors : Field Emissions

Animal	NH4-N, % of total N (as-applied)	Fraction of as-applied manure NH_4-N volatilized in field without incorporation	Fraction of total applied N volatilized
Cattle (solid)	8%	65%[1]	5%
Cattle (liquid)	42%	55%[1]	23%
Hogs (liquid)	63%	55%[1]	35%
Poultry	20%	28%[1]	9%
Horses	9%	65%	6%
Sheep	14%	65%	9%
Goats	14%	65%	9%

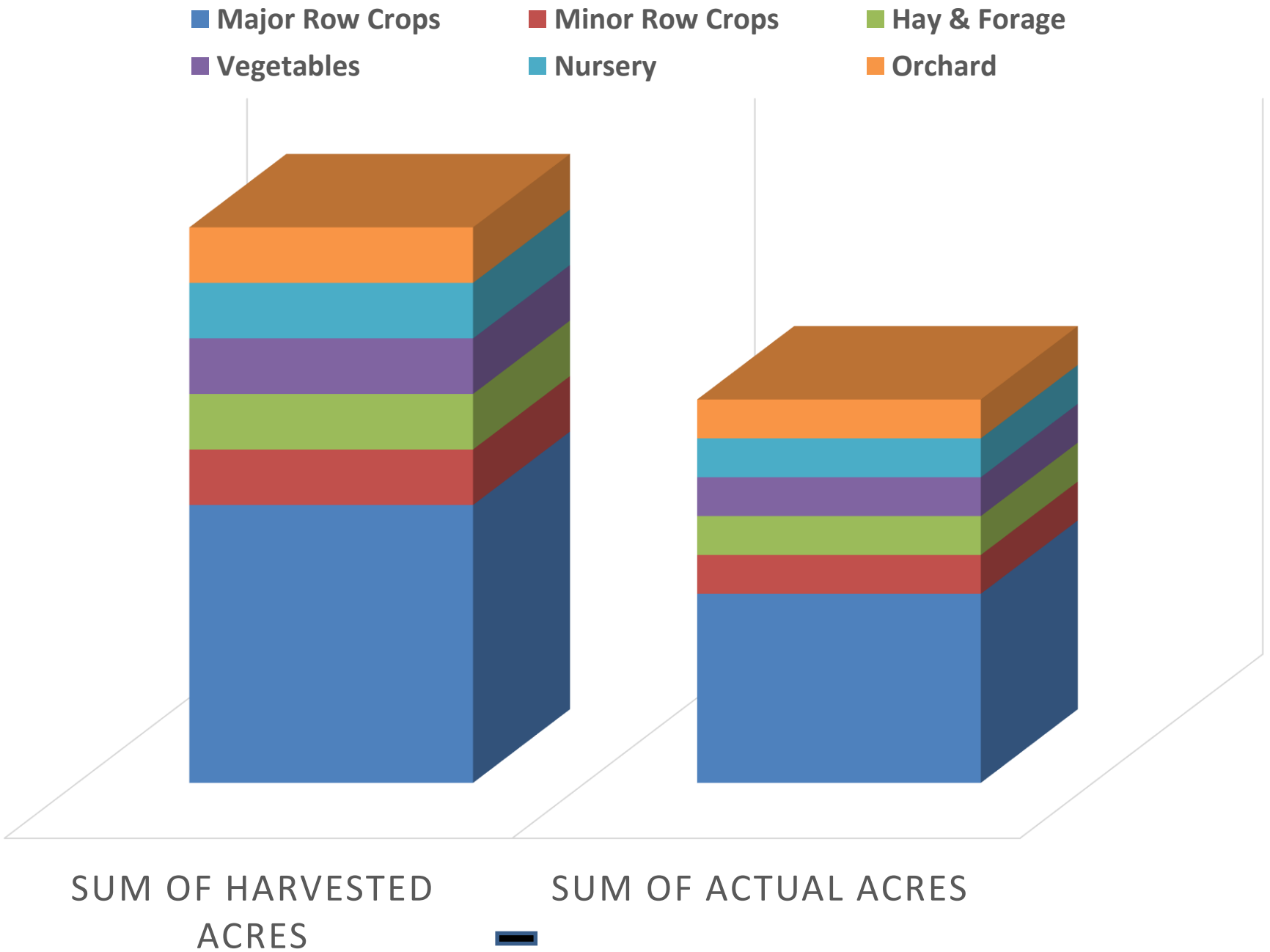
[1]UMD Extension

[2] Typically reported as NH_4^+, but actually NH_3 +NH_4^+ (total ammoniacal N)

