Nutrient applications in CAST

2/13/2026

Tom Butler, EPA

January recap:

Changes to the acres of Grain with Manure and Grain without Manure

- Ratio would change based on differences in plant available nitrogen (PAN)

Investigate state and county specific examples of nitrogen replacement

- High/low manure counties or additional counties of interest in a respective state.

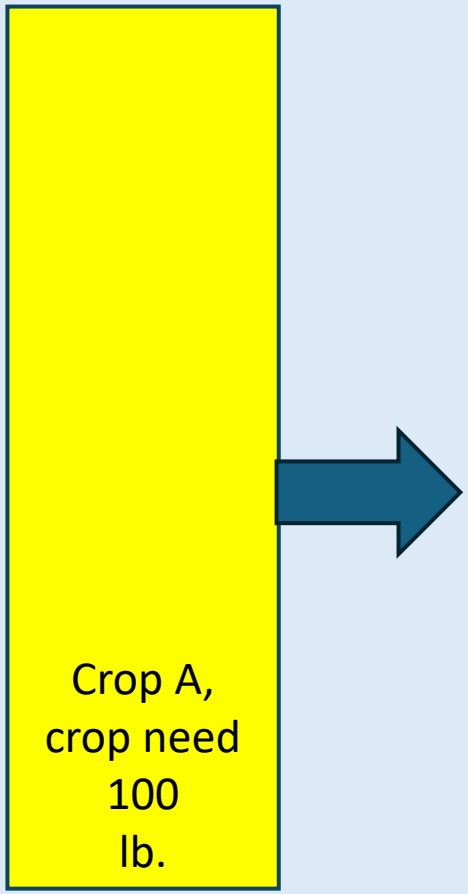
For today’s presentation

	Data year	Scenario year
Crop application goal	✓	✓
Crop yield	✓	✓
Organic nutrient lbs	✓	✓
Inorganic nutrient lbs	✓	X
BMP data	✓	✓

- Data year – Have all the required elements to run CAST are available
- Scenario year – Lack all the pieces of data required to run CAST

Data year

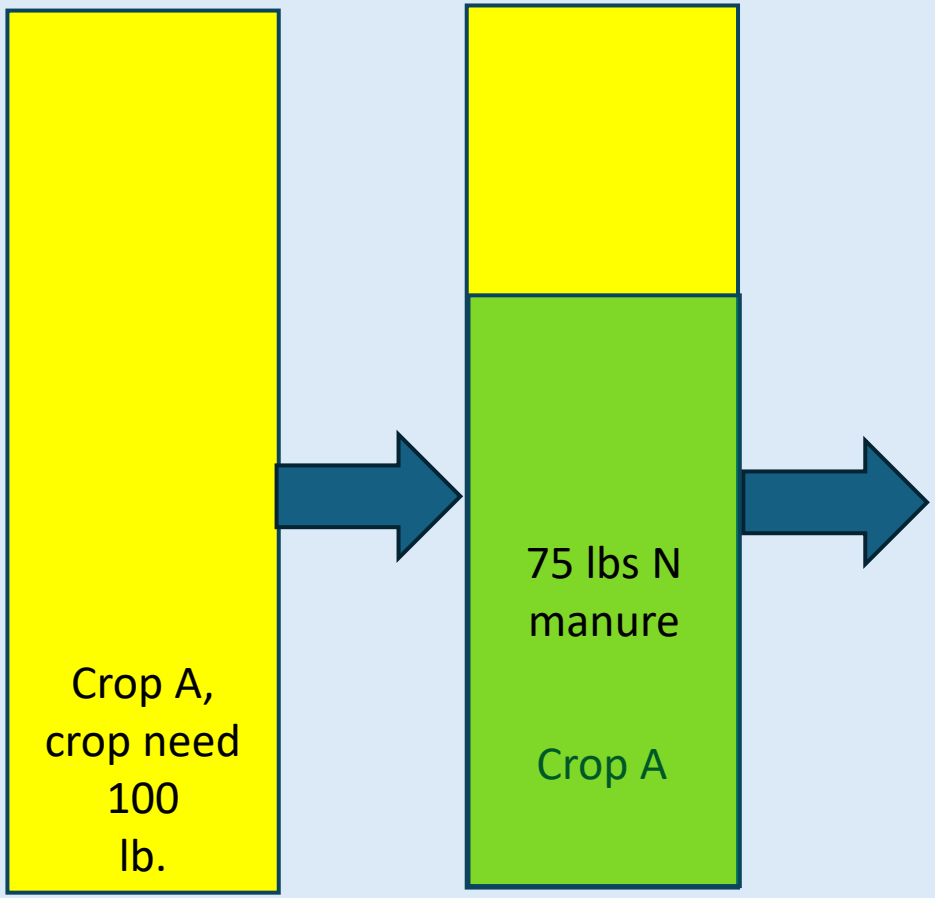
Crop need = (expected yield X application goal)



Data year

Crop need

Organic applications = Application curves distribute manure

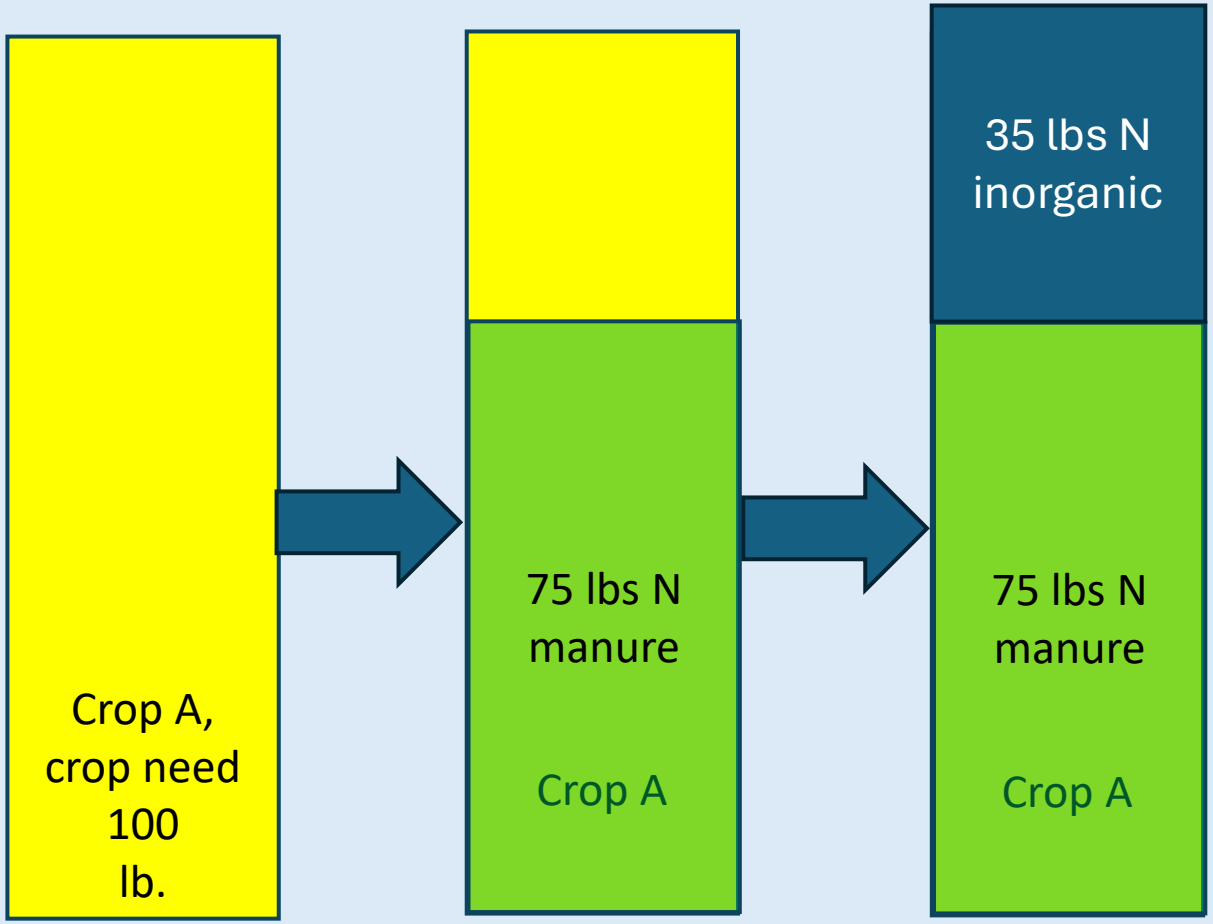


Data year

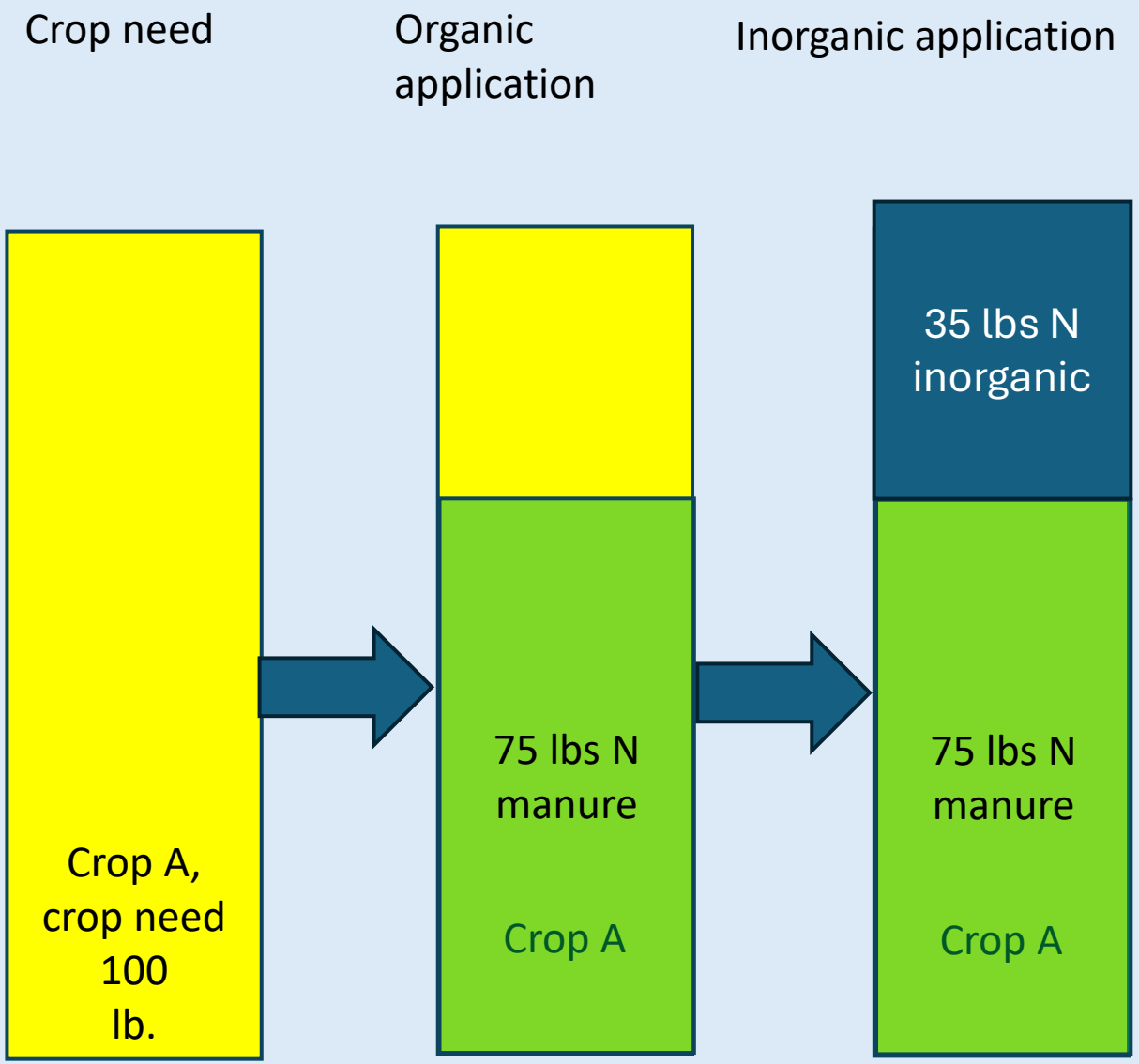
Crop need

Organic application

Inorganic application – Application curves distribute state fertilizer sales



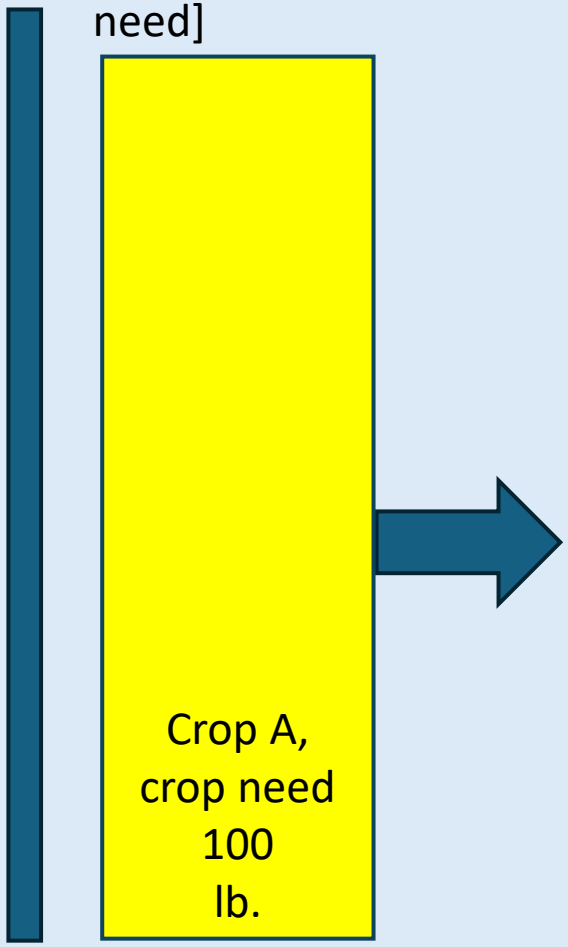
Data year



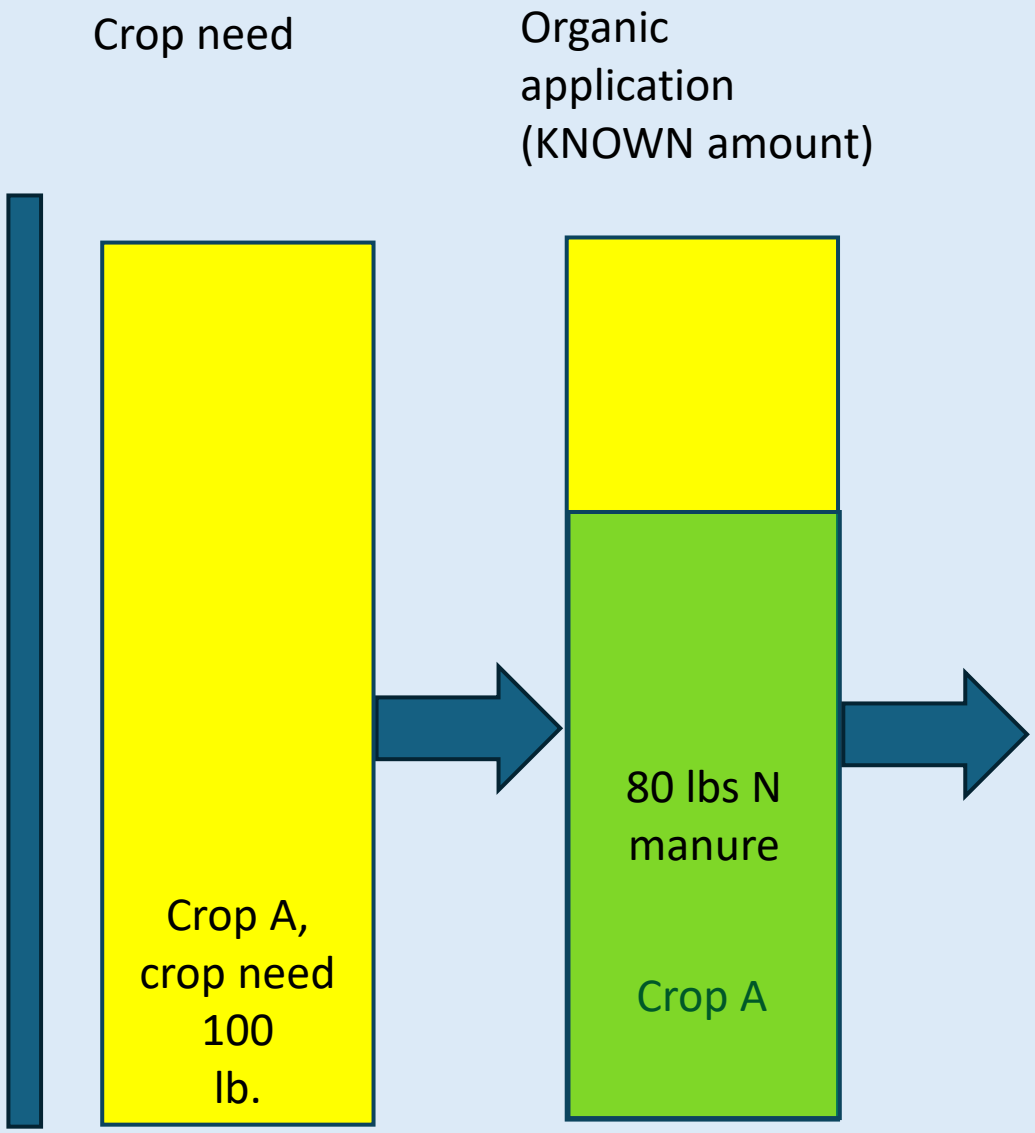
- 100 lbs of N needed
  - 75 lbs of organic applied
  - 35 lbs of inorganic N applied
    - 110 lbs N total
- Establish percent of crop need met
  - 110lbs applied/100lbs needed =110%
- Numbers are KNOWN from datasets

Scenario year

Crop need = [Last known year percentage of crop need]

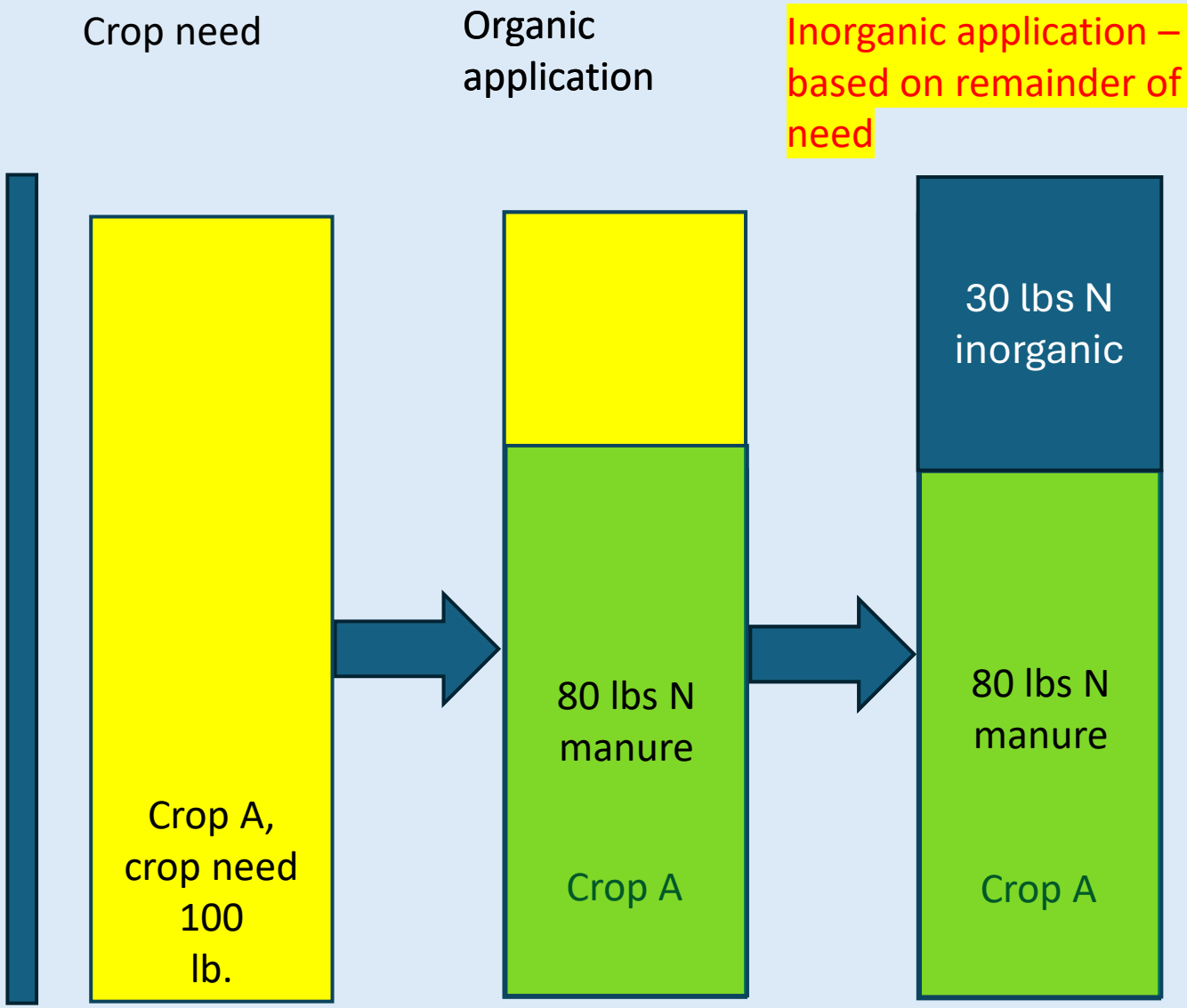


Scenario year



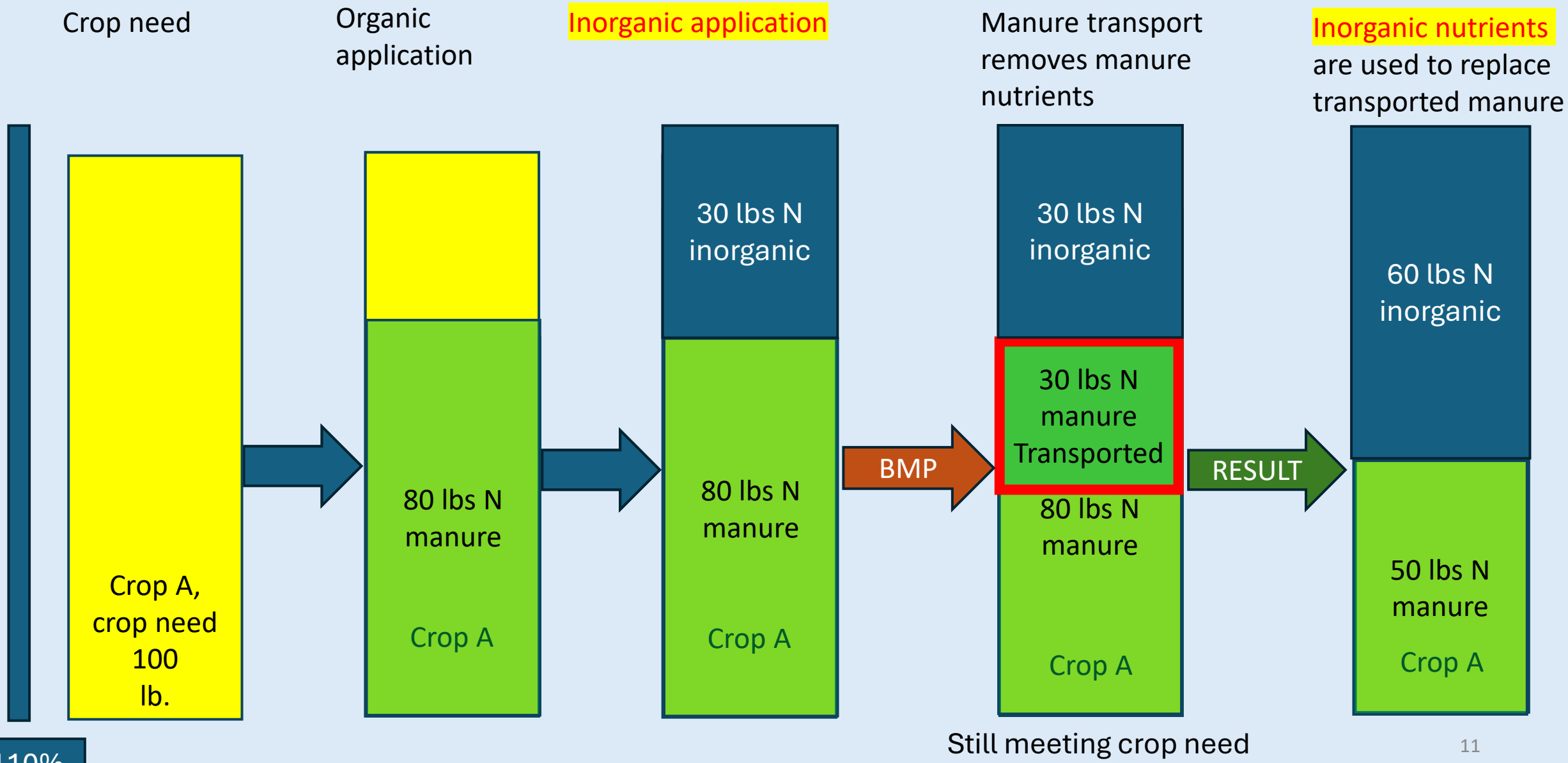
- Scenario crop need is 110% of 100 lbs.
  - 1.1*100=110 lbs
- Satisfy a portion of crop need with KNOWN manure nutrients
  - 80 lbs manure N available
- 110lbs-80lbs = 30lbs of remaining crop need