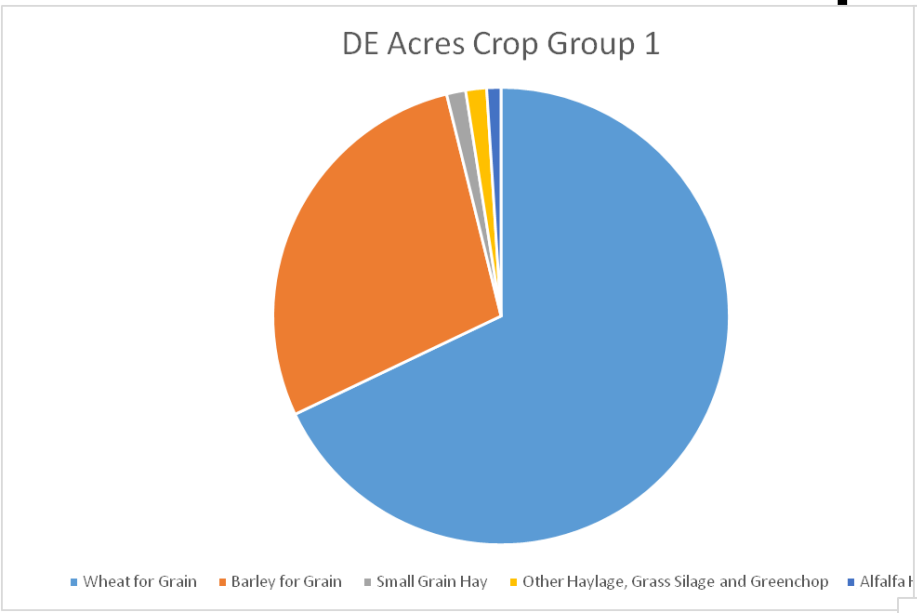
Double Crops

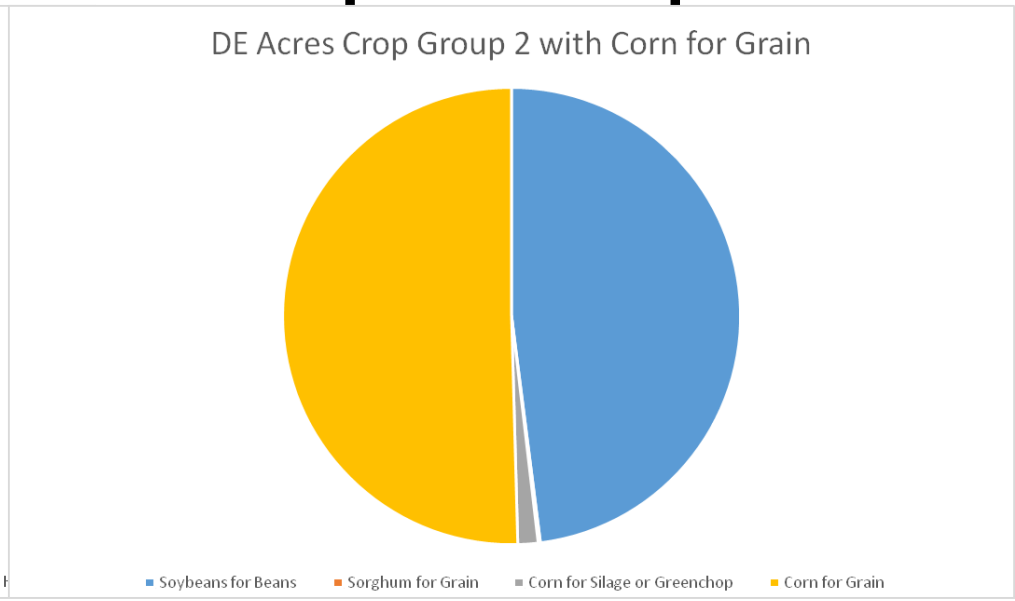
- Issue: Double cropping acres did not account for forage/hay/silage cropping routines very well.
- Under review:
  - AMS reviewing eligible crops for double crop land use.
  - AMS reviewing method.
  - Feedback from Ag Workgroup requested.