Scenario year



- Scenario run has 30lbs of remaining crop need
  - Filled automatically with inorganic fertilizer

Scenario year – With a BMP



Notes on Scenario Run with BMPs

Inorganic fertilizer in Scenario mode is:

- NOT bound by a stock
- Applied based on percentage of crop need

Part 1

Changes to the acres of Grain with Manure and Grain without Manure

- Change in PAN alters ratio of acres for Grain With Manure vs Grain Without manure
  - TEST: Alter Manure Transport/Treatment

A starting point for analysis

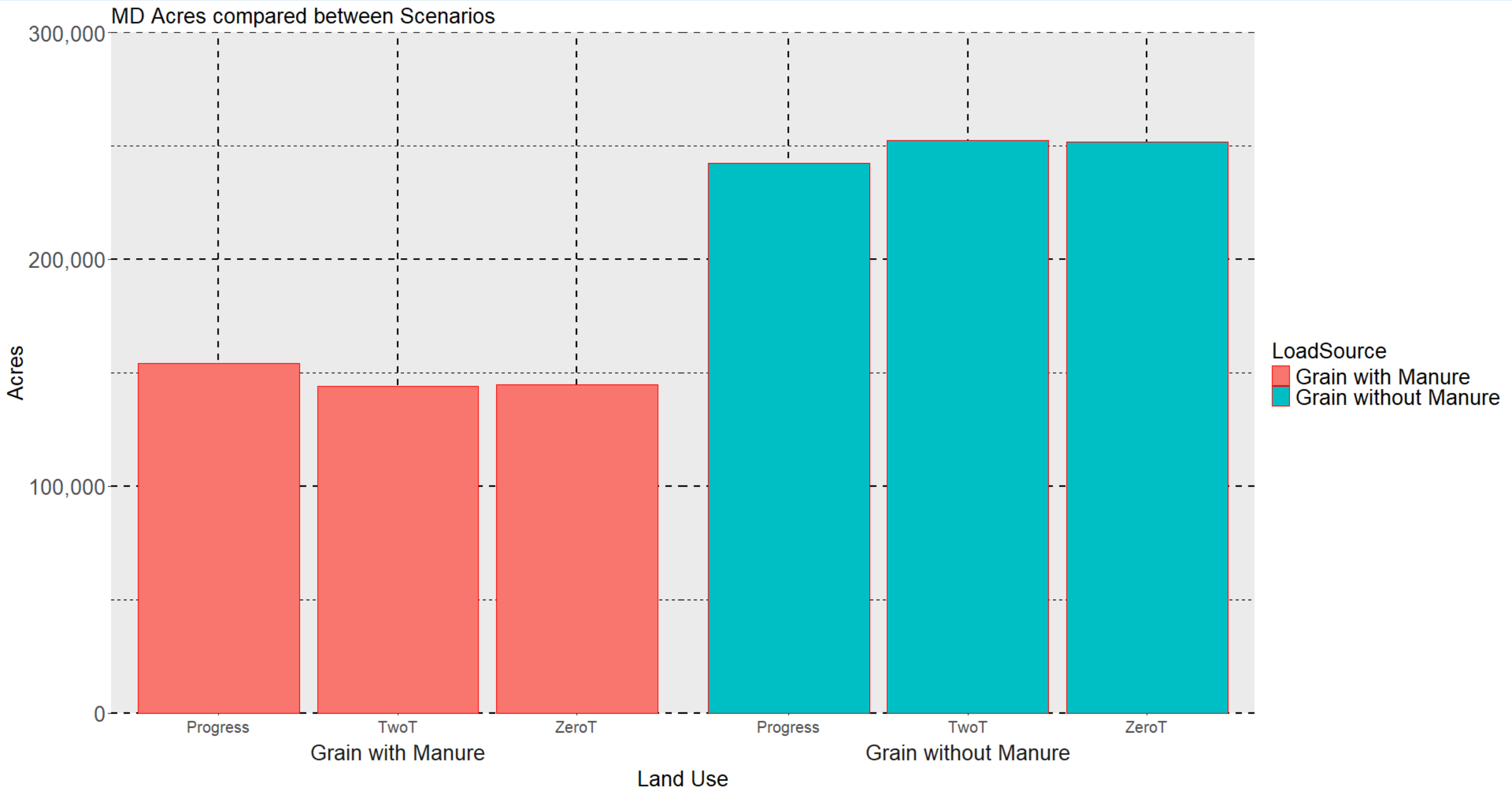
Phase 7 Progress run

- 2023 scenario mode
- New manure curves
- Updated yields
- New pasture and hay land uses,
- Smoothed state fertilizer
- BMP updates
- Hillandale layer populations added in

Comparing scenarios

Progress	ZeroT	TwoT
• Phase 7 scenario mode	• No Manure Transport	• Two times the progress amount of Manure Transport

NOTE - Changing Manure Treatment/Transport alters Plant Available Nitrogen (PAN)

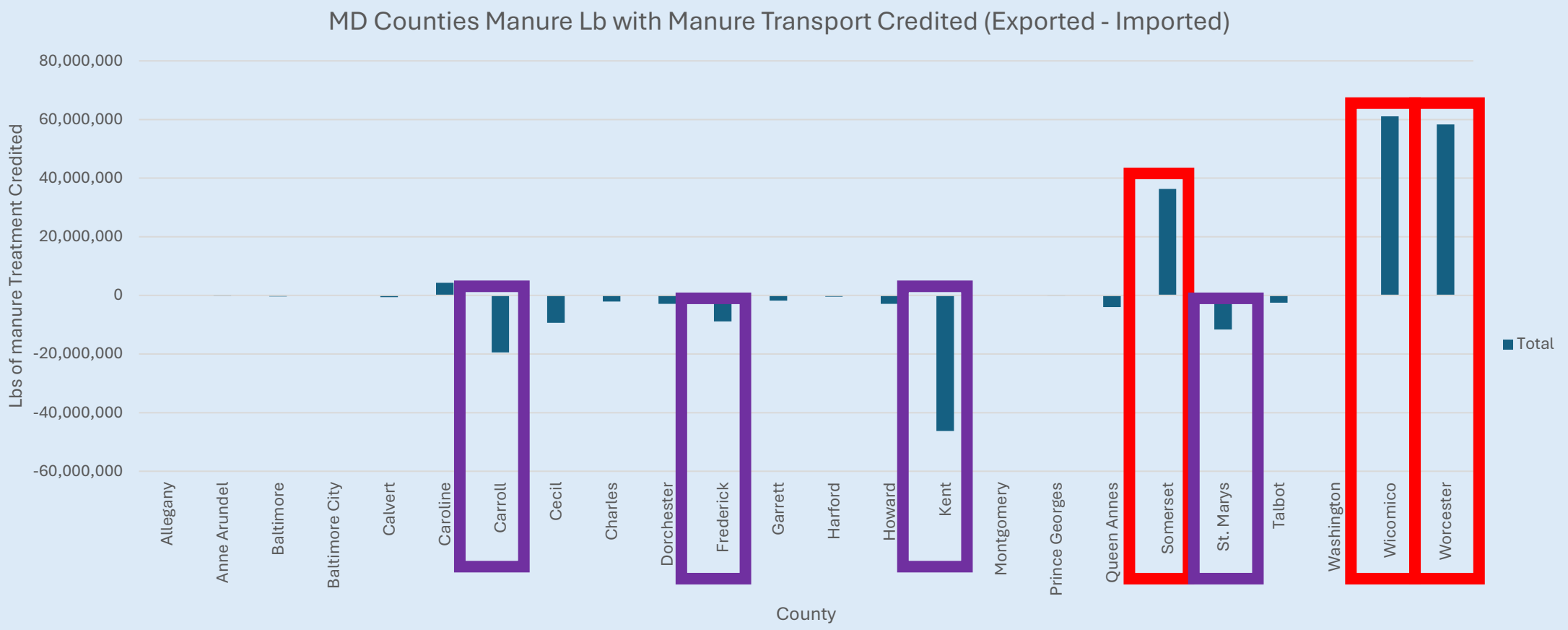

MD Acres compared between Scenarios
300,000
200,000
100,000
0
Acres
Progress
TwoT
ZeroT
Progress
TwoT
ZeroT
Grain with Manure
Grain without Manure
Land Use
LoadSource
Grain with Manure
Grain without Manure

How are these acre changes happening?

- Need to investigate specific counties
  - Organic nutrients are locked in unless transported
    - Export Import dynamics
    - Acres present in each county
- Let's look closer at MD