SETTING TOTAL ACRES FOR PHASE 6

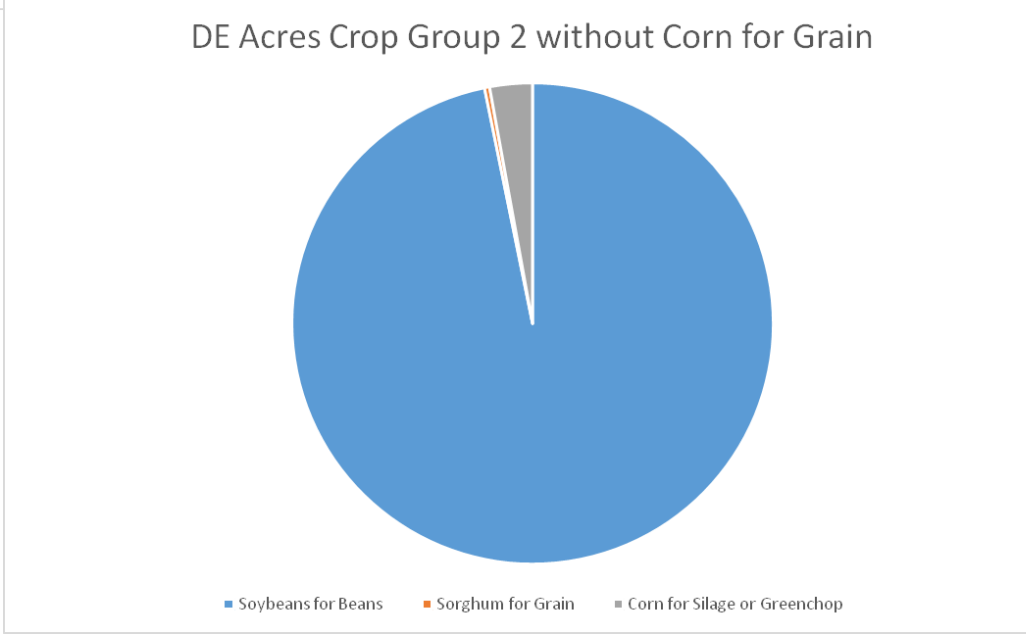


DE 2012 Crops in Crop Groups

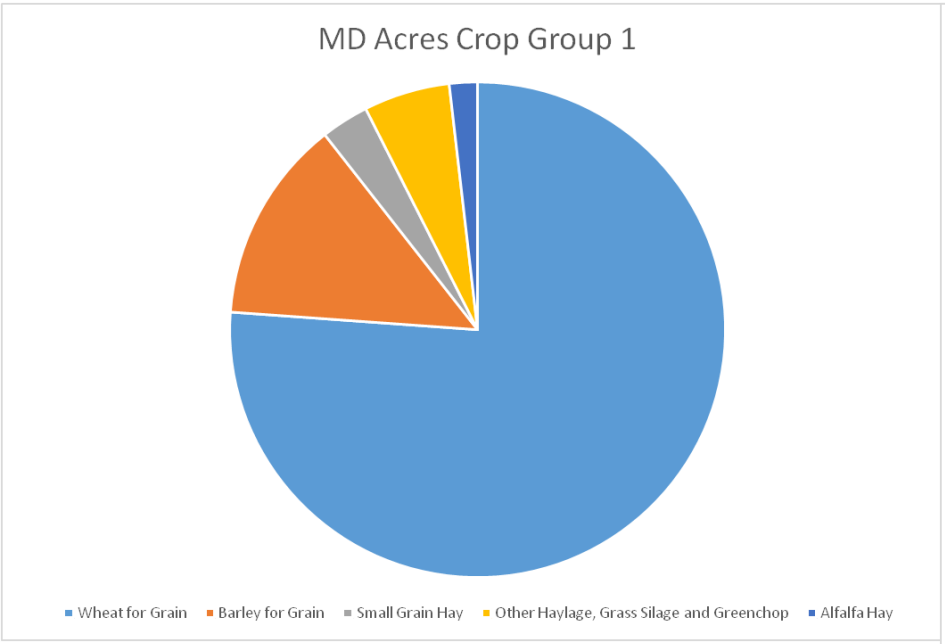


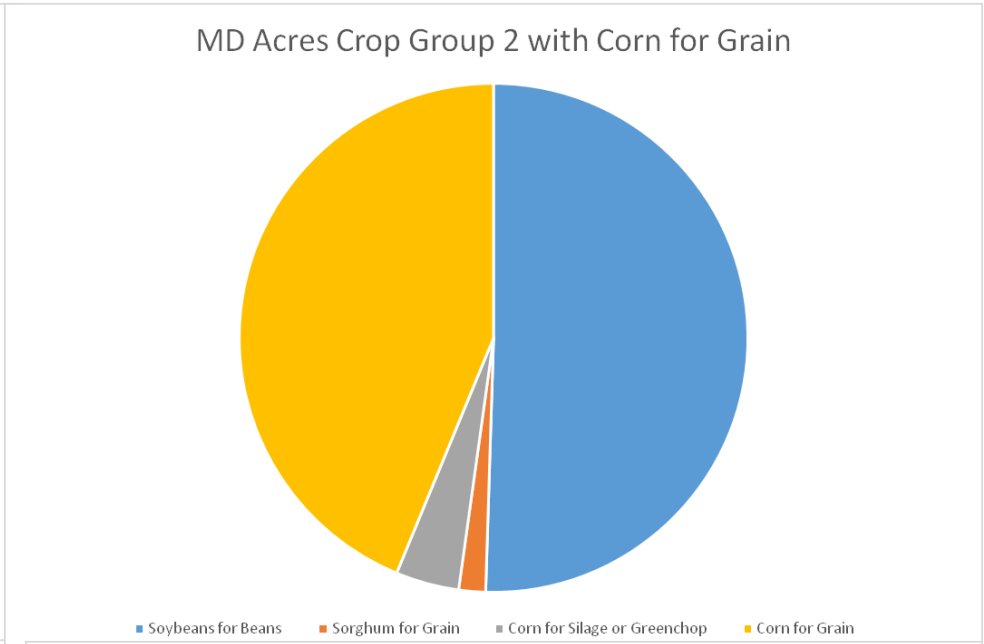


Scenario	Total Double-Cropped Acres
With Corn for Grain	105,985
Without Corn for Grain	105,985

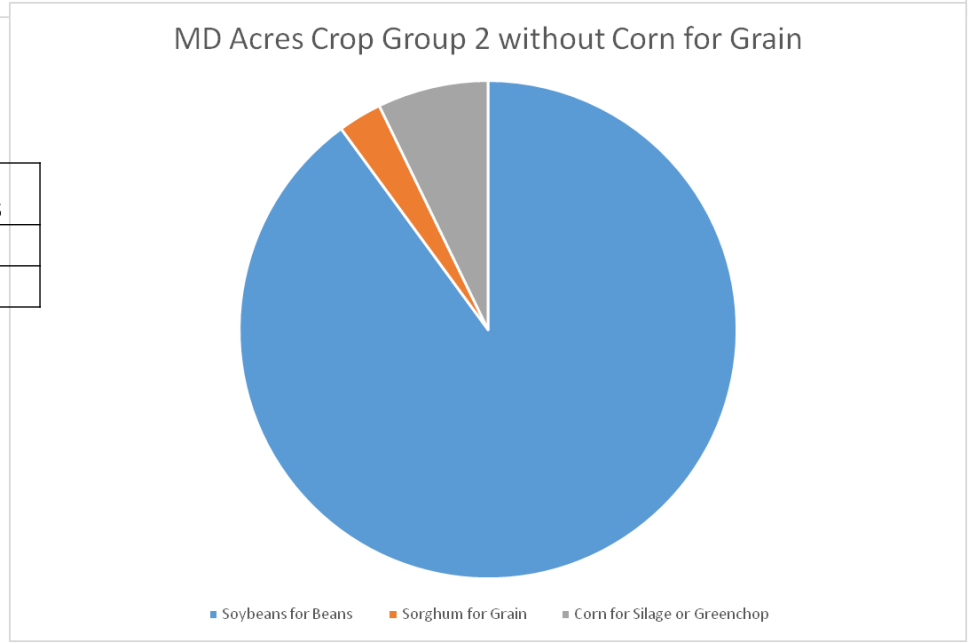


MD 2012 Crops in Crop Groups

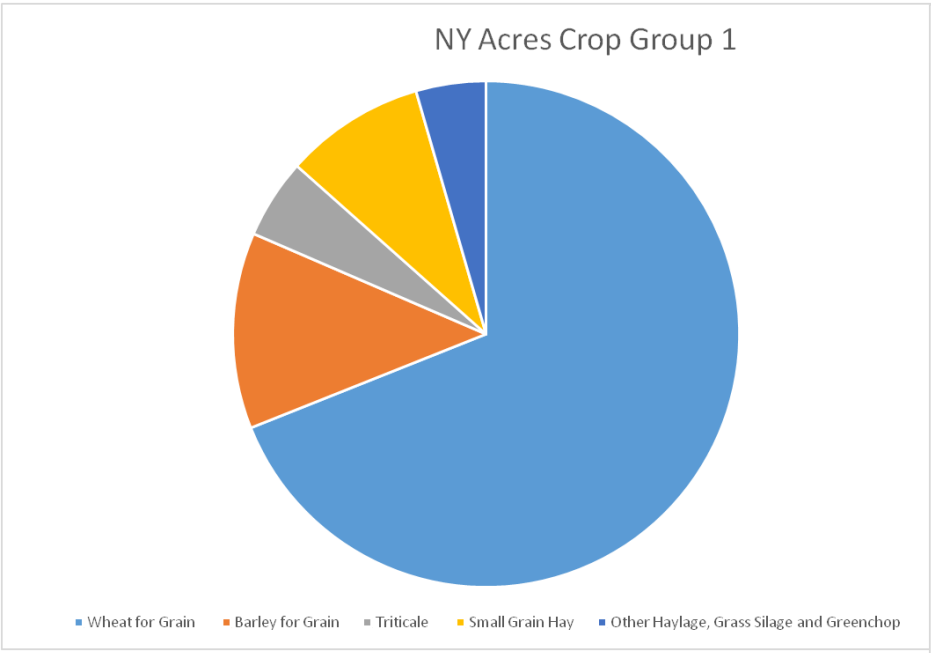


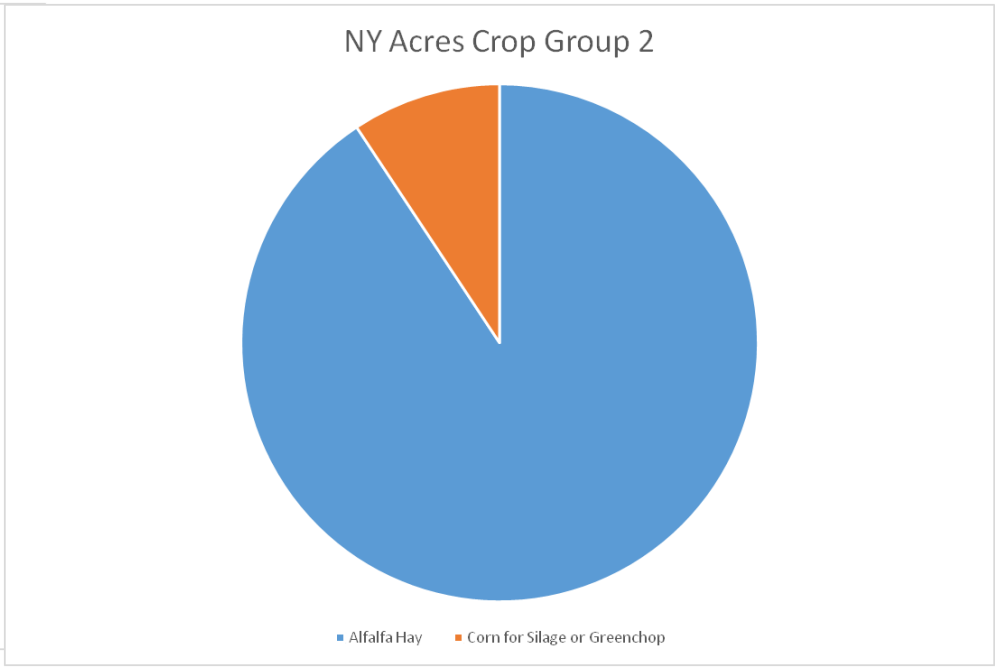


Scenario	Total Double-Cropped Acres
With Corn for Grain	195,337
Without Corn for Grain	195,337