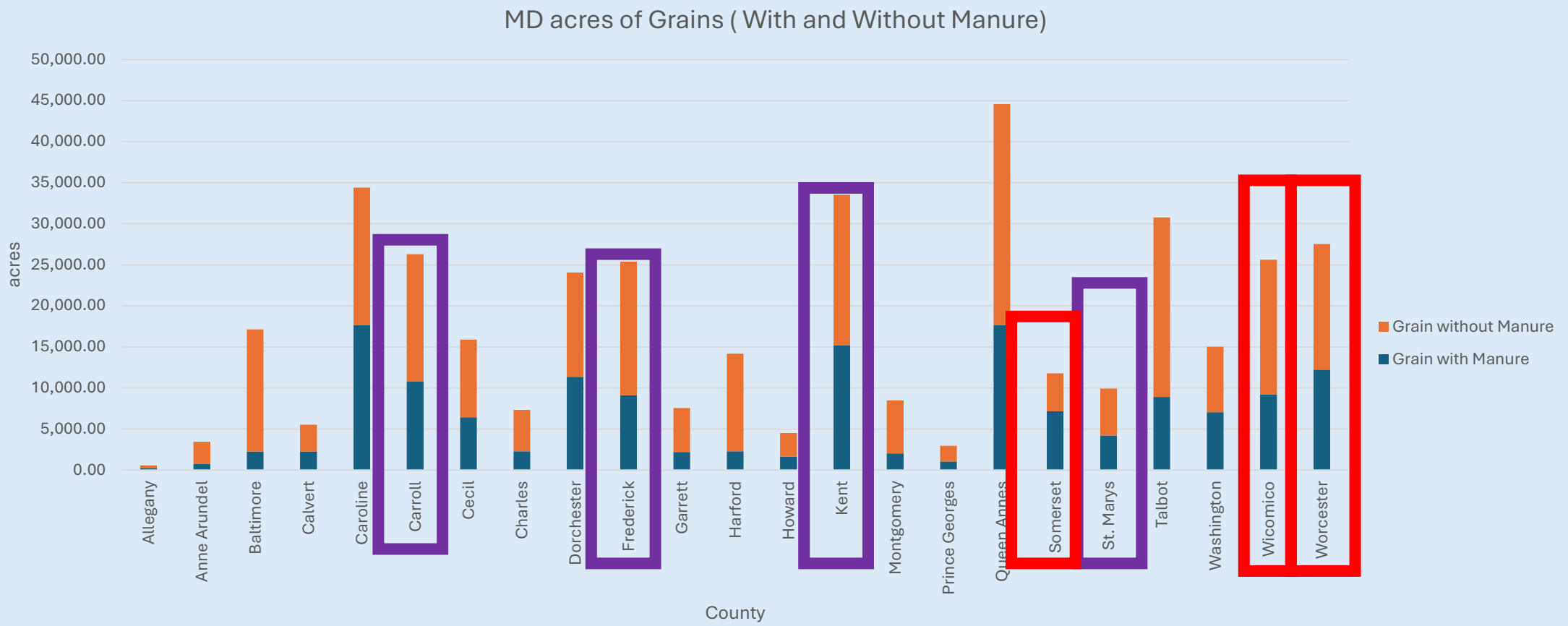
Manure Exporting County

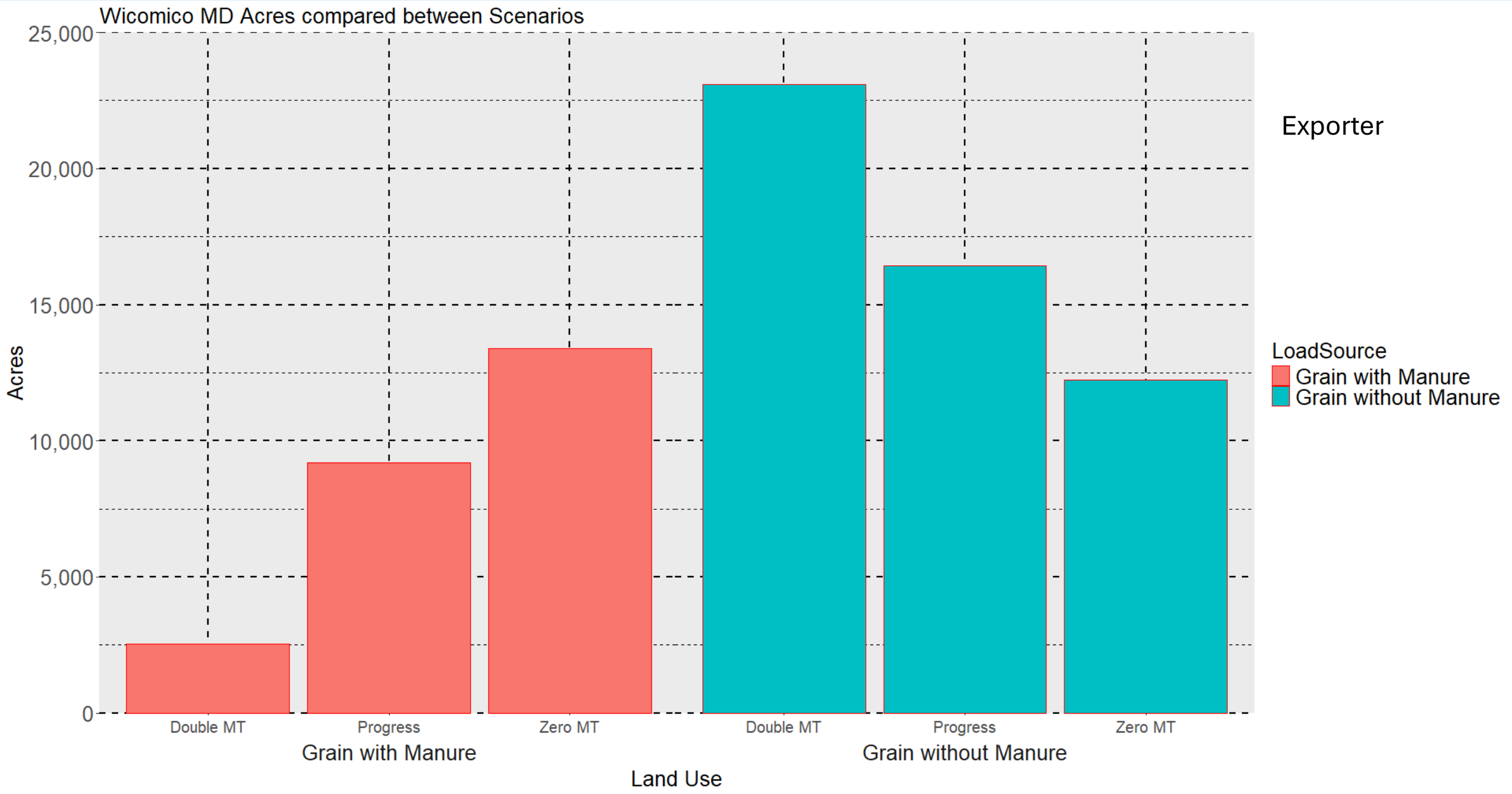
Manure Importing County

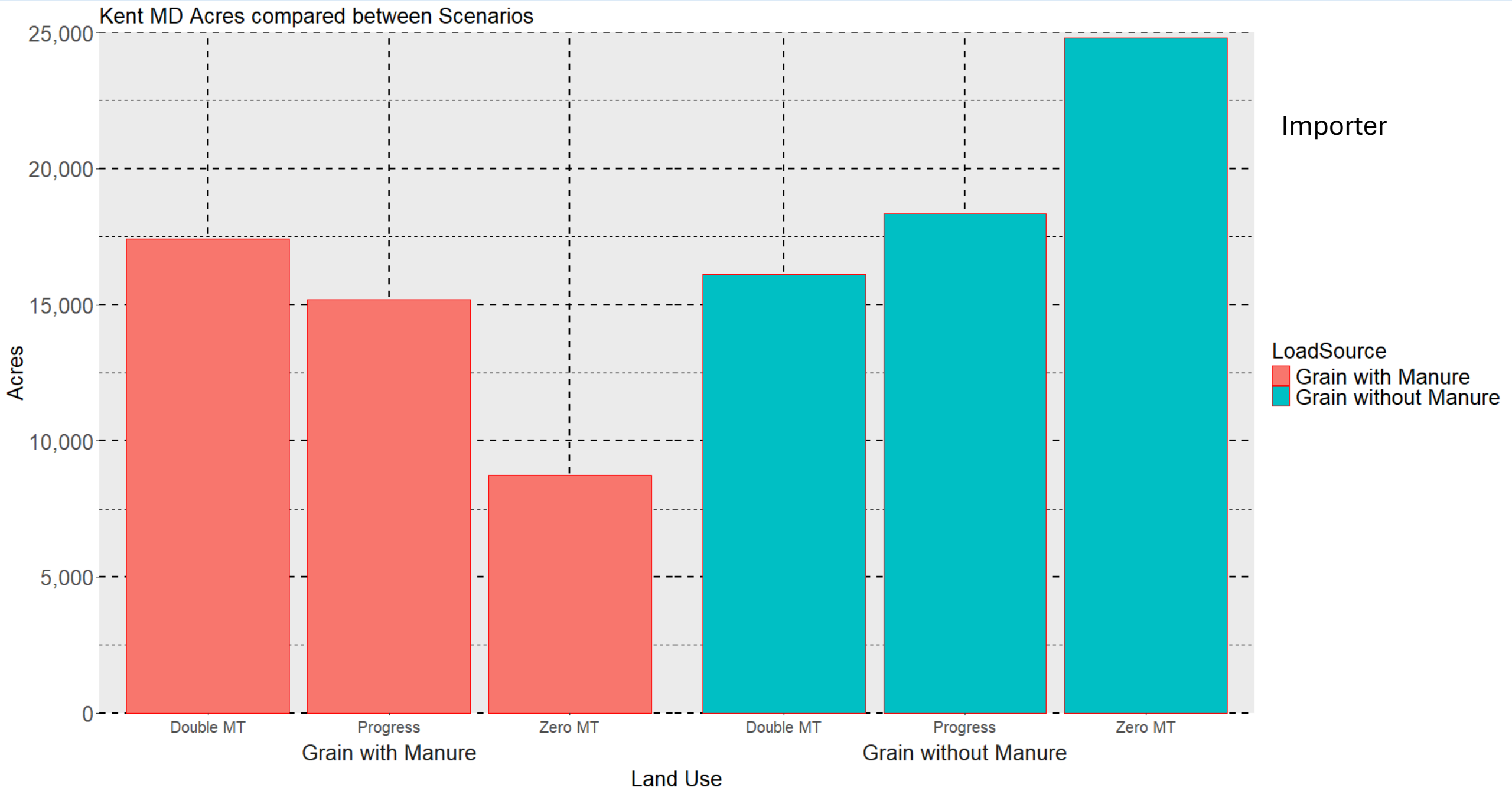


Manure Exporting County

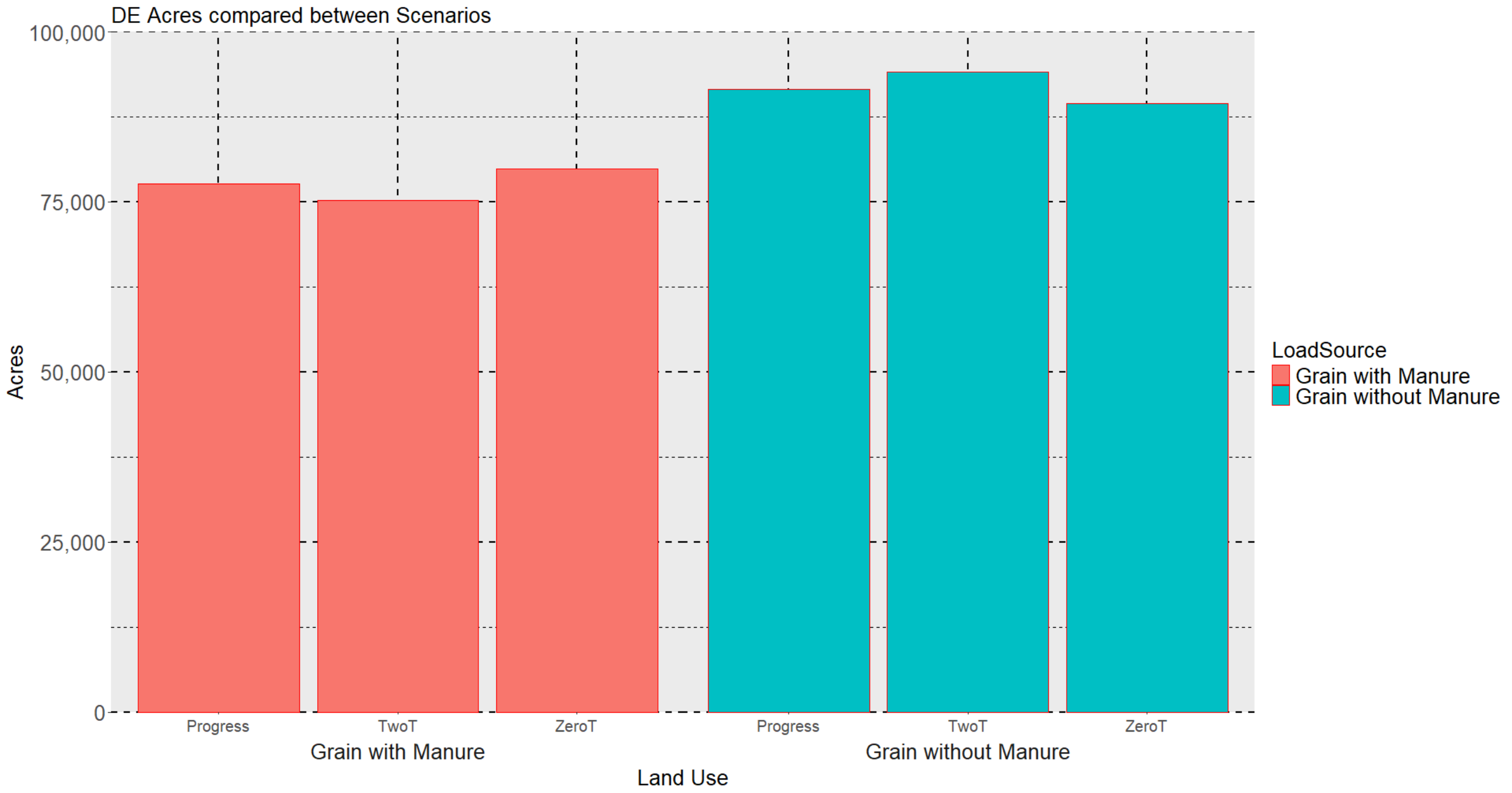
Manure Importing County

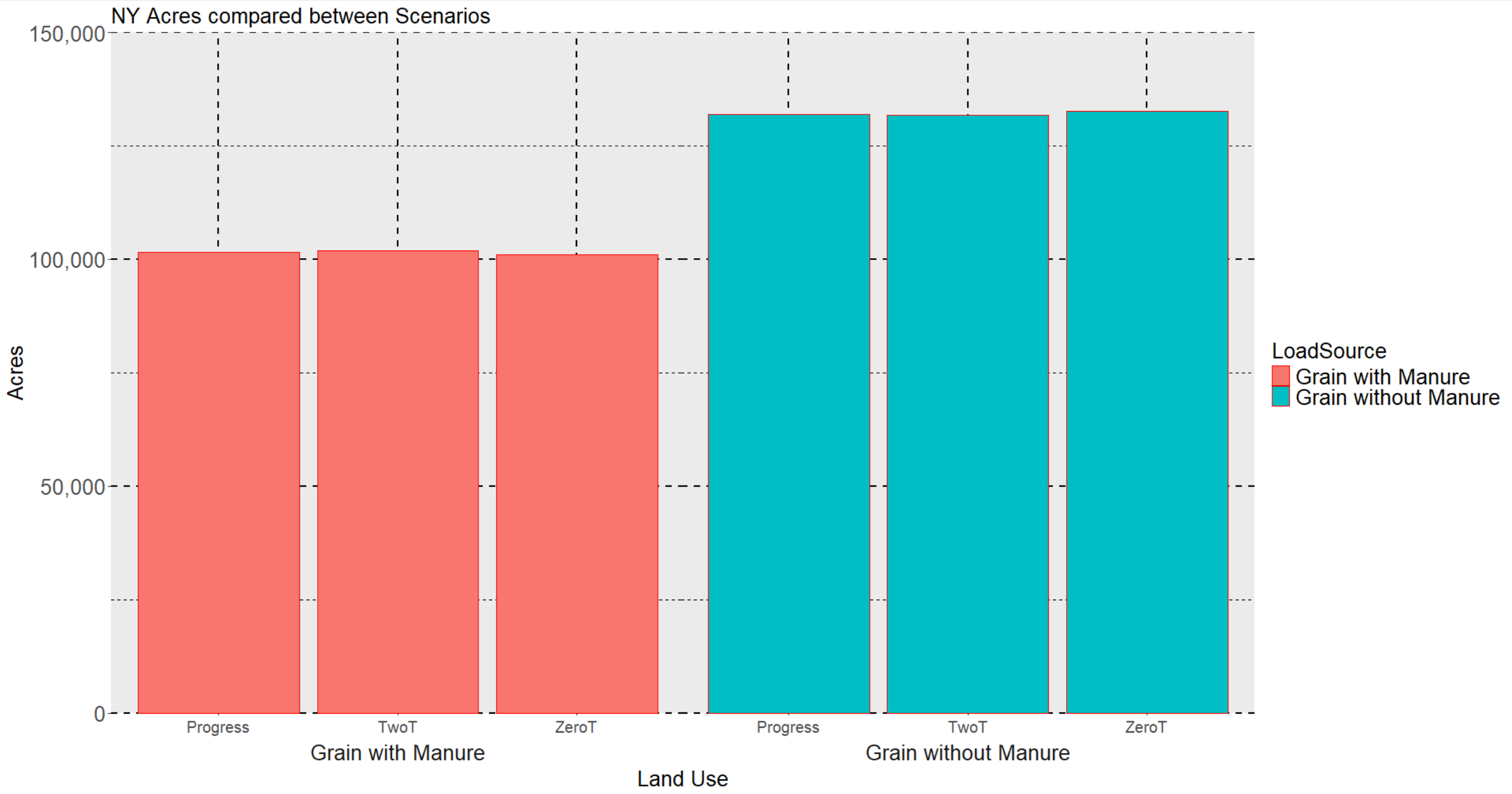


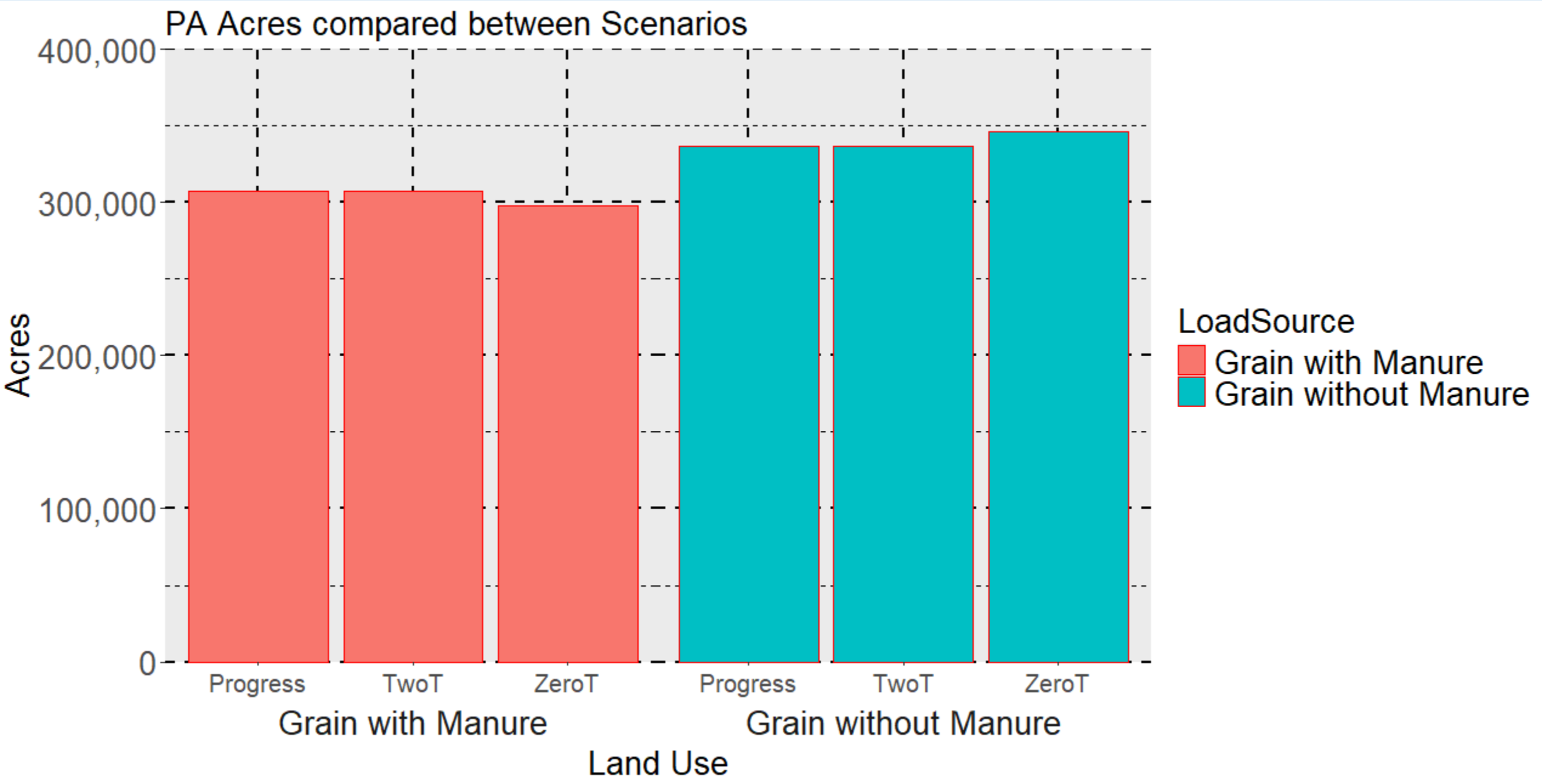

Wicomico MD Acres compared between Scenarios
25,000
20,000
15,000
10,000
5,000
0
Acres
Double MT
Progress
Zero MT
Double MT
Progress
Zero MT
Grain with Manure
Grain without Manure
Land Use
Exporter
LoadSource
Grain with Manure
Grain without Manure

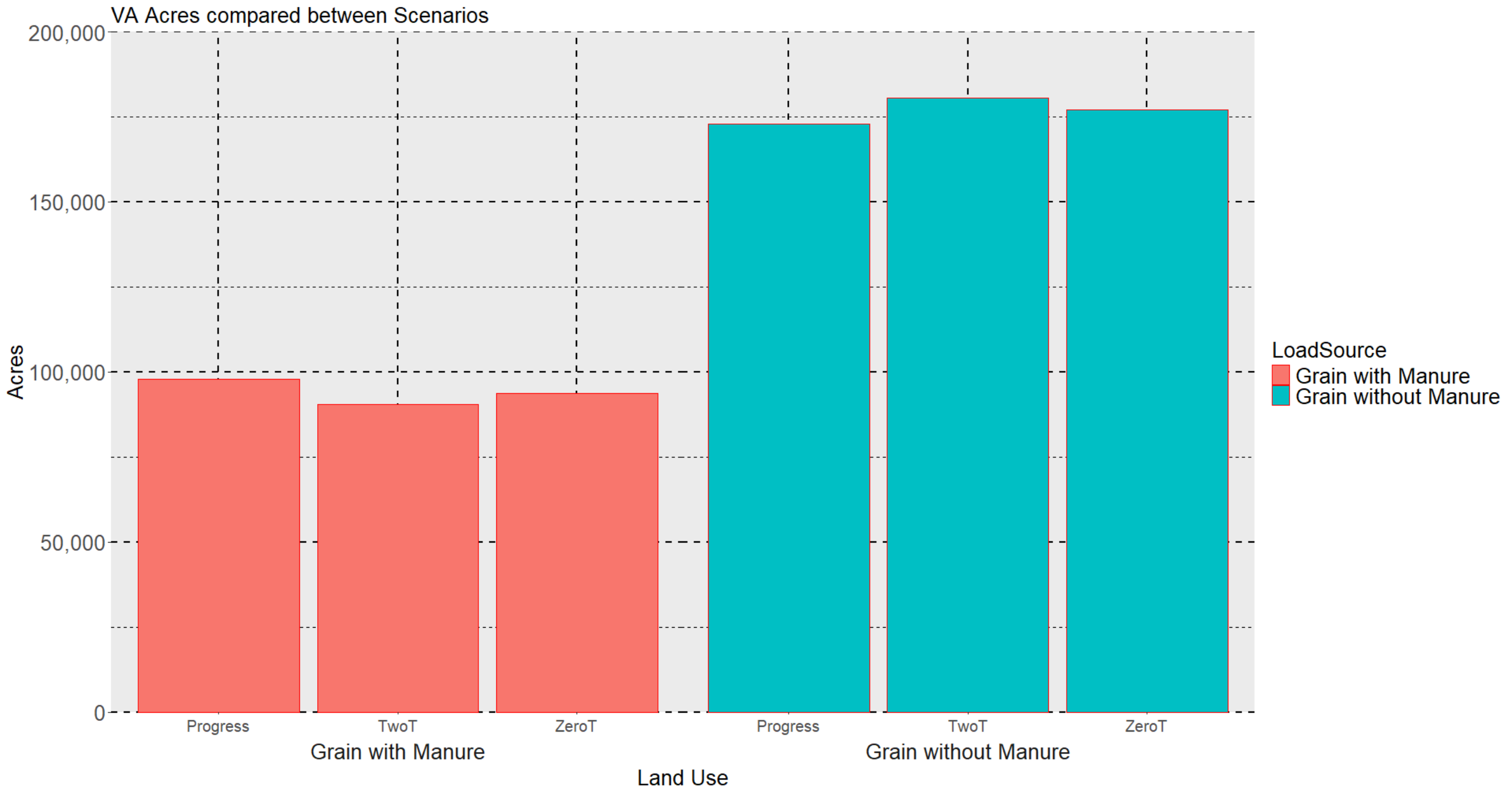

Kent MD Acres compared between Scenarios
25,000
20,000
15,000
10,000
5,000
0
Acres
Double MT
Progress
Zero MT
Double MT
Progress
Zero MT
Grain with Manure
Grain without Manure
Land Use
Importer
LoadSource
Grain with Manure
Grain without Manure

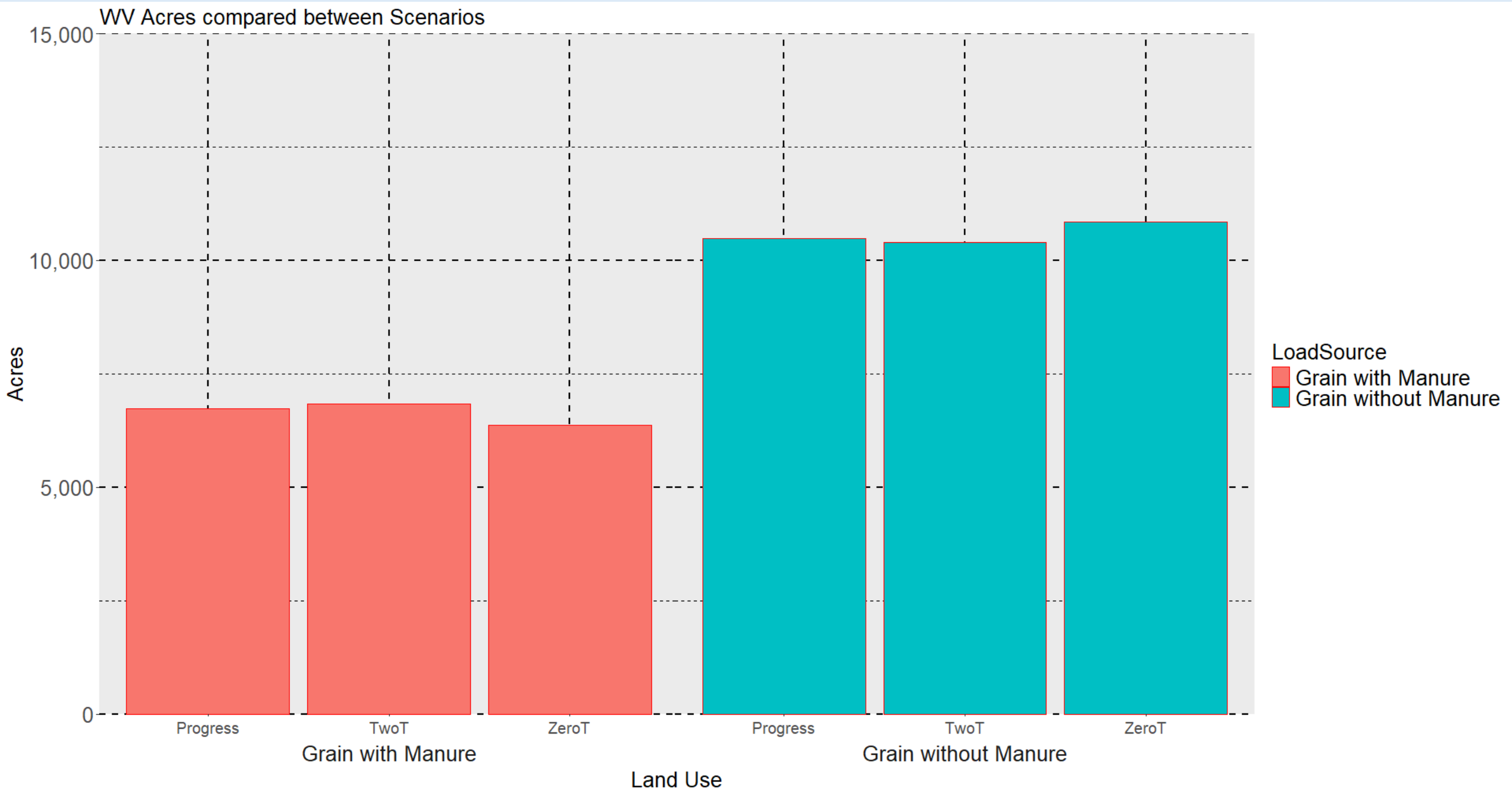
Other states quickly


DE Acres compared between Scenarios
100,000
75,000
50,000
25,000
0
Acres
Progress
TwoT
ZeroT
Progress
TwoT
ZeroT
Grain with Manure
Grain without Manure
Land Use
LoadSource
Grain with Manure
Grain without Manure


NY Acres compared between Scenarios
150,000
100,000
50,000
0
Acres
Progress
TwoT
ZeroT
Progress
TwoT
ZeroT
Grain with Manure
Grain without Manure
Land Use
LoadSource
Grain with Manure
Grain without Manure


PA Acres compared between Scenarios
400,000
300,000
200,000
100,000
0
Acres
Progress
TwoT
ZeroT
Progress
TwoT
ZeroT
Grain with Manure
Grain without Manure
Land Use
LoadSource
Grain with Manure
Grain without Manure


VA Acres compared between Scenarios
200,000
150,000
100,000
50,000
0
Acres
Progress
TwoT
ZeroT
Progress
TwoT
ZeroT
Grain with Manure
Grain without Manure
Land Use
LoadSource
Grain with Manure
Grain without Manure


WV Acres compared between Scenarios
15,000
10,000
5,000
0
Acres
Progress
TwoT
ZeroT
Progress
TwoT
ZeroT
Grain with Manure
Grain without Manure
Land Use
LoadSource
Grain with Manure
Grain without Manure

Summary

Acres of Grain with Manure vs Grain without Manure change when PAN changes

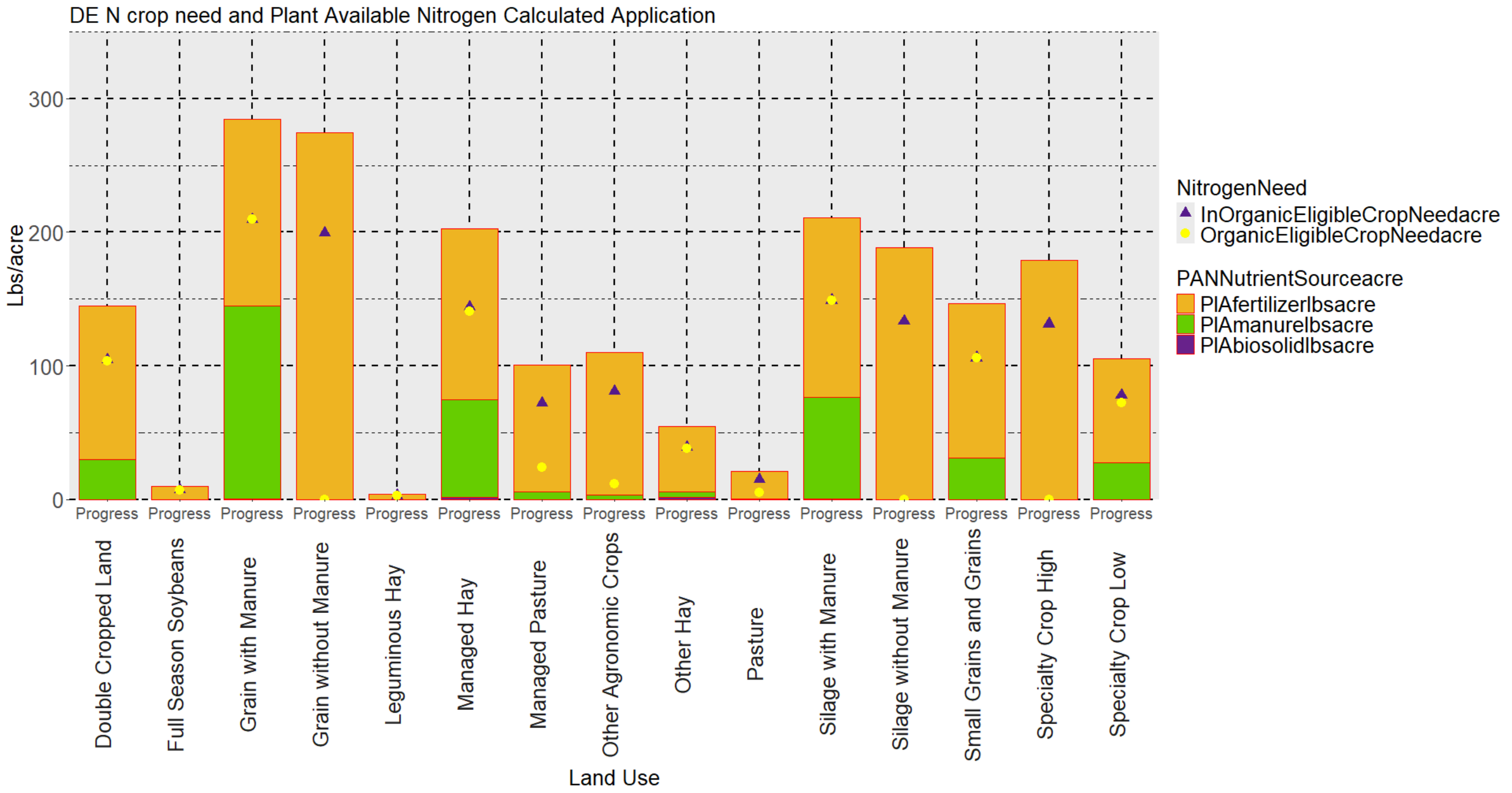
Influenced by multiple other factors

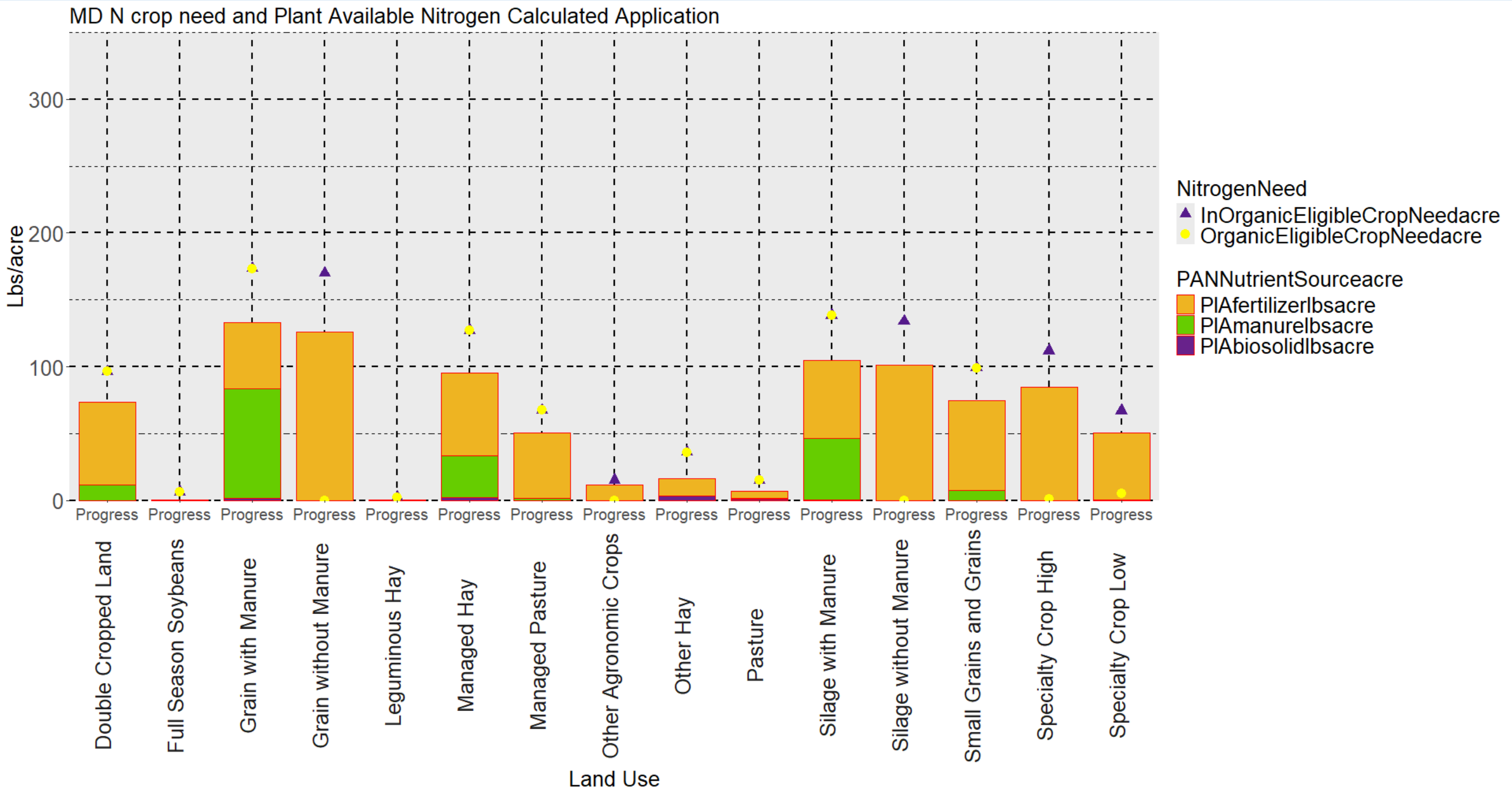
- Specific county import/export
- Acres available in each county