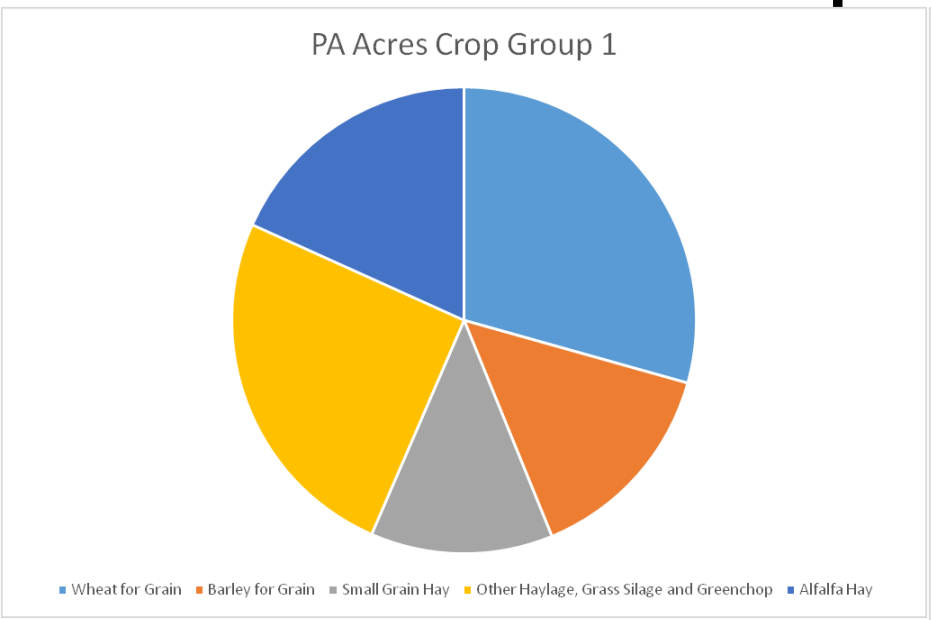
NY 2012 Crops in Crop Groups

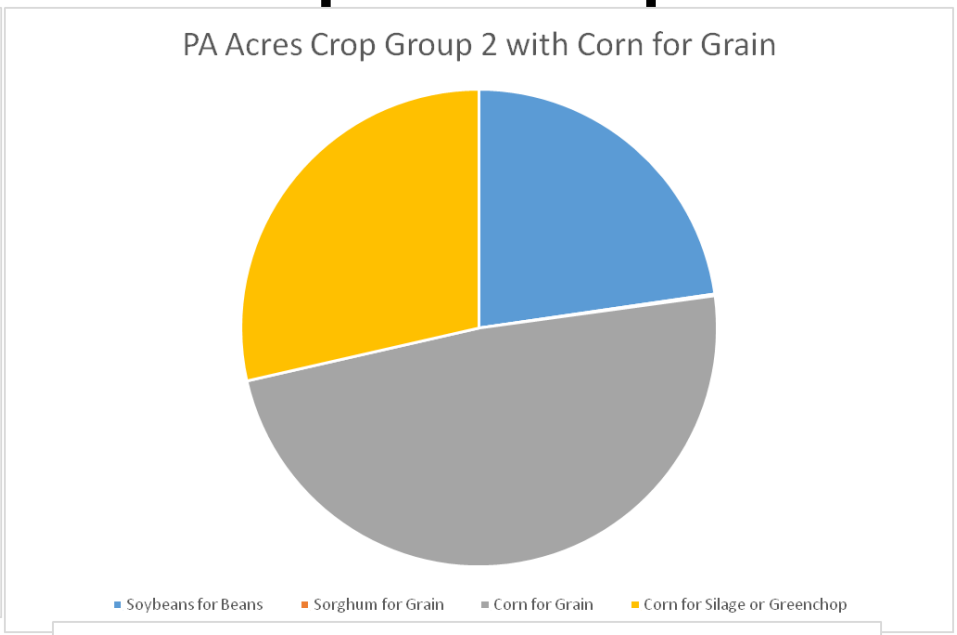




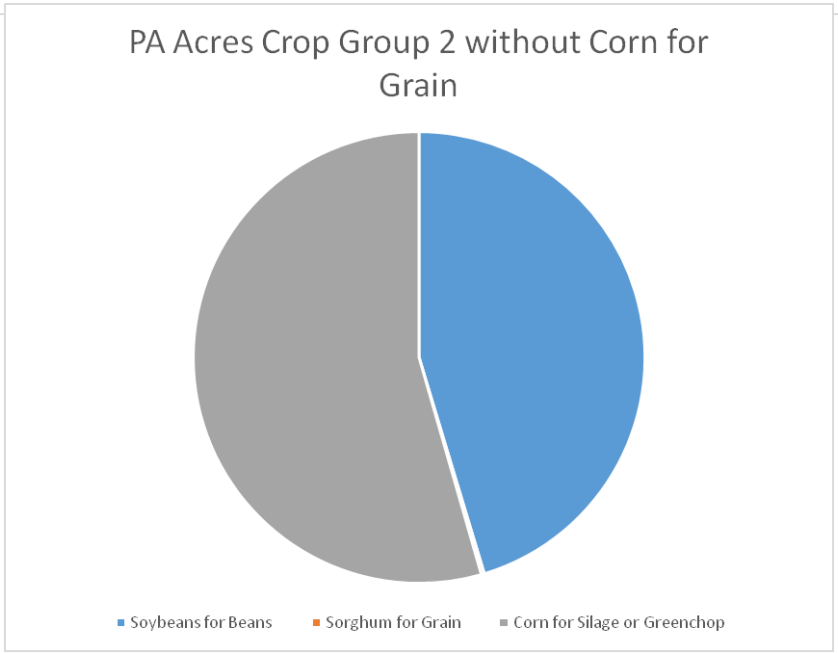
Total Double-Cropped Acres
48,146