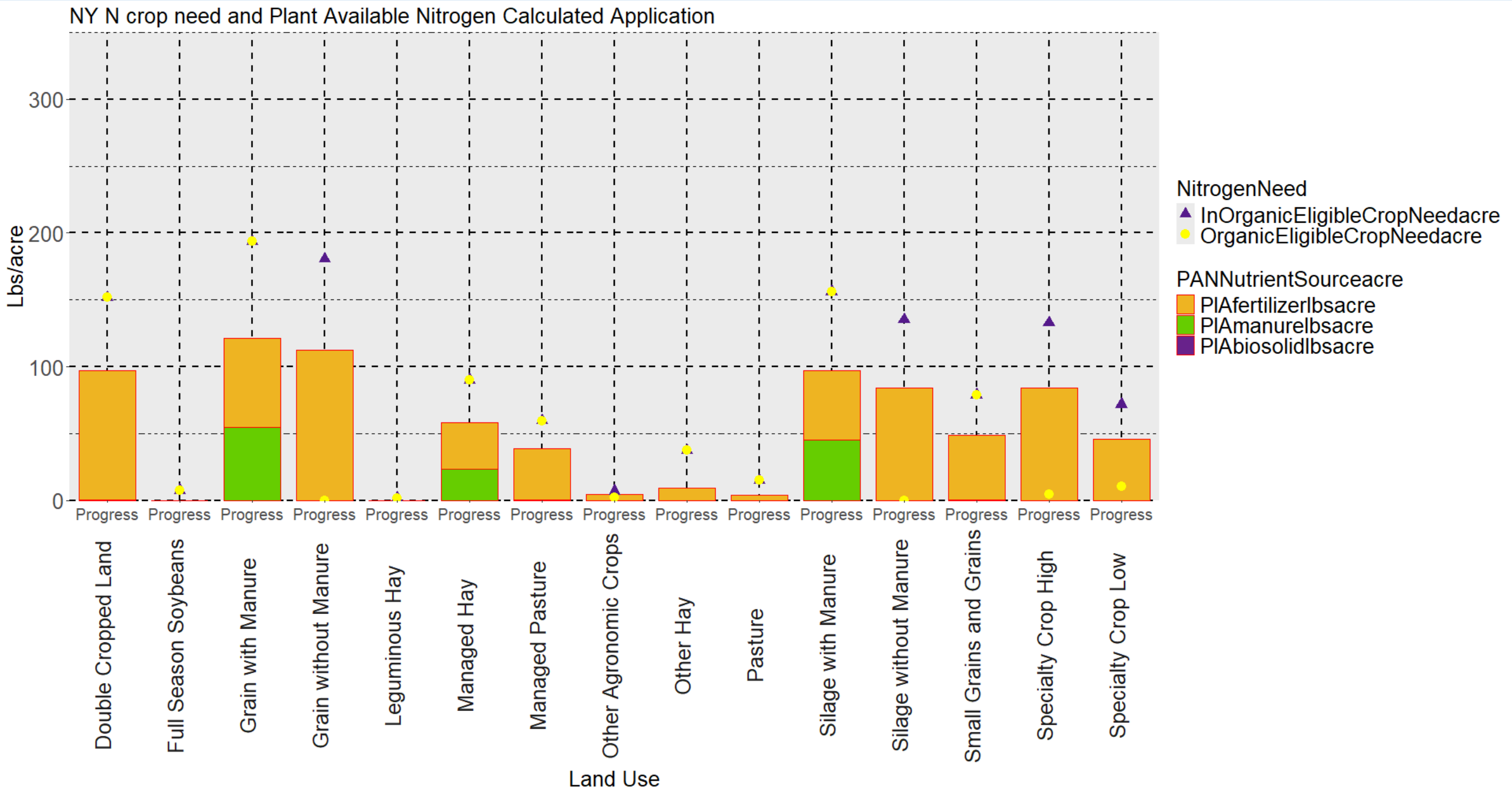
Part 2; Nutrient backfilling

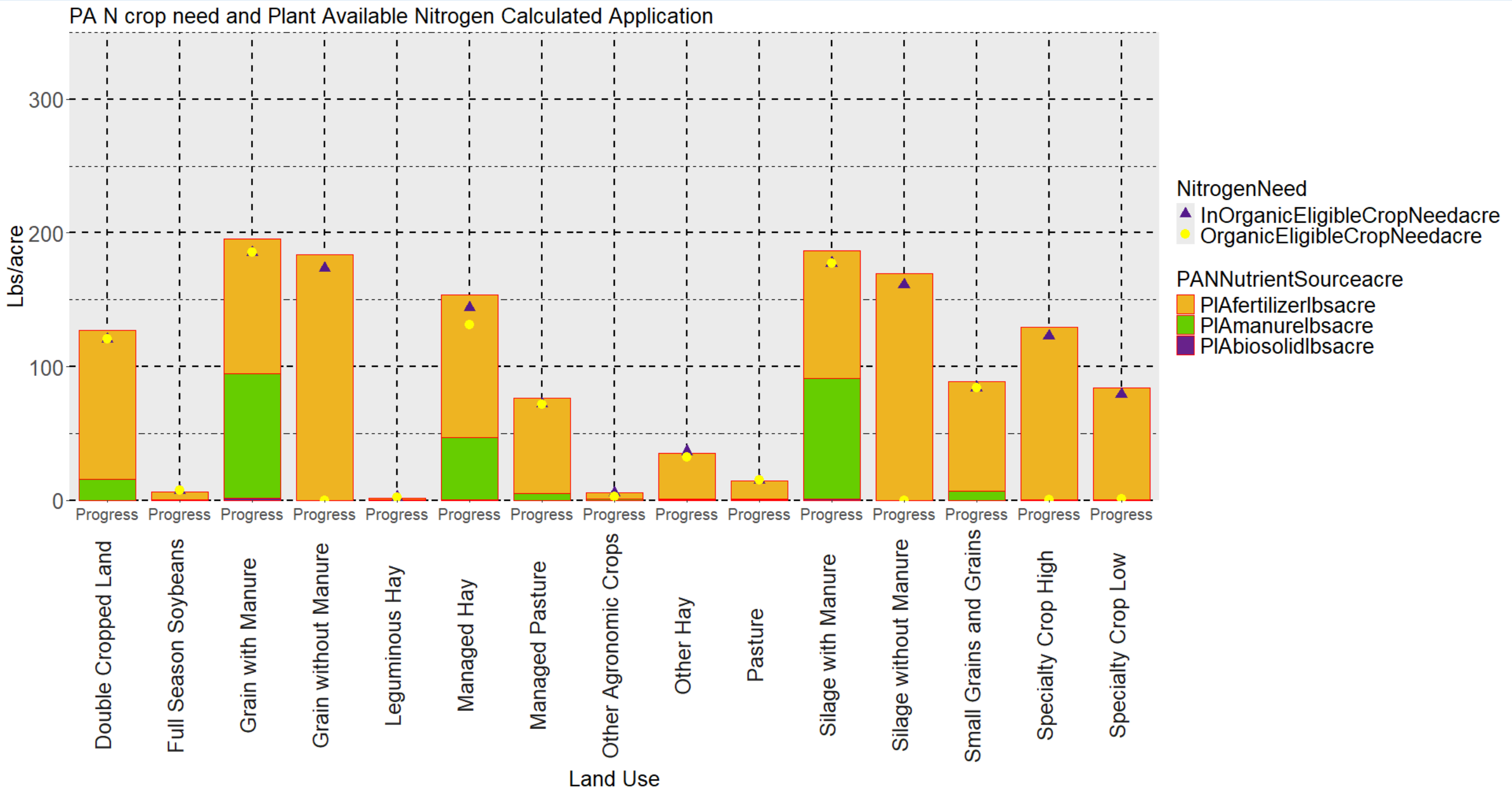
Investigate state and county specific examples of nitrogen replacement

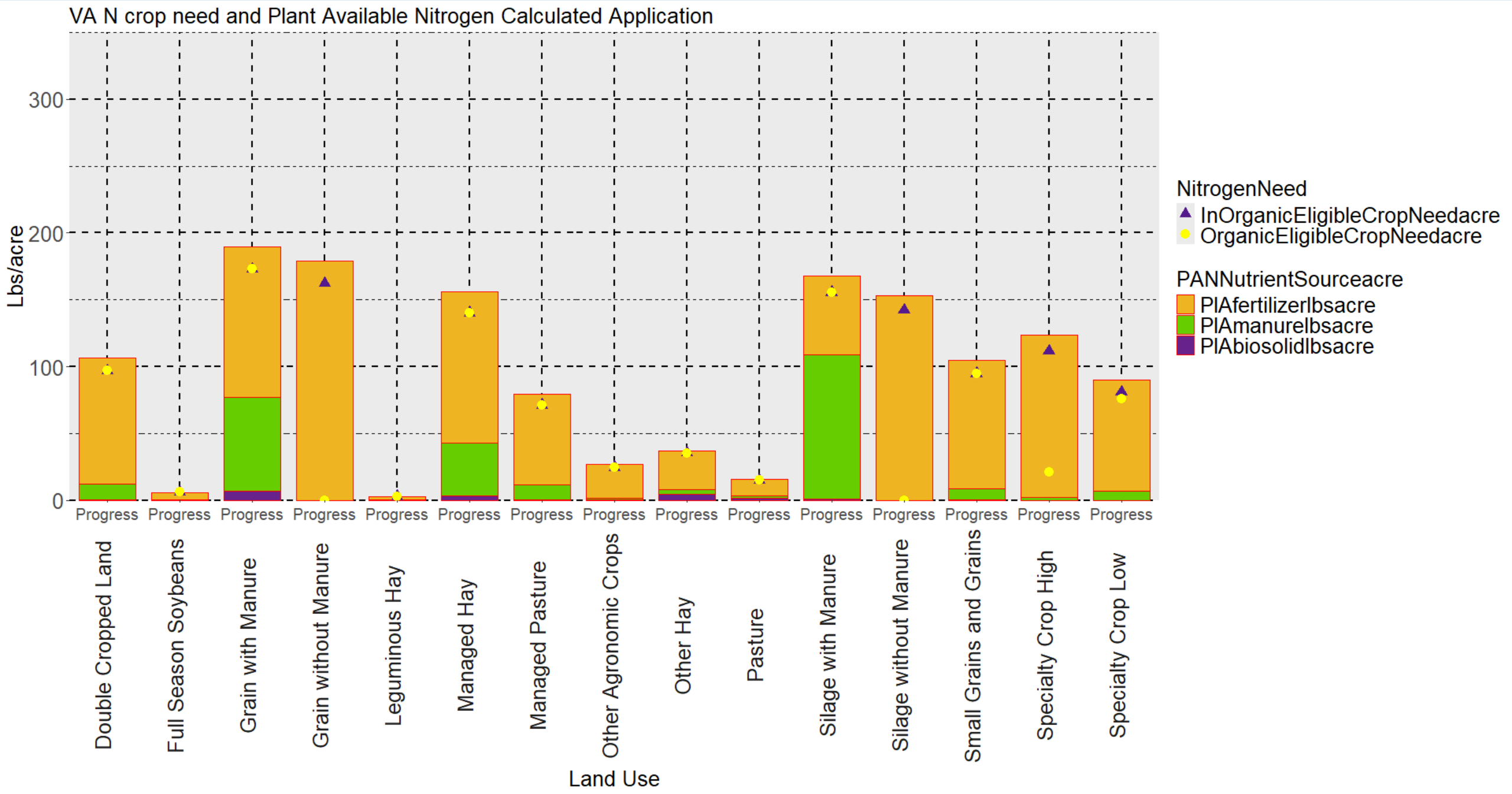
- How often does it occur that we exceed 100% of crop need?
  - Same P7 progress run
  - Compare nutrient requirements to applications

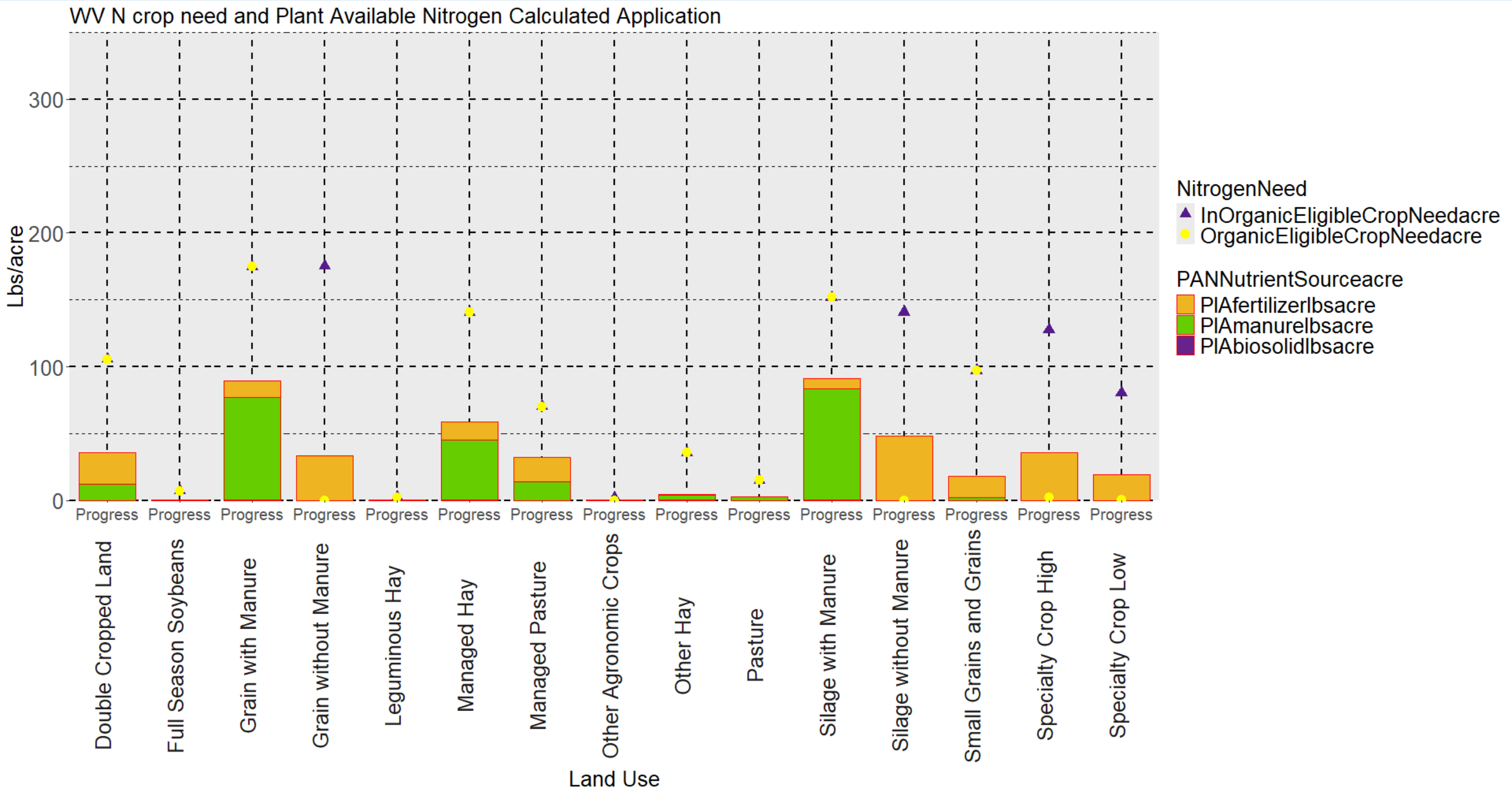

DE N crop need and Plant Available Nitrogen Calculated Application
Lbs/acre
300
200
100
0
Progress
Double Cropped Land
Full Season Soybeans
Grain with Manure
Grain without Manure
Leguminous Hay
Managed Hay
Managed Pasture
Other Agronomic Crops
Other Hay
Pasture
Silage with Manure
Silage without Manure
Small Grains and Grains
Specialty Crop High
Specialty Crop Low
Land Use
NitrogenNeed
InOrganicEligibleCropNeedacre
OrganicEligibleCropNeedacre
PANNutrientSourceacre
PlAfertilizerlbsacre
PlAmanurelbsacre
PlAbiosolidlbsacre


MD N crop need and Plant Available Nitrogen Calculated Application
Lbs/acre
300
200
100
0
Progress
Double Cropped Land
Full Season Soybeans
Grain with Manure
Grain without Manure
Leguminous Hay
Managed Hay
Managed Pasture
Other Agronomic Crops
Other Hay
Pasture
Silage with Manure
Silage without Manure
Small Grains and Grains
Specialty Crop High
Specialty Crop Low
Land Use
NitrogenNeed
InOrganicEligibleCropNeedacre
OrganicEligibleCropNeedacre
PANNutrientSourceacre
PlAfertilizerlbsacre
PlAmanurelbsacre
PlAbiosolidlbsacre


NY N crop need and Plant Available Nitrogen Calculated Application
Lbs/acre
300
200
100
0
Progress
Double Cropped Land
Full Season Soybeans
Grain with Manure
Grain without Manure
Leguminous Hay
Managed Hay
Managed Pasture
Other Agronomic Crops
Other Hay
Pasture
Silage with Manure
Silage without Manure
Small Grains and Grains
Specialty Crop High
Specialty Crop Low
Land Use
NitrogenNeed
InOrganicEligibleCropNeedacre
OrganicEligibleCropNeedacre
PANNutrientSourceacre
PlAfertilizerlbsacre
PlAmanurelbsacre
PlAbiosolidlbsacre


PA N crop need and Plant Available Nitrogen Calculated Application
Lbs/acre
300
200
100
0
Progress
Double Cropped Land
Full Season Soybeans
Grain with Manure
Grain without Manure
Leguminous Hay
Managed Hay
Managed Pasture
Other Agronomic Crops
Other Hay
Pasture
Silage with Manure
Silage without Manure
Small Grains and Grains
Specialty Crop High
Specialty Crop Low
Land Use
NitrogenNeed
InOrganicEligibleCropNeedacre
OrganicEligibleCropNeedacre
PANNutrientSourceacre
PlAfertilizerlbsacre
PlAmanurelbsacre
PlAbiosolidlbsacre


VA N crop need and Plant Available Nitrogen Calculated Application
Lbs/acre
300
200
100
0
Progress
Double Cropped Land
Full Season Soybeans
Grain with Manure
Grain without Manure
Leguminous Hay
Managed Hay
Managed Pasture
Other Agronomic Crops
Other Hay
Pasture
Silage with Manure
Silage without Manure
Small Grains and Grains
Specialty Crop High
Specialty Crop Low
Land Use
NitrogenNeed
InOrganicEligibleCropNeedacre
OrganicEligibleCropNeedacre
PANNutrientSourceacre
PlAfertilizerlbsacre
PlAmanurelbsacre
PlAbiosolidlbsacre


WV N crop need and Plant Available Nitrogen Calculated Application
Lbs/acre
300
200
100
0
Progress
Double Cropped Land
Full Season Soybeans
Grain with Manure
Grain without Manure
Leguminous Hay
Managed Hay
Managed Pasture
Other Agronomic Crops
Other Hay
Pasture
Silage with Manure
Silage without Manure
Small Grains and Grains
Specialty Crop High
Specialty Crop Low
Land Use
NitrogenNeed
InOrganicEligibleCropNeedacre
OrganicEligibleCropNeedacre
PANNutrientSourceacre
PlAfertilizerlbsacre
PlAmanurelbsacre
PlAbiosolidlbsacre