PA 2012 Crops in Crop Groups

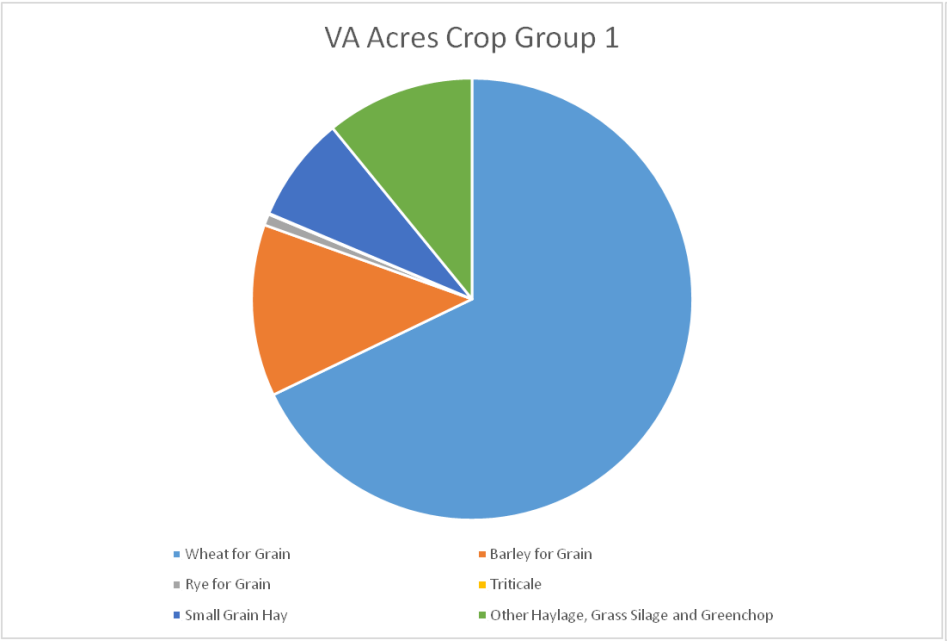


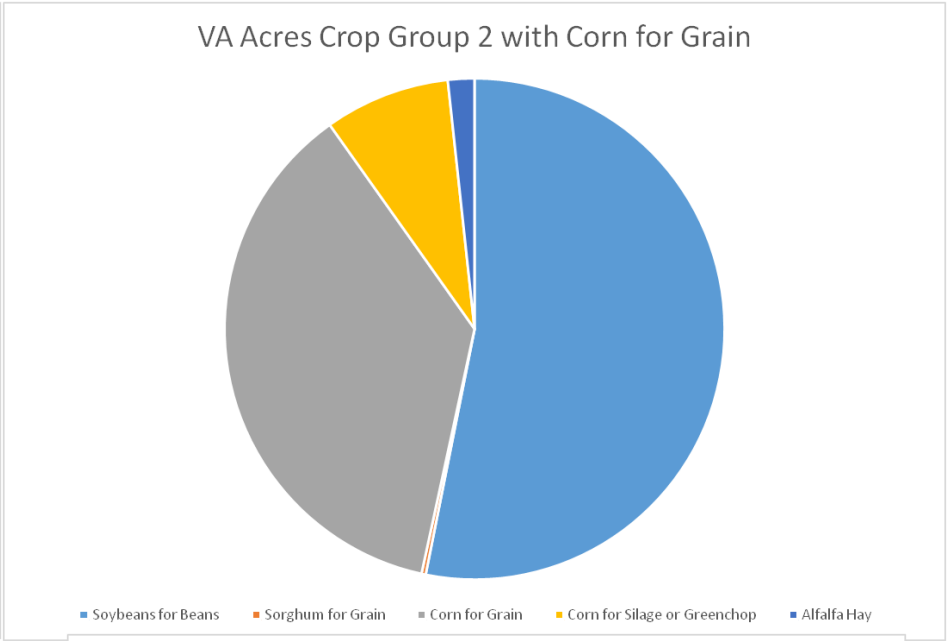


Scenario	Total Double-Cropped Acres
With Corn for Grain	186,949
Without Corn for Grain	186,651