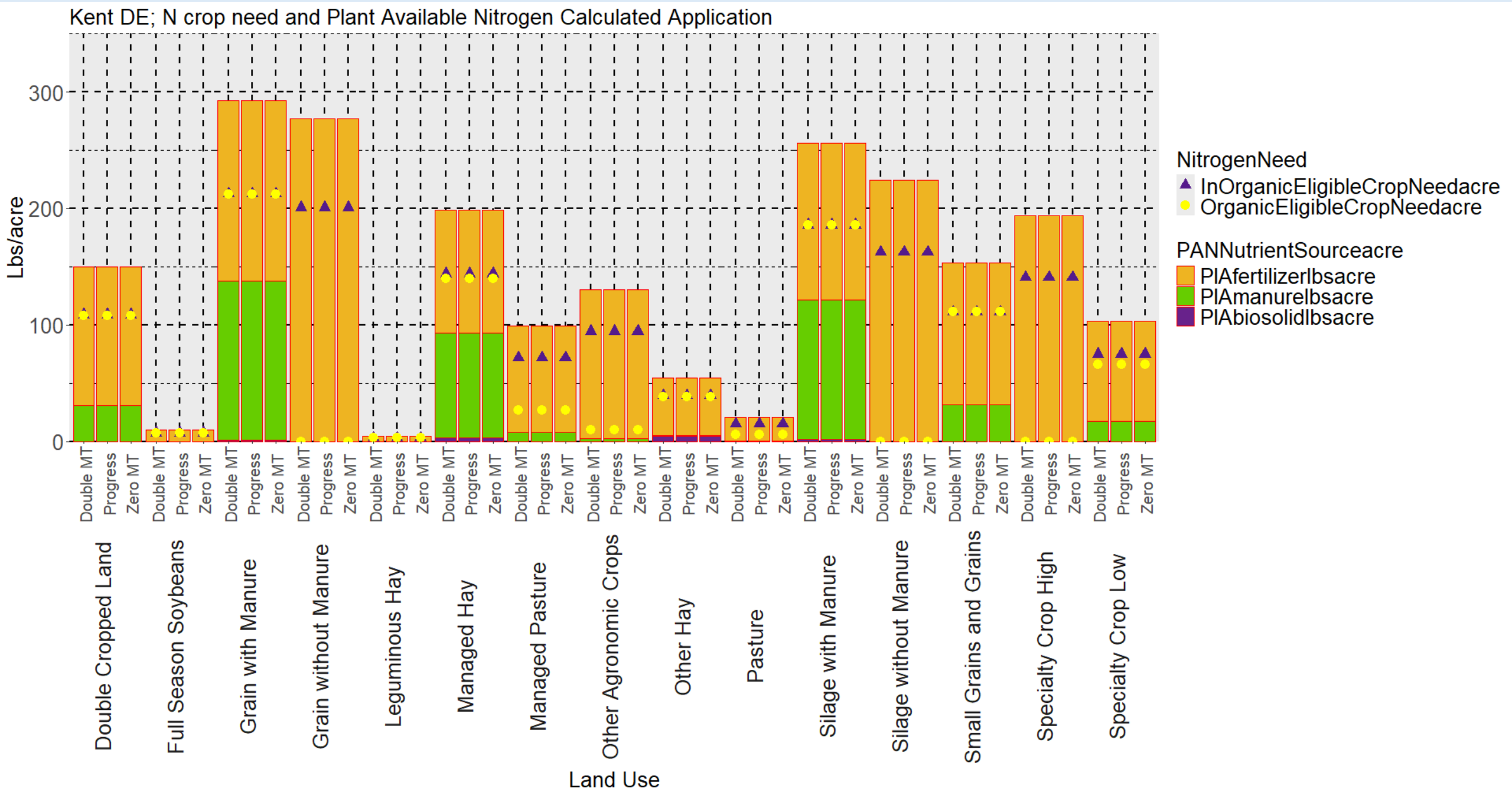
Overall state applications relative to crop need

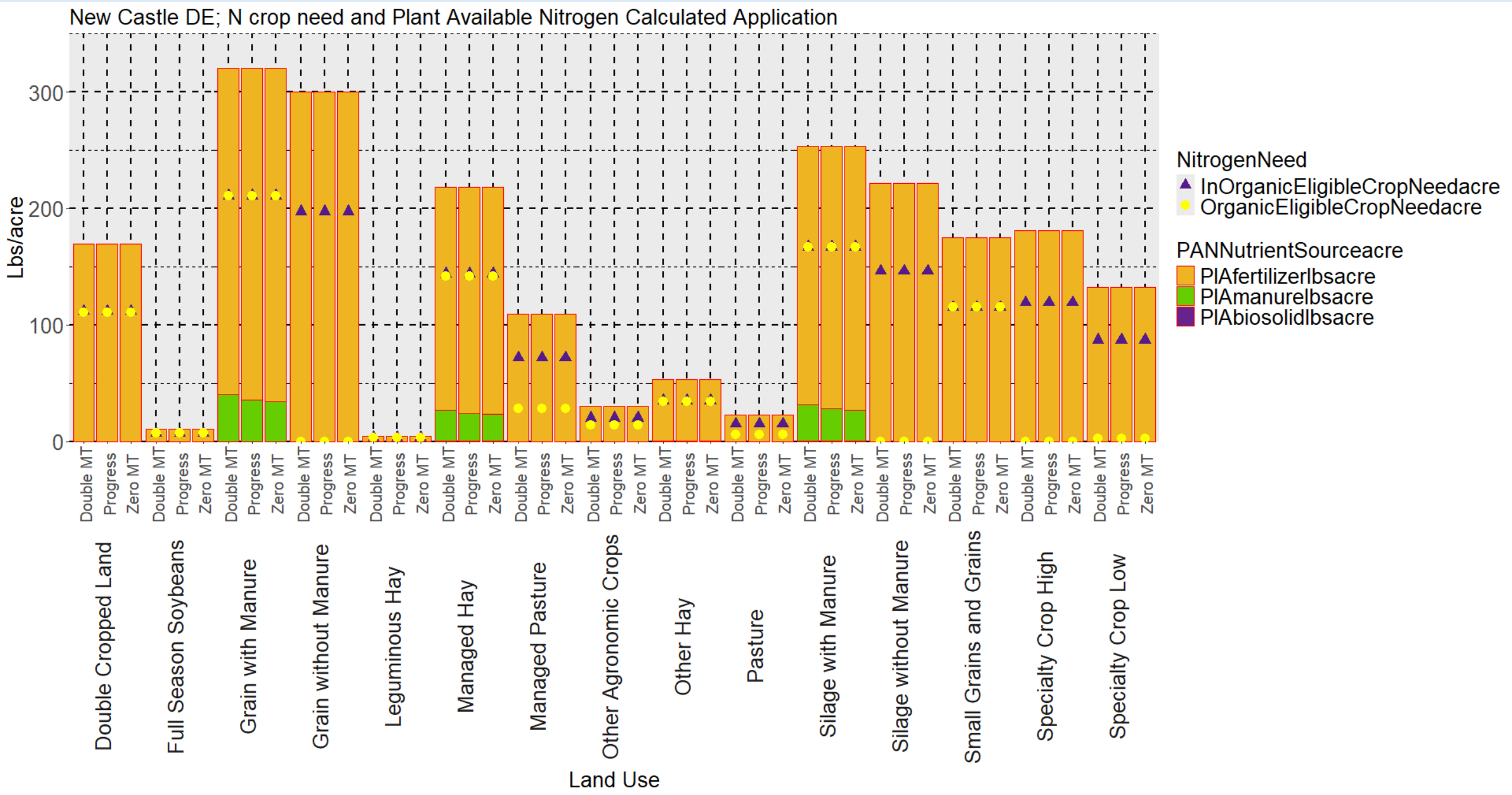
If value exceeds 1 then a state applies MORE N than the crop application goal suggests it should receive

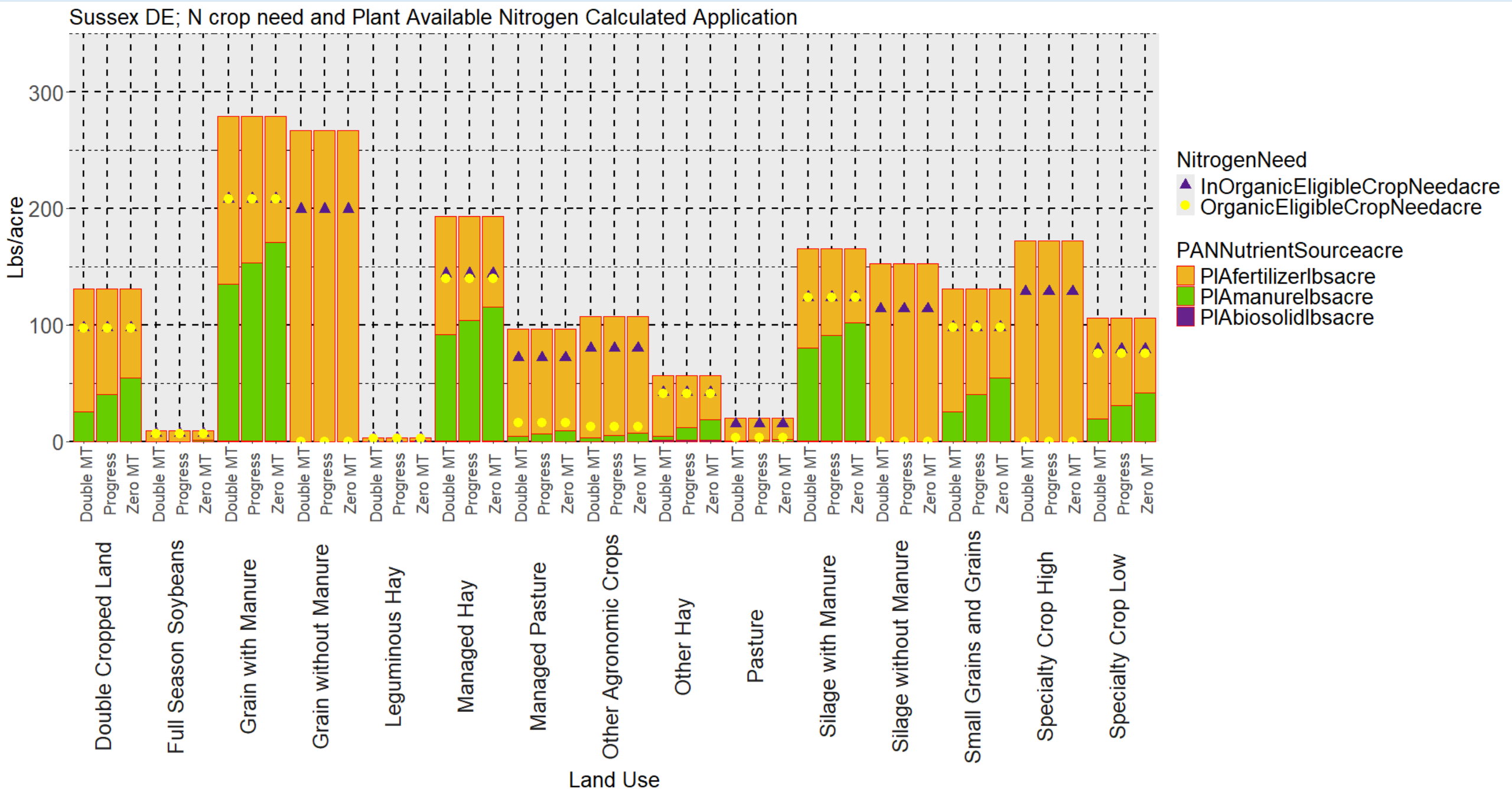
Jurisdiction	Percent of N applied relative to crop need	Percent of N applied relative to crop need (application goal)	Number of counties that have at least one crop over 100%	Number of counties that have at least one crop over 120%
DE	1.37	+37%	3	3
MD	0.72	-28%	2	1
NY	0.55	-45%	0	0
PA	1.04	+4%	42	0
VA	1.08	+8%	61	2
WV	0.21	-79%	0	0

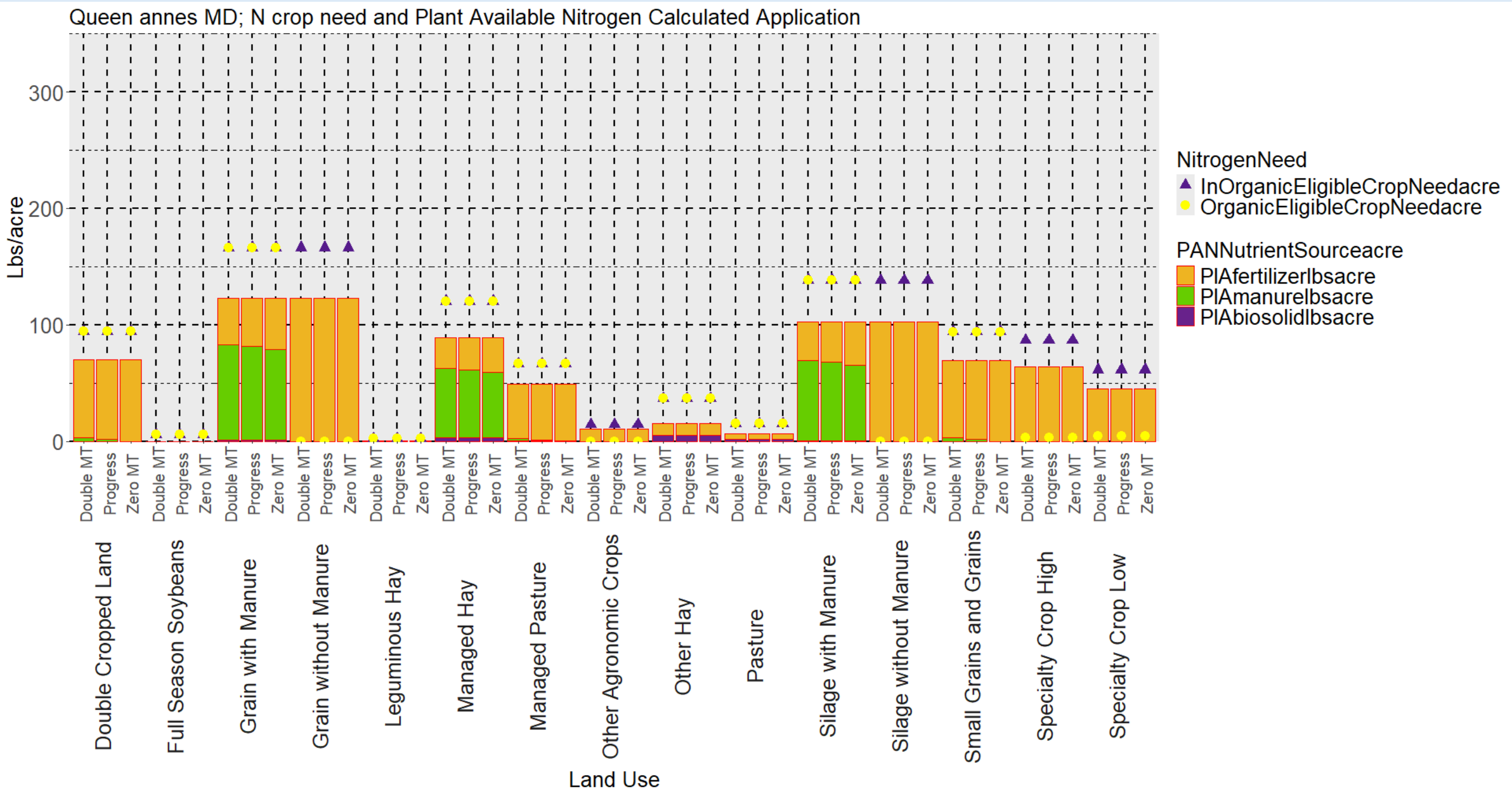
Data requests:

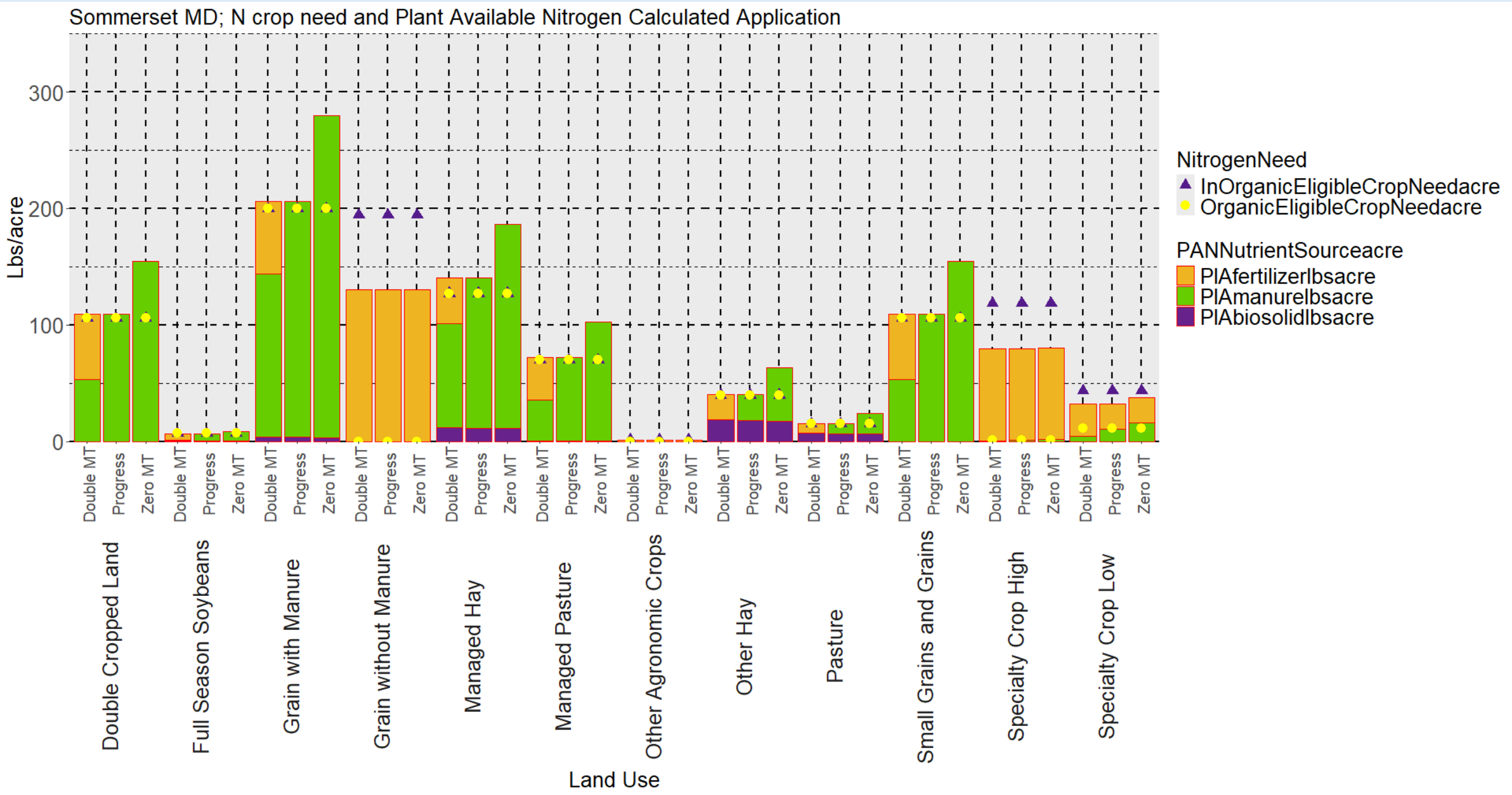
DE	MD	NY	PA	VA	WV
Kent	Queen Anne's	Steuben	Berks	Page	Hardy
New Castle	Somerset		Snyder	Rockingham	Jefferson
Sussex	Frederick		Lebanon		

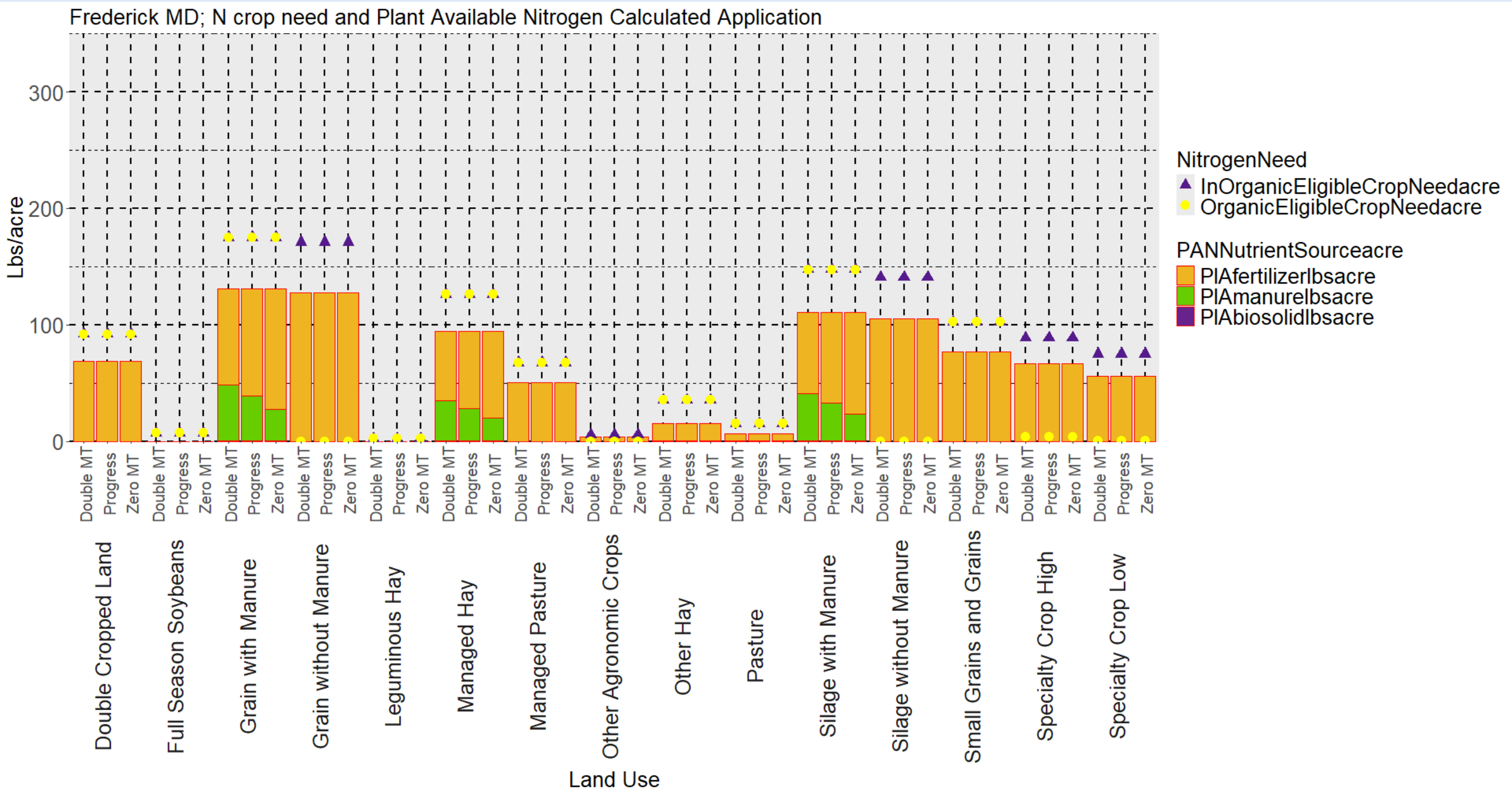

Kent DE; N crop need and Plant Available Nitrogen Calculated Application
Lbs/acre
300
200
100
0
Double MT
Progress
Zero MT
Double Cropped Land
Full Season Soybeans
Grain with Manure
Grain without Manure
Leguminous Hay
Managed Hay
Managed Pasture
Other Agronomic Crops
Other Hay
Pasture
Silage with Manure
Silage without Manure
Small Grains and Grains
Specialty Crop High
Specialty Crop Low
Land Use
NitrogenNeed
InOrganicEligibleCropNeedacre
OrganicEligibleCropNeedacre
PANNutrientSourceacre
PlAfertilizerlbsacre
PlAmanurelbsacre
PlAbiosolidlbsacre

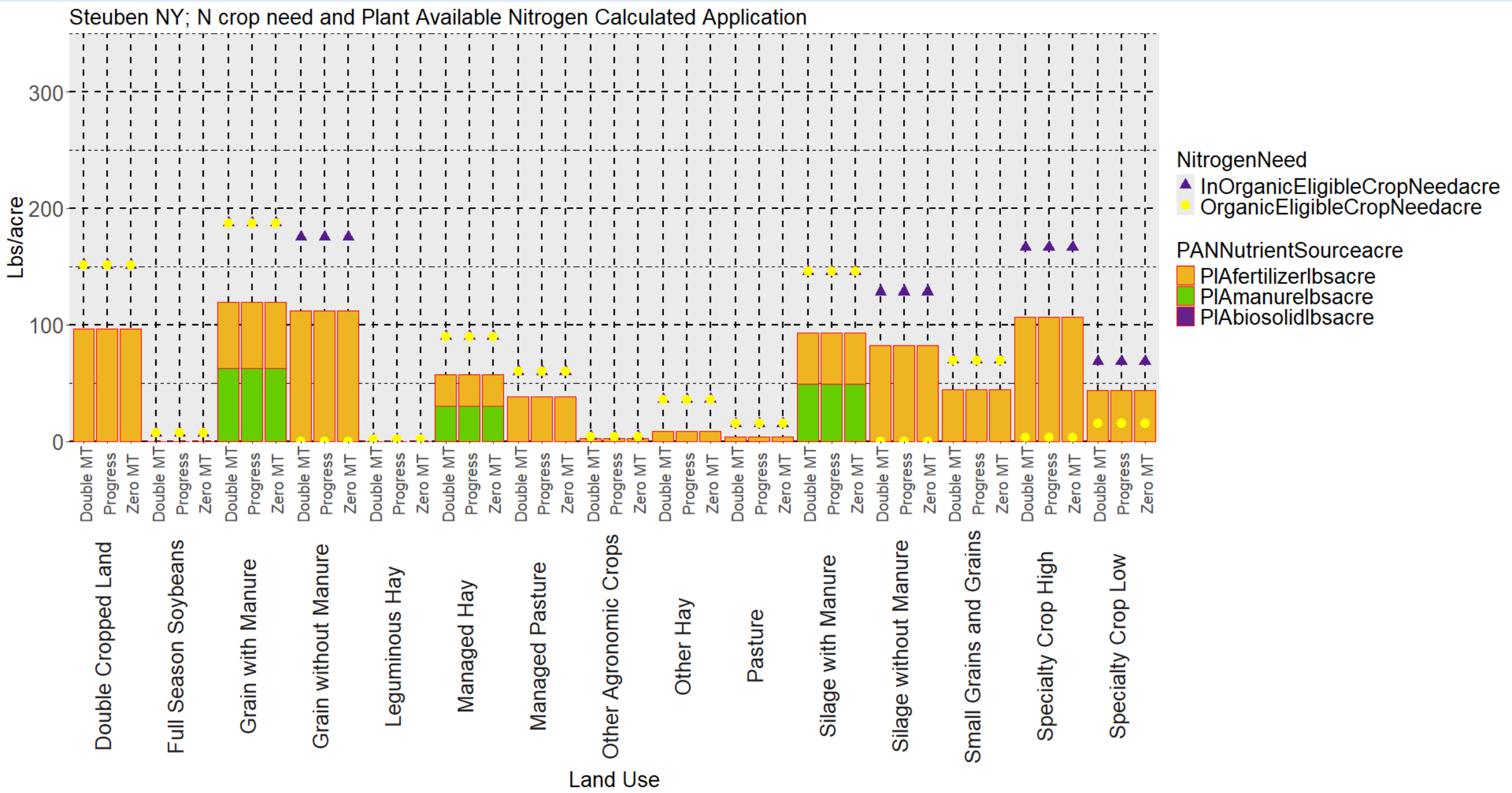

New Castle DE; N crop need and Plant Available Nitrogen Calculated Application
Lbs/acre
300
200
100
0
Double MT
Progress
Zero MT
Double Cropped Land
Full Season Soybeans
Grain with Manure
Grain without Manure
Leguminous Hay
Managed Hay
Managed Pasture
Other Agronomic Crops
Other Hay
Pasture
Silage with Manure
Silage without Manure
Small Grains and Grains
Specialty Crop High
Specialty Crop Low
Land Use
NitrogenNeed
InOrganicEligibleCropNeedacre
OrganicEligibleCropNeedacre
PANNutrientSourceacre
PlAfertilizerlbsacre
PlAmanurelbsacre
PlAbiosolidlbsacre

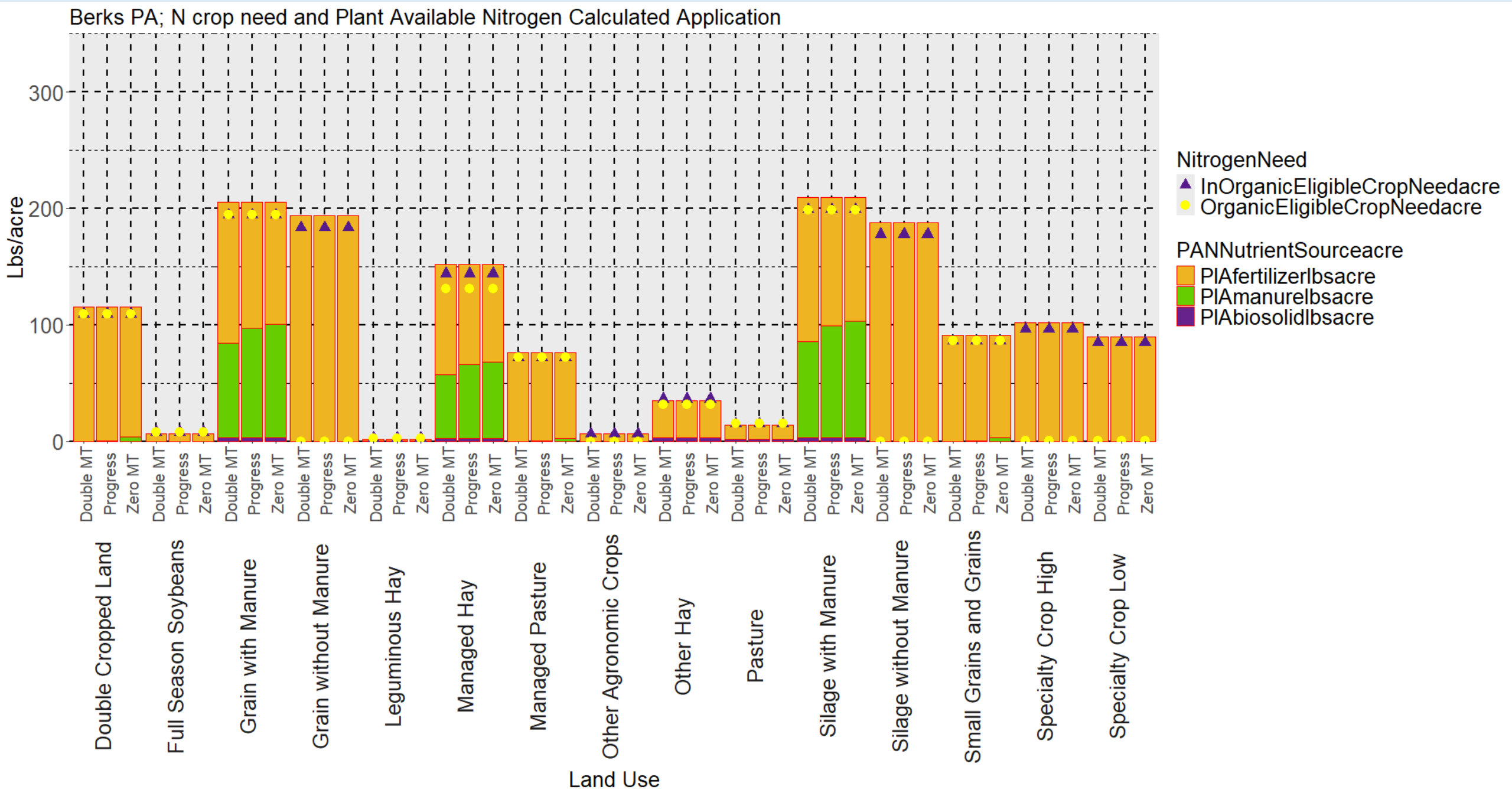

Sussex DE; N crop need and Plant Available Nitrogen Calculated Application
Lbs/acre
300
200
100
0
Double MT
Progress
Zero MT
Double Cropped Land
Full Season Soybeans
Grain with Manure
Grain without Manure
Leguminous Hay
Managed Hay
Managed Pasture
Other Agronomic Crops
Other Hay
Pasture
Silage with Manure
Silage without Manure
Small Grains and Grains
Specialty Crop High
Specialty Crop Low
Land Use
NitrogenNeed
InOrganicEligibleCropNeedacre
OrganicEligibleCropNeedacre
PANNutrientSourceacre
PlAfertilizerlbsacre
PlAmanurelbsacre
PlAbiosolidlbsacre

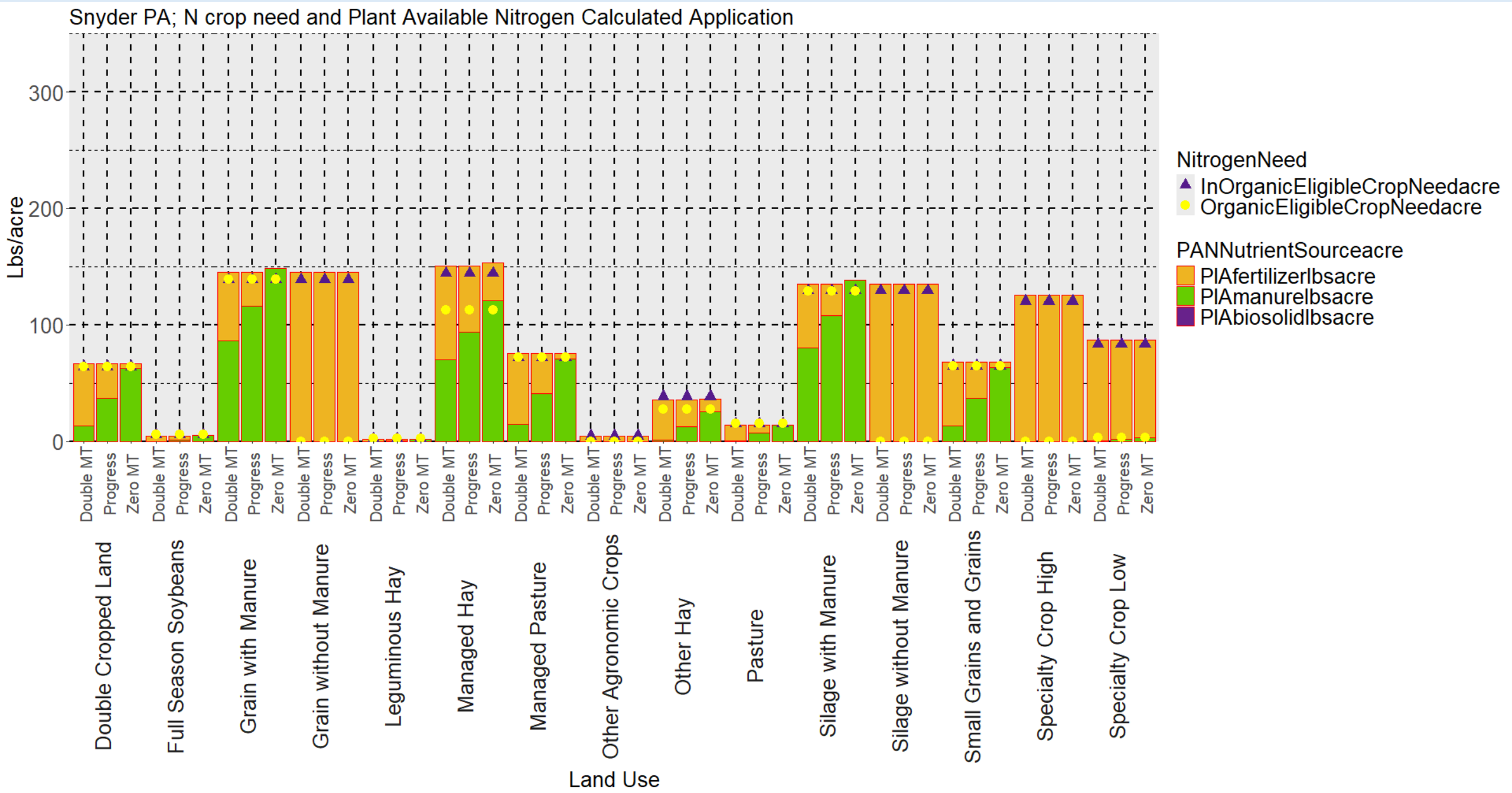

Queen annes MD; N crop need and Plant Available Nitrogen Calculated Application
Lbs/acre
300
200
100
0
Double MT
Progress
Zero MT
Double Cropped Land
Full Season Soybeans
Grain with Manure
Grain without Manure
Leguminous Hay
Managed Hay
Managed Pasture
Other Agronomic Crops
Other Hay
Pasture
Silage with Manure
Silage without Manure
Small Grains and Grains
Specialty Crop High
Specialty Crop Low
Land Use
NitrogenNeed
InOrganicEligibleCropNeedacre
OrganicEligibleCropNeedacre
PANNutrientSourceacre
PlAfertilizerlbsacre
PlAmanurelbsacre
PlAbiosolidlbsacre

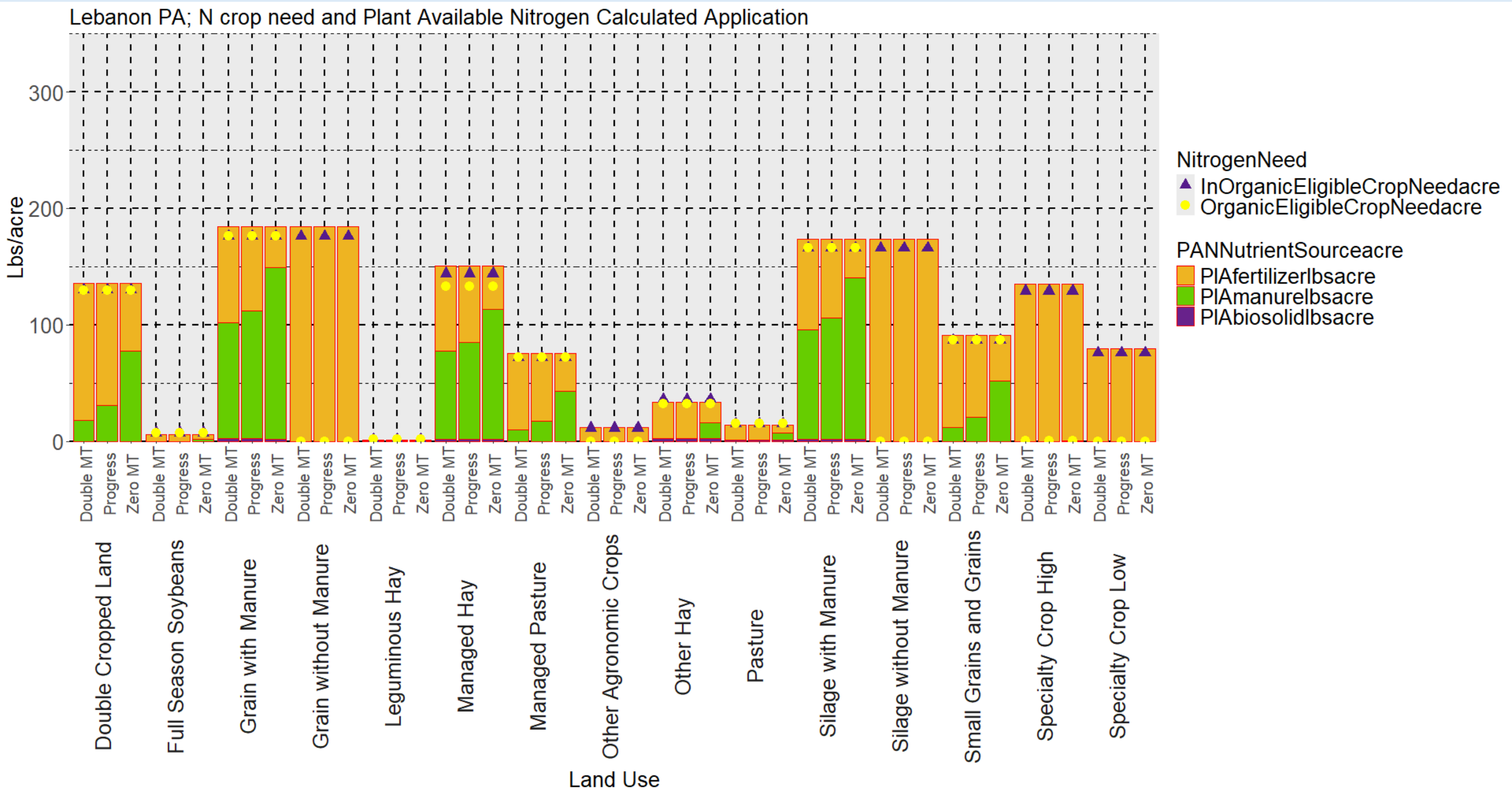

Sommerset MD; N crop need and Plant Available Nitrogen Calculated Application
Lbs/acre
300
200
100
0
Double MT
Progress
Zero MT
Double Cropped Land
Full Season Soybeans
Grain with Manure
Grain without Manure
Managed Hay
Managed Pasture
Other Agronomic Crops
Other Hay
Pasture
Small Grains and Grains
Specialty Crop High
Specialty Crop Low
Land Use
NitrogenNeed
InOrganicEligibleCropNeedacre
OrganicEligibleCropNeedacre
PANNutrientSourceacre
PlAfertilizerlbsacre
PlAmanurelbsacre
PlAbiosolidlbsacre

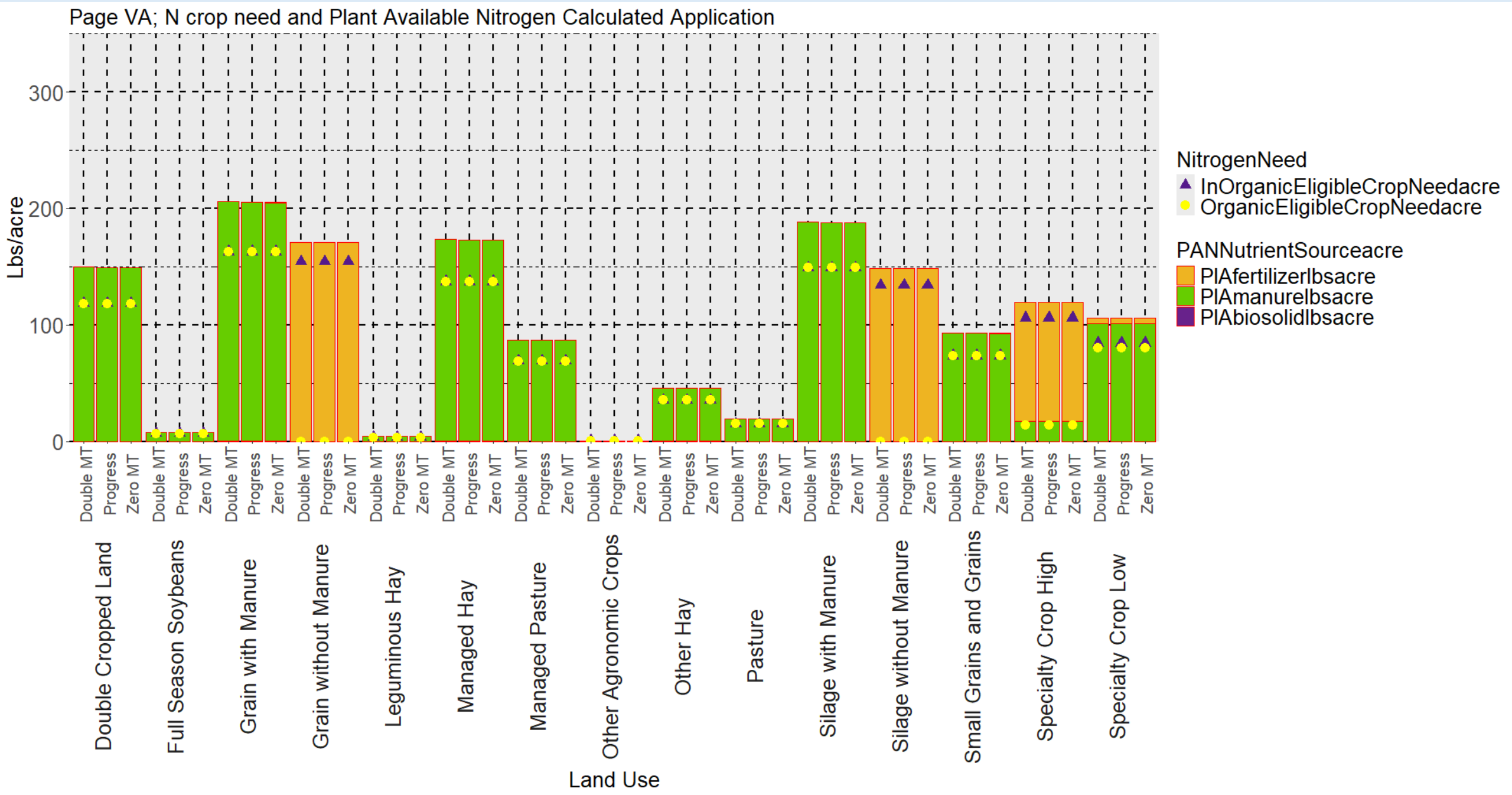

Frederick MD; N crop need and Plant Available Nitrogen Calculated Application
Lbs/acre
300
200
100
0
Double MT
Progress
Zero MT
Double Cropped Land
Full Season Soybeans
Grain with Manure
Grain without Manure
Leguminous Hay
Managed Hay
Managed Pasture
Other Agronomic Crops
Other Hay
Pasture
Silage with Manure
Silage without Manure
Small Grains and Grains
Specialty Crop High
Specialty Crop Low
Land Use
NitrogenNeed
InOrganicEligibleCropNeedacre
OrganicEligibleCropNeedacre
PANNutrientSourceacre
PlAfertilizerlbsacre
PlAmanurelbsacre
PlAbiosolidlbsacre