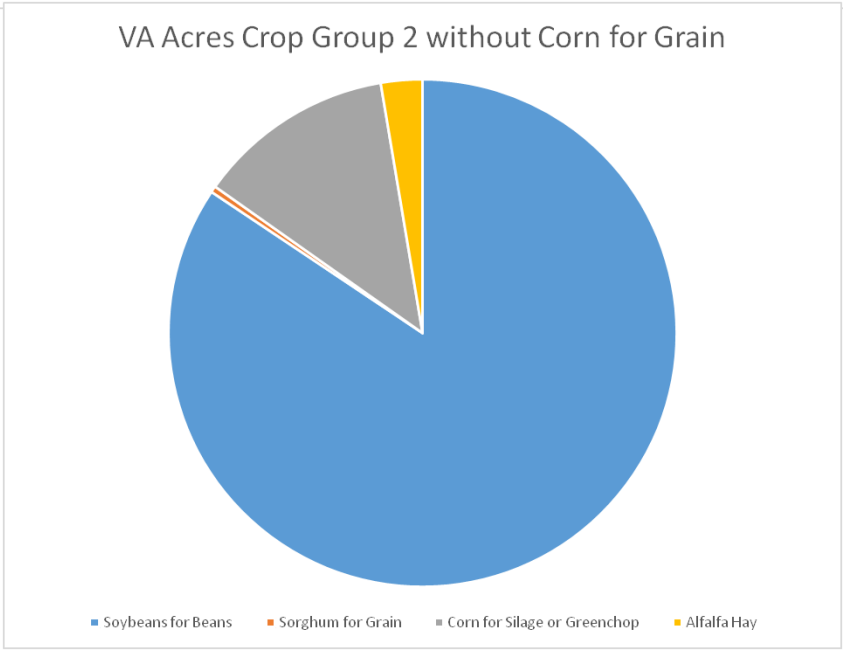


VA 2012 Crops in Crop Groups

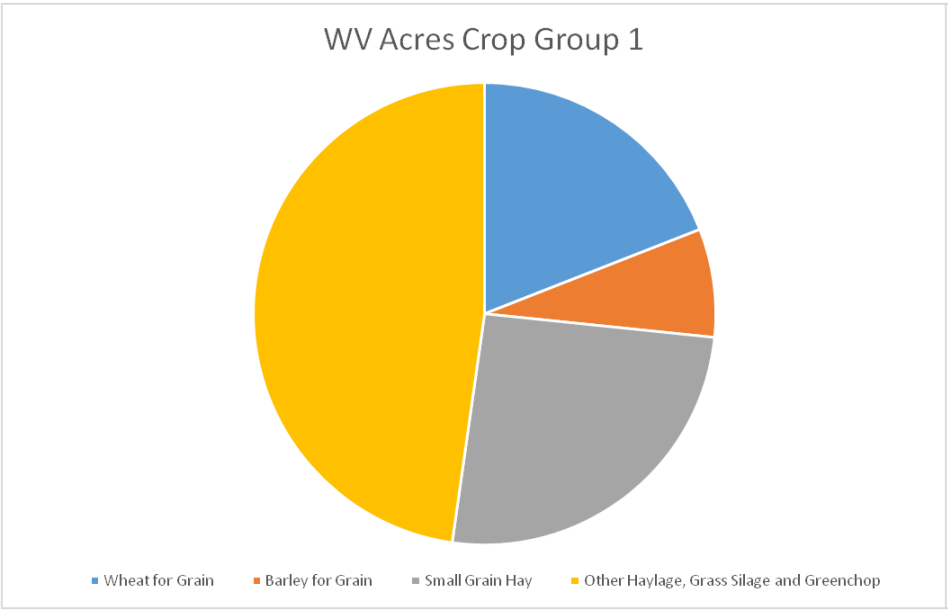


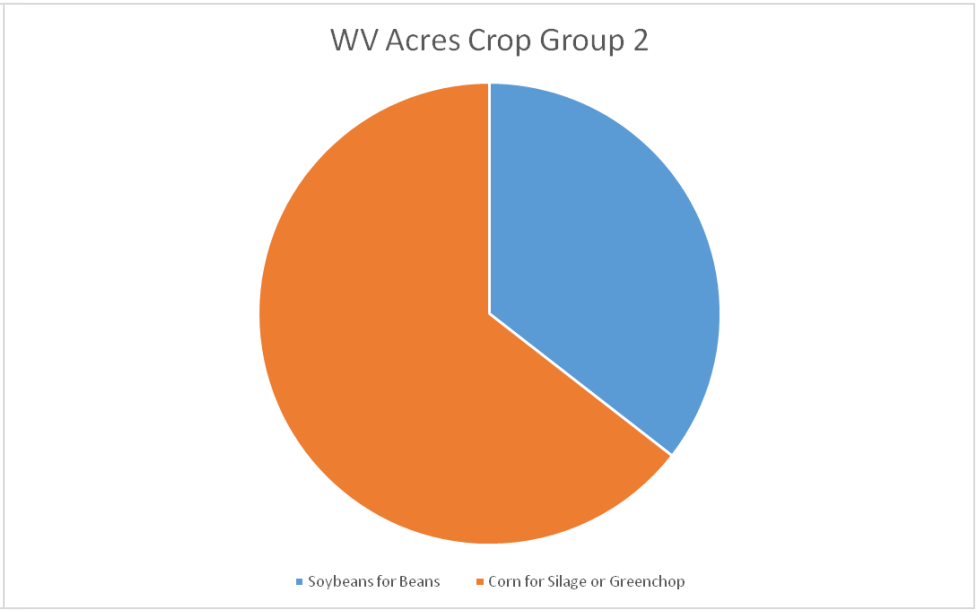


Scenario	Total Double-Cropped Acres
With Corn for Grain	179,284
Without Corn for Grain	178,749



WV 2012 Crops in Crop Groups

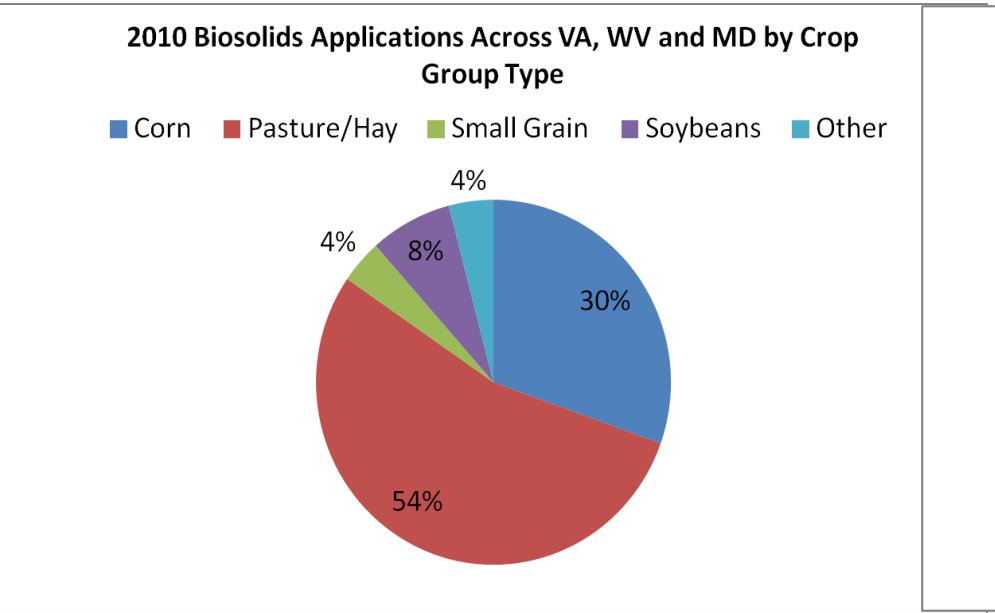


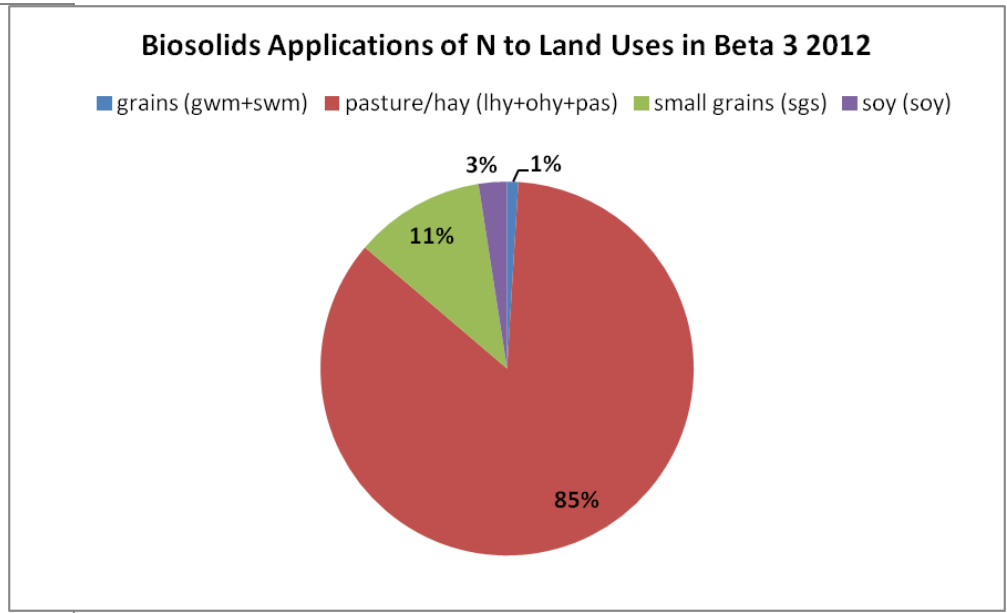


Total Double-Cropped Acres
2,759

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.





Confinement fractions

- Issue: Inequity between confinement fractions led to unexpected storage and handling loss estimates for dairy and other cattle.
- Under review:
  - NY, PA, WV, DE and MD provided justification for revised values and approved them.
  - VA still reviewing values.
  - All states should review final values before AMS sign-off.

Issues under review/solution recommended

- Nutrient spread curves (solution recommended)
- Size of other cattle (solution recommended)
- Yield goal multiplier (solution recommended)
- Ammonia volatilization (under review)
- Double crops (under review)
- Biosolids (under review)
- Confinement fractions (under review)

Outstanding items

- Outliers in Ag Census and NASS data
  - Investigating alternative methods to replace non-disclosure data.
  - Removing outliers in yield data.
  - Investigating a spike in acres/animals in 2002.
- Incorporating average farm size
- Properly accounting for Manure Transport in future scenarios
- Crop Removal – No update since Beta 3 values for legumes and major crops were incorporated.
- STAC review comments expected in September.