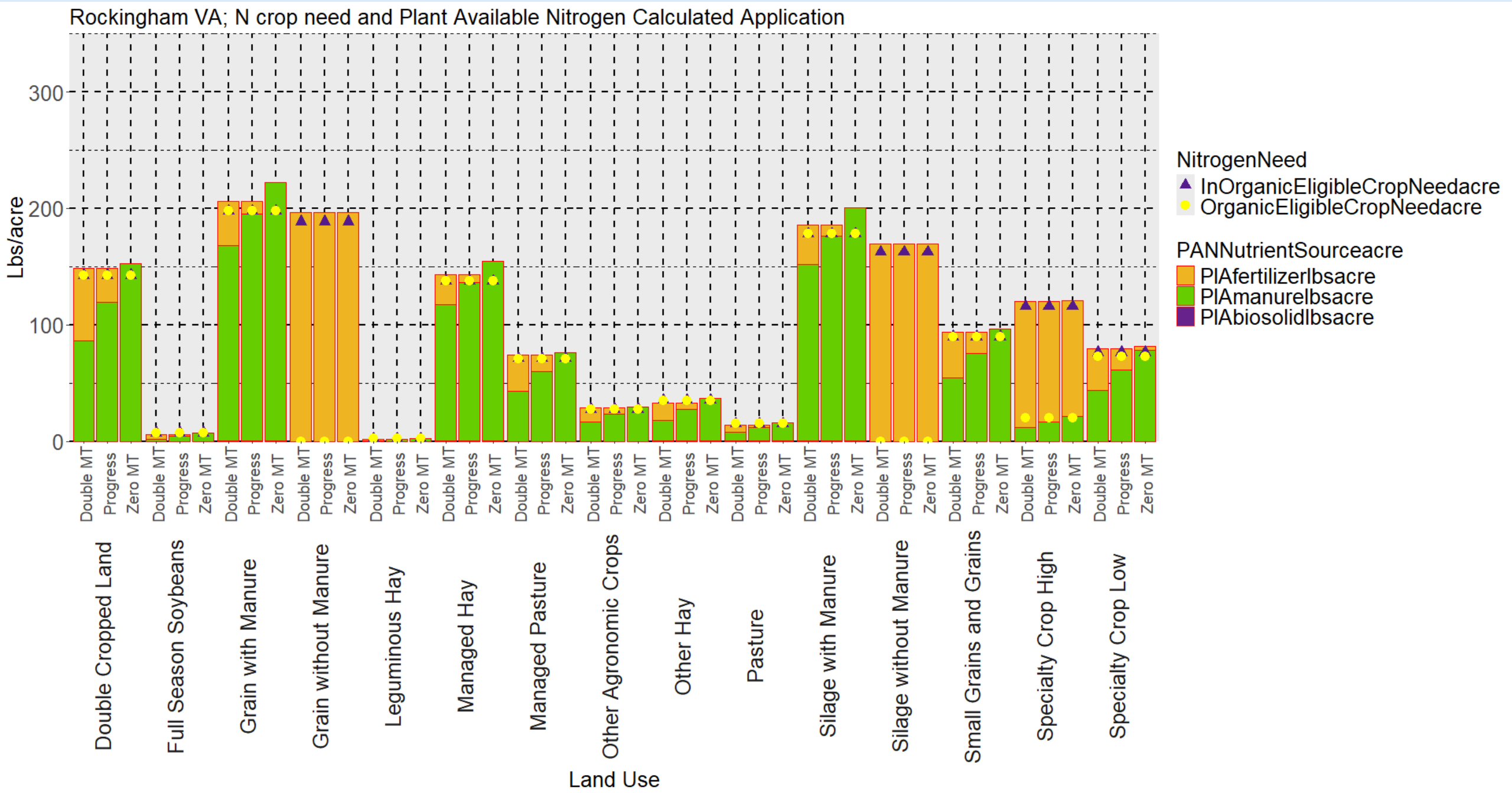

Steuben NY; N crop need and Plant Available Nitrogen Calculated Application
Lbs/acre
300
200
100
0
Double MT
Progress
Zero MT
Double Cropped Land
Full Season Soybeans
Grain with Manure
Grain without Manure
Leguminous Hay
Managed Hay
Managed Pasture
Other Agronomic Crops
Other Hay
Pasture
Silage with Manure
Silage without Manure
Small Grains and Grains
Specialty Crop High
Specialty Crop Low
Land Use
NitrogenNeed
InOrganicEligibleCropNeedacre
OrganicEligibleCropNeedacre
PANNutrientSourceacre
PlAfertilizerlbsacre
PlAmanurelbsacre
PlAbiosolidlbsacre

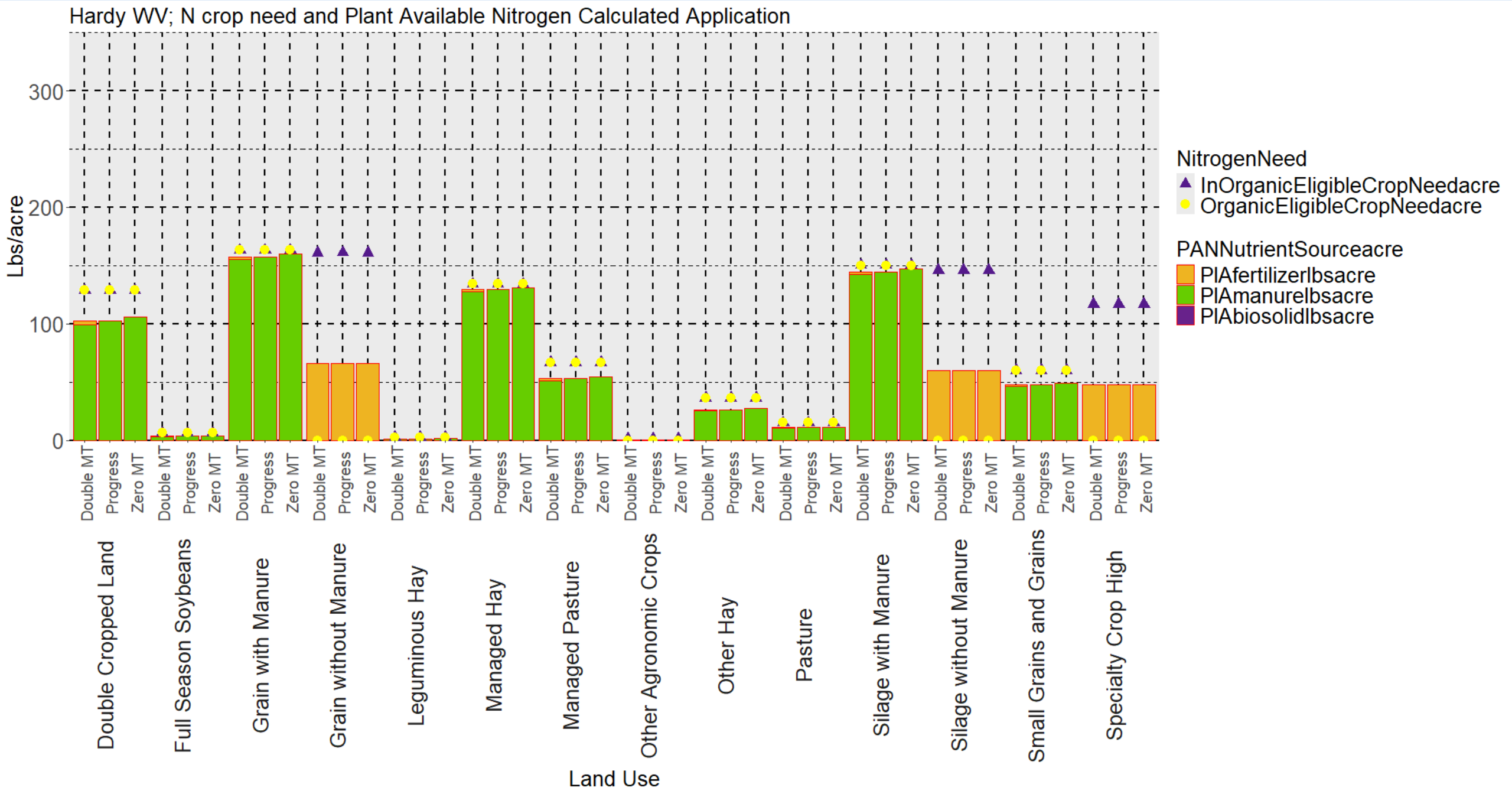

Berks PA; N crop need and Plant Available Nitrogen Calculated Application
Lbs/acre
300
200
100
0
Double MT
Progress
Zero MT
Double Cropped Land
Full Season Soybeans
Grain with Manure
Grain without Manure
Leguminous Hay
Managed Hay
Managed Pasture
Other Agronomic Crops
Other Hay
Pasture
Silage with Manure
Silage without Manure
Small Grains and Grains
Specialty Crop High
Specialty Crop Low
Land Use
NitrogenNeed
InOrganicEligibleCropNeedacre
OrganicEligibleCropNeedacre
PANNutrientSourceacre
PlAfertilizerlbsacre
PlAmanurelbsacre
PlAbiosolidlbsacre

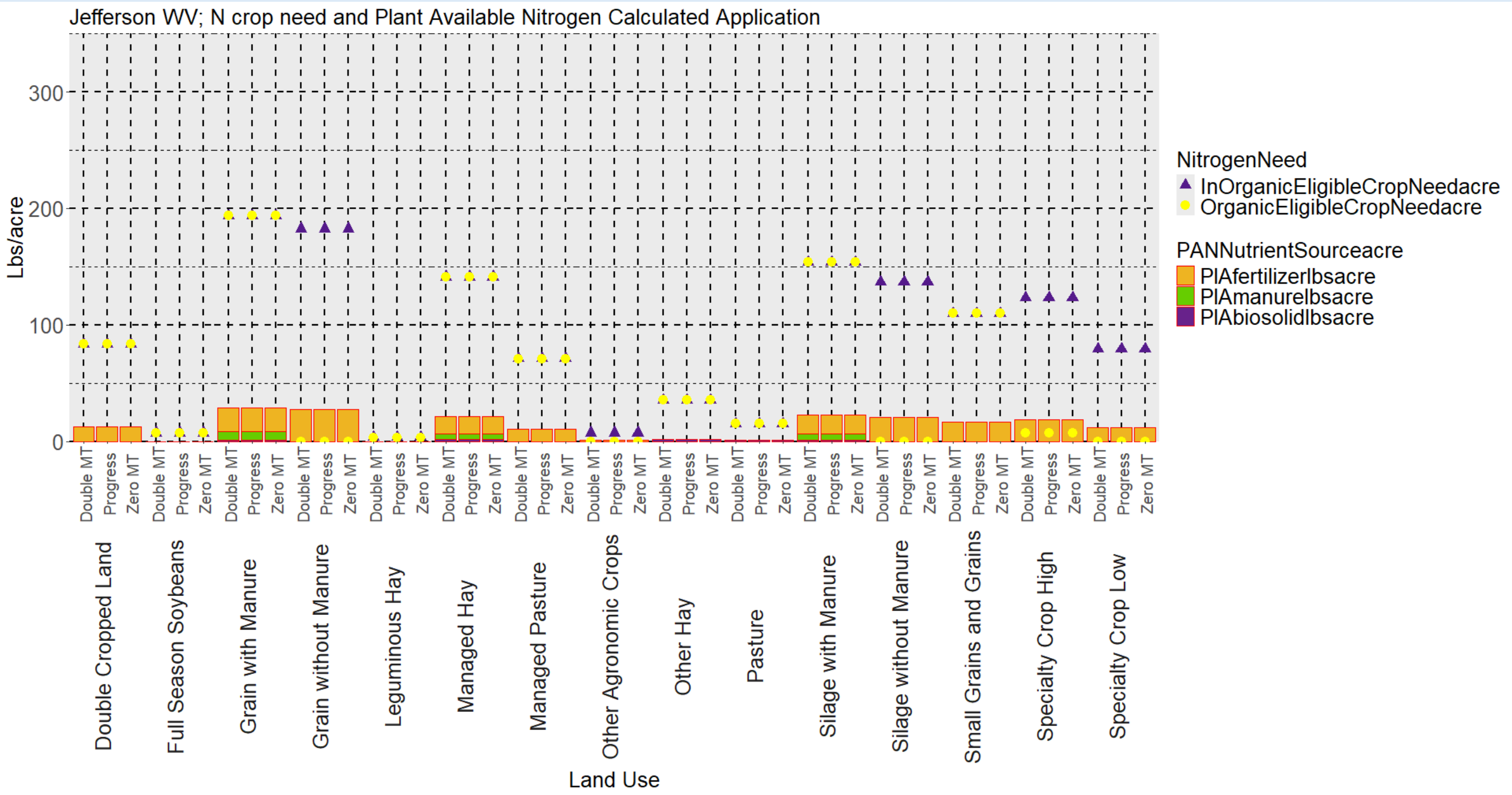

Snyder PA; N crop need and Plant Available Nitrogen Calculated Application
Lbs/acre
300
200
100
0
Double MT
Progress
Zero MT
Double Cropped Land
Full Season Soybeans
Grain with Manure
Grain without Manure
Leguminous Hay
Managed Hay
Managed Pasture
Other Agronomic Crops
Other Hay
Pasture
Silage with Manure
Silage without Manure
Small Grains and Grains
Specialty Crop High
Specialty Crop Low
Land Use
NitrogenNeed
InOrganicEligibleCropNeedacre
OrganicEligibleCropNeedacre
PANNutrientSourceacre
PlAfertilizerlbsacre
PlAmanurelbsacre
PlAbiosolidlbsacre


Lebanon PA; N crop need and Plant Available Nitrogen Calculated Application
Lbs/acre
300
200
100
0
Double MT
Progress
Zero MT
Double Cropped Land
Full Season Soybeans
Grain with Manure
Grain without Manure
Leguminous Hay
Managed Hay
Managed Pasture
Other Agronomic Crops
Other Hay
Pasture
Silage with Manure
Silage without Manure
Small Grains and Grains
Specialty Crop High
Specialty Crop Low
Land Use
NitrogenNeed
InOrganicEligibleCropNeedacre
OrganicEligibleCropNeedacre
PANNutrientSourceacre
PlAfertilizerlbsacre
PlAmanurelbsacre
PlAbiosolidlbsacre


Page VA; N crop need and Plant Available Nitrogen Calculated Application
Lbs/acre
300
200
100
0
Double MT
Progress
Zero MT
Double Cropped Land
Full Season Soybeans
Grain with Manure
Grain without Manure
Leguminous Hay
Managed Hay
Managed Pasture
Other Agronomic Crops
Other Hay
Pasture
Silage with Manure
Silage without Manure
Small Grains and Grains
Specialty Crop High
Specialty Crop Low
Land Use
NitrogenNeed
InOrganicEligibleCropNeedacre
OrganicEligibleCropNeedacre
PANNutrientSourceacre
PlAfertilizerlbsacre
PlAmanurelbsacre
PlAbiosolidlbsacre


Rockingham VA; N crop need and Plant Available Nitrogen Calculated Application
Lbs/acre
300
200
100
0
Double MT
Progress
Zero MT
Double Cropped Land
Full Season Soybeans
Grain with Manure
Grain without Manure
Leguminous Hay
Managed Hay
Managed Pasture
Other Agronomic Crops
Other Hay
Pasture
Silage with Manure
Silage without Manure
Small Grains and Grains
Specialty Crop High
Specialty Crop Low
Land Use
NitrogenNeed
InOrganicEligibleCropNeedacre
OrganicEligibleCropNeedacre
PANNutrientSourceacre
PlAfertilizerlbsacre
PlAmanurelbsacre
PlAbiosolidlbsacre


Hardy WV; N crop need and Plant Available Nitrogen Calculated Application
Lbs/acre
300
200
100
0
Double MT
Progress
Zero MT
Double Cropped Land
Full Season Soybeans
Grain with Manure
Grain without Manure
Leguminous Hay
Managed Hay
Managed Pasture
Other Agronomic Crops
Other Hay
Pasture
Silage with Manure
Silage without Manure
Small Grains and Grains
Specialty Crop High
Land Use
NitrogenNeed
InOrganicEligibleCropNeedacre
OrganicEligibleCropNeedacre
PANNutrientSourceacre
PlAfertilizerlbsacre
PlAmanurelbsacre
PlAbiosolidlbsacre


Jefferson WV; N crop need and Plant Available Nitrogen Calculated Application
Lbs/acre
300
200
100
0
Double MT
Progress
Zero MT
Double Cropped Land
Full Season Soybeans
Grain with Manure
Grain without Manure
Leguminous Hay
Managed Hay
Managed Pasture
Other Agronomic Crops
Other Hay
Pasture
Silage with Manure
Silage without Manure
Small Grains and Grains
Specialty Crop High
Specialty Crop Low
Land Use
NitrogenNeed
InOrganicEligibleCropNeedacre
OrganicEligibleCropNeedacre
PANNutrientSourceacre
PlAfertilizerlbsacre
PlAmanurelbsacre
PlAbiosolidlbsacre

Circling back to applications vs crop need

If value exceeds 1 then a state applies MORE N than the crop application goal suggests it should receive

Jurisdiction	Percent of N applied relative to crop need	Percent of N applied relative to crop need (application goal)	Number of counties that have at least one crop over 100%	Number of counties that have at least one crop over 120%
DE	1.37	+37%	3	3
MD	0.72	-28%	2	1
NY	0.55	-45%	0	0
PA	1.04	+4%	42	0
VA	1.08	+8%	61	2
WV	0.21	-79%	0	0

Kent County DE

County Name	State	Load Source	Acres	Crop Need	Organic Eligible Crop Need	BiosolidLbsApplied	ManureLbsApplied	FertilizerLbsApplied	Plant Available Lbs Applied/Crop Need
Kent	DE	Silage without Manure		3413		0	0	4706	1.378846
Kent	DE	Leguminous Hay	992	2992	2992	0	0	4125	1.378676
Kent	DE	Silage with Manure	116	21555	21555	233	13887	15597	1.378659
Kent	DE	Pasture	4913	73695	27554	0	650	100950	1.378655
Kent	DE	Specialty Crop Low	2737	204647	180031	0	47302	234834	1.378647
Kent	DE	Specialty Crop High	1832	257884		0	0	355531	1.378647
Kent	DE	Other Hay	2504	98641	96164	10403	2269	123319	1.378646
Kent	DE	Full Season Soybeans	36498	265211	265211	2869	0	362763	1.378646
Kent	DE	Grain with Manure	24338	5167554	5167554	28038	3329204	3766978	1.378645
Kent	DE	Grain without Manure	25785	5177524		0	0	7137964	1.378644
Kent	DE	Double Cropped Land	21572	2345933	2332717	711	660854	2572642	1.378644
Kent	DE	Other Agronomic Crops	9524	901202	93127	0	24468	1217968	1.378643
Kent	DE	Small Grains and Grains	5370	596627	596627	173	169023	653339	1.378642
Kent	DE	Managed Pasture	546	39304	14696	0	4163	50023	1.378638
Kent	DE	Managed Hay	835	120190	116792	2527	75243	87928	1.378634

New Castle, DE

County Name	State	Load Source	Acres	Crop Need	Organic Eligible Crop Need	BiosolidLbsApplied	ManureLbsApplied	FertilizerLbsApplied	Plant Available Lbs Applied/Crop Need
New Castle	DE	Leguminous Hay	249	773	773	0	0	1174	1.518758
New Castle	DE	Silage with Manure	203	33851	33851	17	5728	45650	1.518271
New Castle	DE	Small Grains and Grains	1845	212364	212364	3	0	322423	1.518271
New Castle	DE	Grain without Manure	14381	2839089		0	0	4310504	1.51827
New Castle	DE	Double Cropped Land	9387	1049638	1038548	15	0	1593619	1.51827
New Castle	DE	Other Hay	2381	83418	82174	423	0	126228	1.518269
New Castle	DE	Managed Hay	794	114267	112561	116	19046	154326	1.518269
New Castle	DE	Grain with Manure	2587	545337	545337	140	92277	735551	1.518269
New Castle	DE	Pasture	2016	30245	11904	0	0	45920	1.518267
New Castle	DE	Other Agronomic Crops	1998	40078	27942	0	0	60849	1.518264
New Castle	DE	Full Season Soybeans	11779	83792	83792	43	0	127175	1.518259
New Castle	DE	Specialty Crop High	544	64763		0	0	98327	1.518259
New Castle	DE	Managed Pasture	224	16131	6349	0	0	24491	1.518257
New Castle	DE	Silage without Manure	36	5260		0	0	7986	1.518251
New Castle	DE	Specialty Crop Low	94	8186	240	0	0	12428	1.518202

Sussex, DE

County Name	State	Load Source	Acres	Crop Need	Organic Eligible Crop Need	BiosolidLbsApplied	ManureLbsApplied	FertilizerLbsApplied	Plant Available Lbs Applied/Crop Need
Sussex	DE	Silage without Manure	54	6144		0	0	8232	1.339844
Sussex	DE	Silage with Manure	307	37931	37931	85	27947	22789	1.339828
Sussex	DE	Managed Hay	857	123364	119984	515	88402	76367	1.339807
Sussex	DE	Specialty Crop High	4043	520244		0	0	697026	1.339806
Sussex	DE	Specialty Crop Low	9479	748595	712864	0	291540	711432	1.339806
Sussex	DE	Double Cropped Land	24580	2402226	2392581	145	988245	2230125	1.339805
Sussex	DE	Grain without Manure	51434	10245710		0	0	13727253	1.339805
Sussex	DE	Grain with Manure	50749	10563415	10563415	11347	7782891	6358676	1.339805
Sussex	DE	Other Hay	2570	107962	105497	2263	27502	114883	1.339805
Sussex	DE	Other Agronomic Crops	10188	814683	129282	0	52872	1038644	1.339805
Sussex	DE	Small Grains and Grains	5531	541927	541927	31	223840	502205	1.339804
Sussex	DE	Full Season Soybeans	38035	259148	259148	556	0	346651	1.339802
Sussex	DE	Pasture	2800	41996	9485	0	2473	53793	1.339794
Sussex	DE	Managed Pasture	311	22398	5059	0	2089	27919	1.339762
Sussex	DE	Leguminous Hay	1553	3854	3854	0	0	5163	1.339647

Calvert, MD

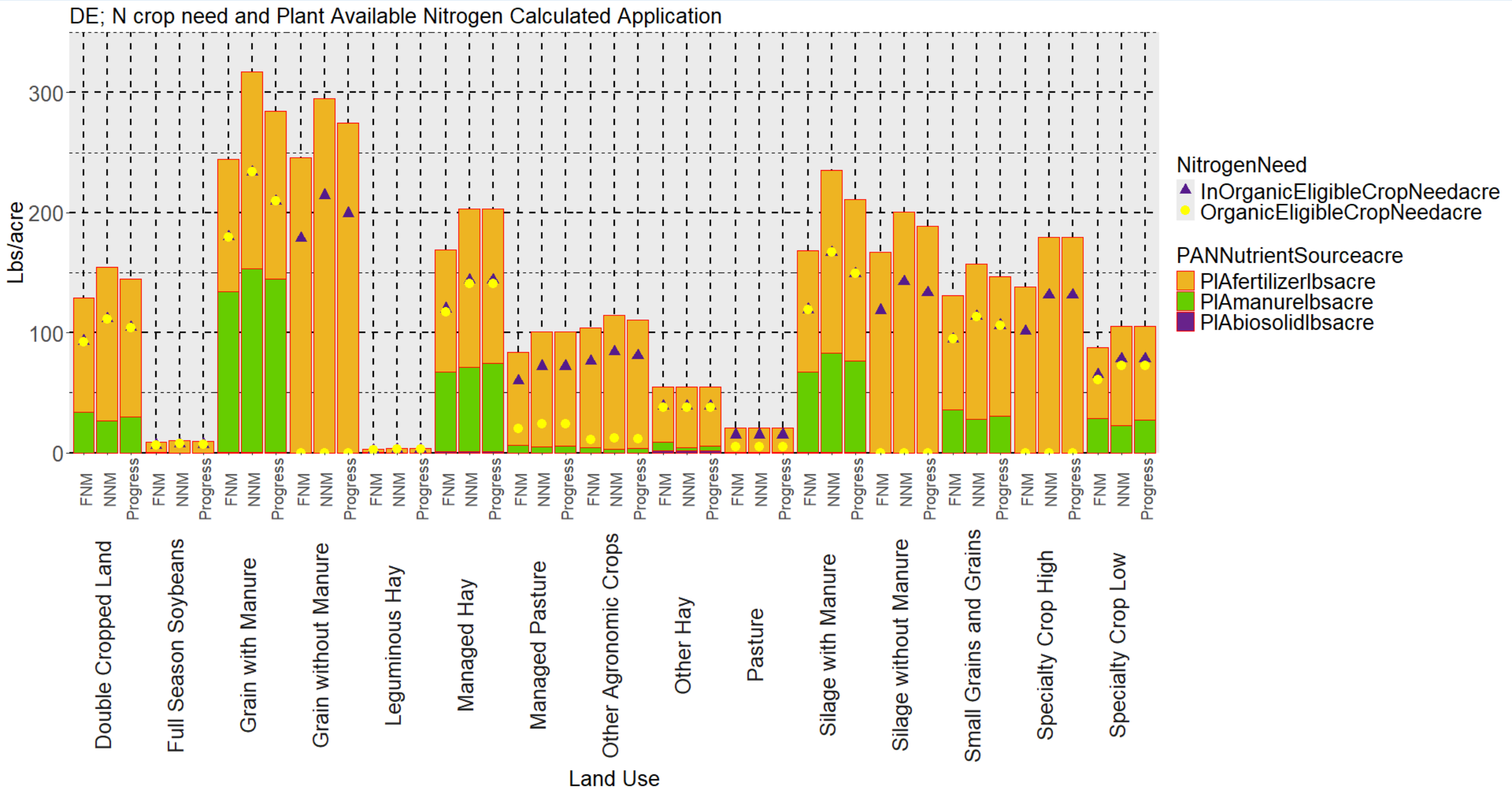
County Name	State	Load Source	Acres	Crop Need	Organic Eligible Crop Need	BiosolidLbs Applied	ManureLbs Applied	FertilizerLbs Applied	Plant Available Lbs Applied/Crop Need
Calvert	MD	Leguminous Hay	121	198	198	309	0	0	1.560606
Calvert	MD	Other Hay	1545	58486	58486	91198	0	0	1.559313
Calvert	MD	Pasture	1959	29387	29387	45823	0	0	1.559295

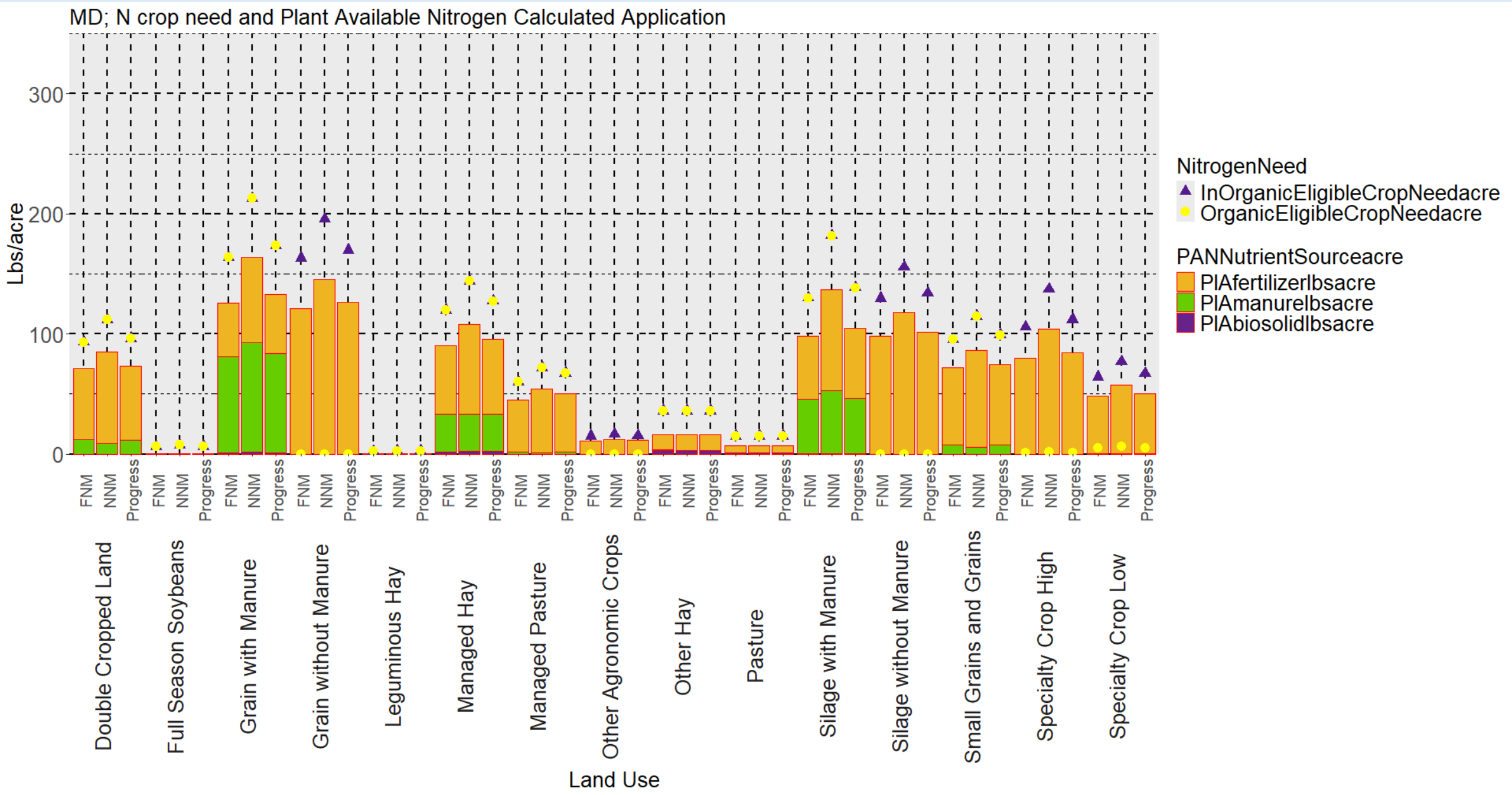
Fairfax and Page, VA

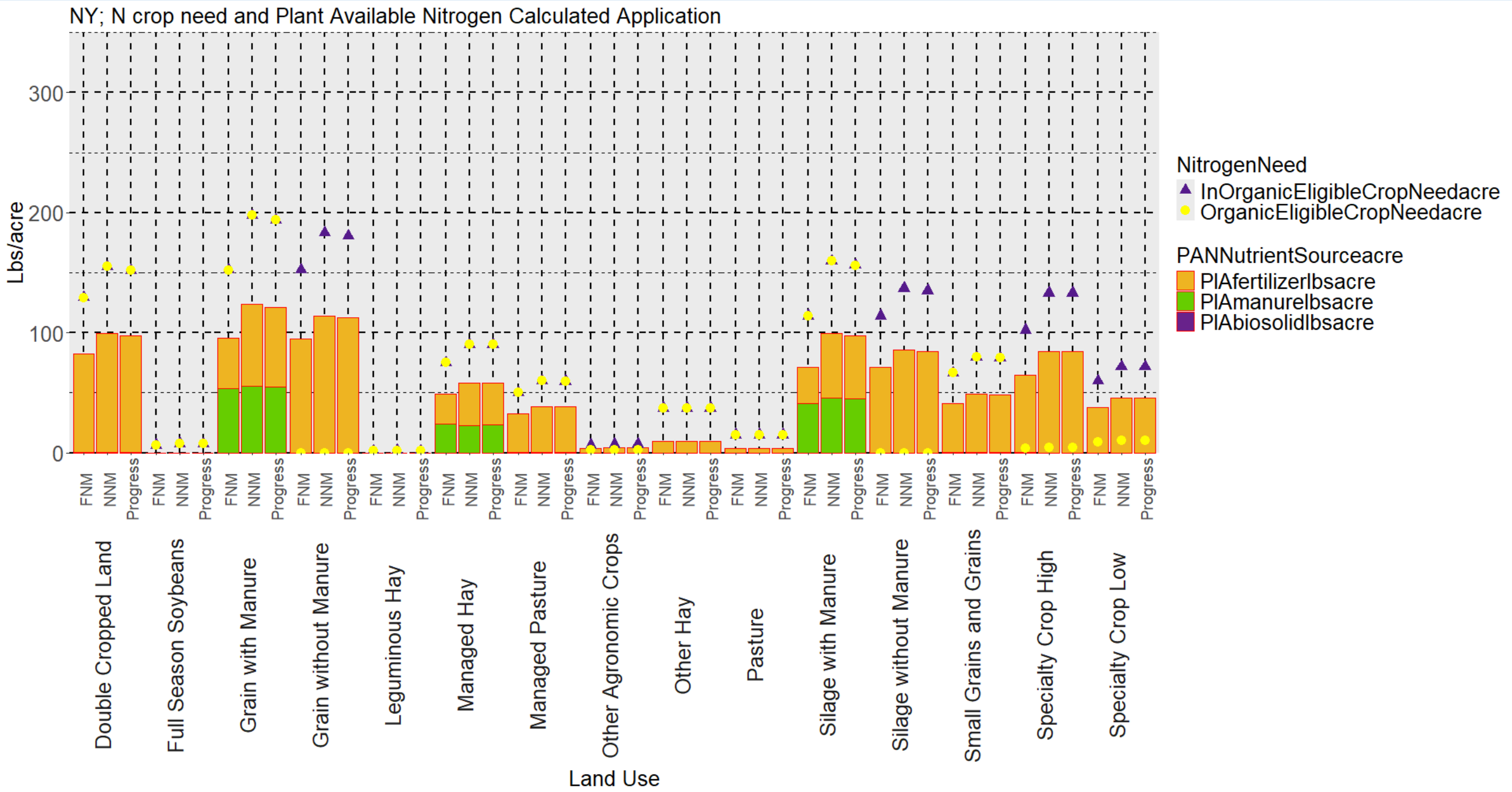
County Name	State	Load Source	Acres	Crop Need	Organic Eligible Crop Need	BiosolidLbs Applied	ManureLbs Applied	FertilizerLbs Applied	Plant Available Lbs Applied/Crop Need
Fairfax	VA	Other Hay	7	240	240	0	632	0	2.633333
Fairfax	VA	Pasture	69	1041	1041	0	2737	0	2.629203
Fairfax	VA	Small Grains and Grains	1	95	95	0	204	0	2.147368
Fairfax	VA	Managed Pasture	8	555	555	0	1190	0	2.144144
Fairfax	VA	Managed Hay	2	323	323	0	691	0	2.139319
Fairfax	VA	Specialty Crop Low	6	461	455	0	976	7	2.132321
Page	VA	Other Hay	8728	307954	307954	1321	397325	0	1.294499
Page	VA	Pasture	19087	286307	286307	1228	369395	0	1.294495
Page	VA	Small Grains and Grains	502	36958	36958	2	46656	0	1.26246
Page	VA	Managed Hay	2909	399113	399113	342	503518	0	1.262449
Page	VA	Managed Pasture	2121	146288	146288	6	184675	0	1.262448
Page	VA	Double Cropped Land	564	66776	66776	2	84298	0	1.26243
Page	VA	Grain with Manure	1929	313940	313940	202	396064	0	1.262235
Page	VA	Silage with Manure	831	123793	123793	53	156177	0	1.262026
Page	VA	Other Agronomic Crops	1481	550	550	0	694	0	1.261818
Page	VA	Specialty Crop Low	197	16606	15792	0	19923	901	1.254005
Page	VA	Full Season Soybeans	578	3883	3883	2	4714	0	1.214525
Page	VA	Leguminous Hay	1942	6728	6728	29	8141	0	1.214328

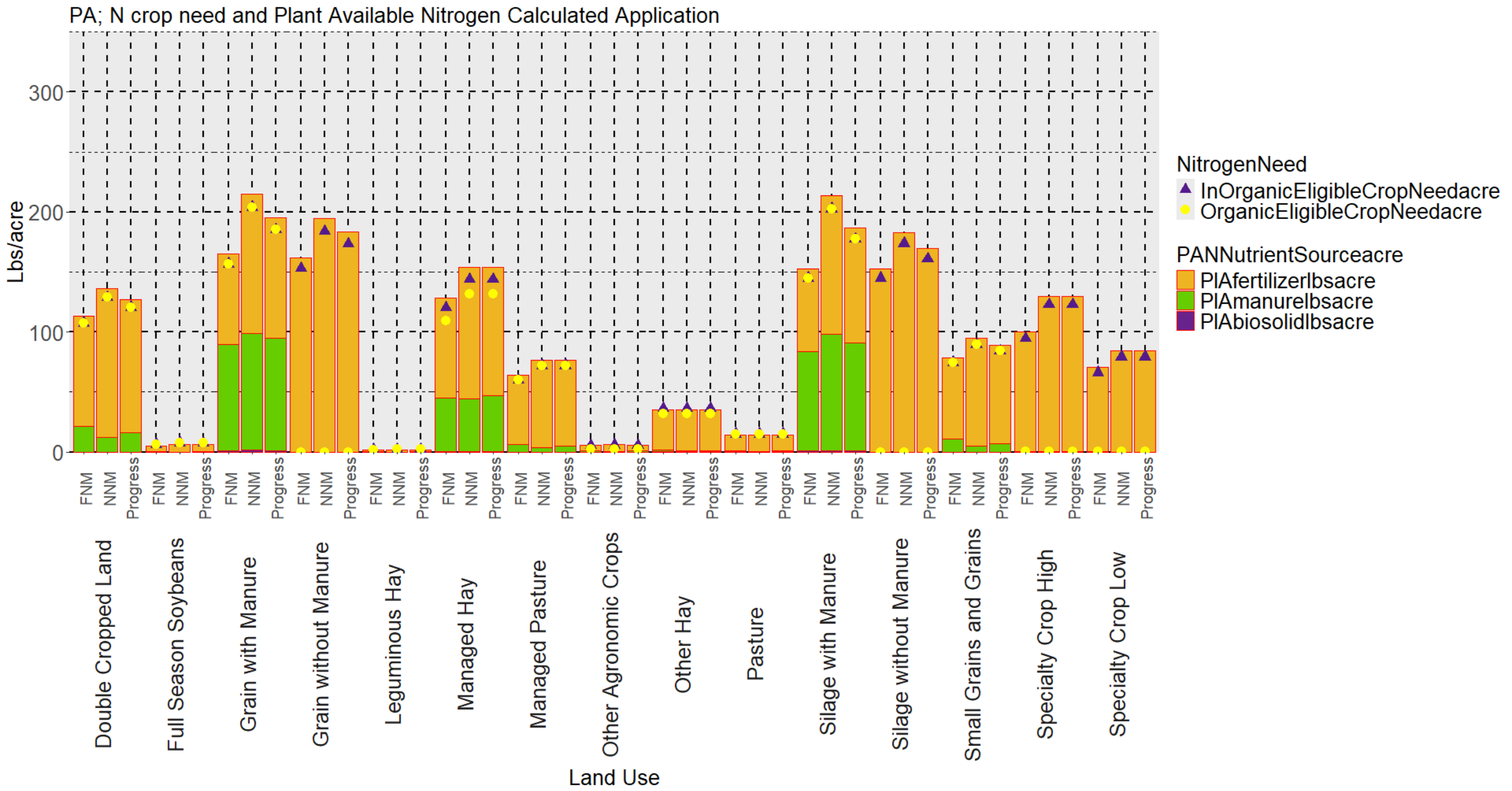
How do we improve this functioning?

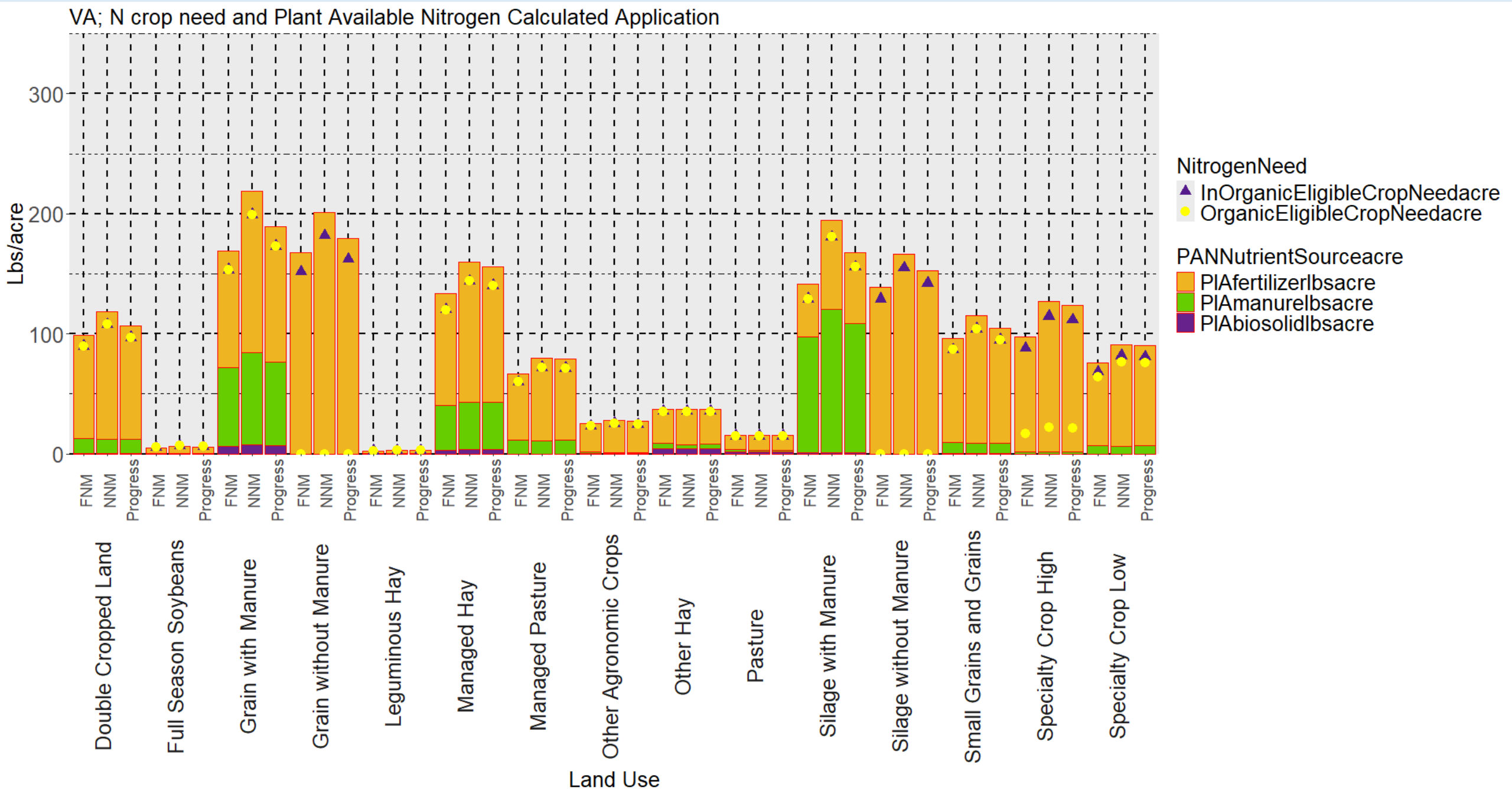
- A quick dive in Nutrient Management
  - Implementation draws down overall applications

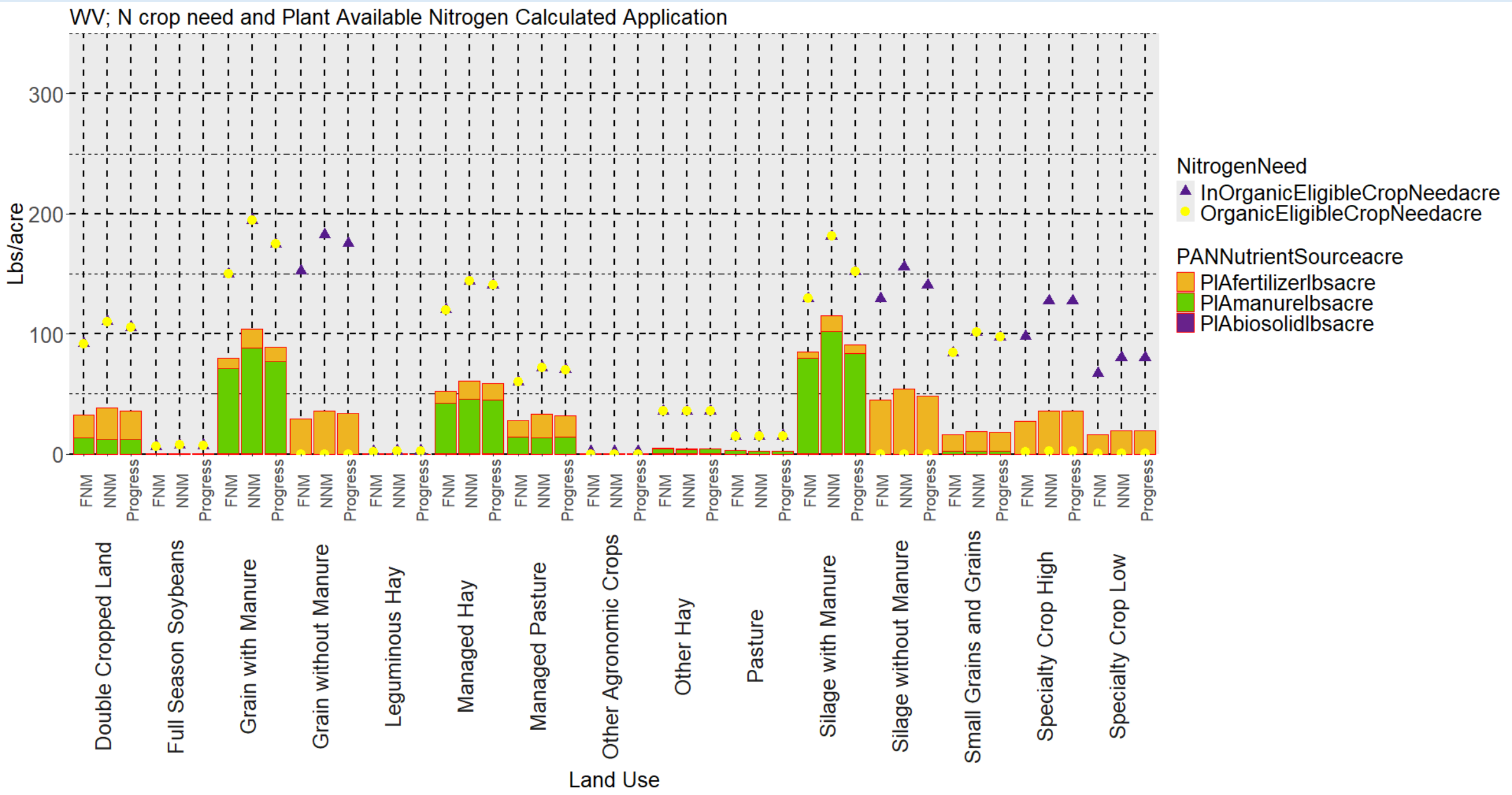

DE; N crop need and Plant Available Nitrogen Calculated Application
Lbs/acre
300
200
100
0
FNM
NNM
Progress
Double Cropped Land
Full Season Soybeans
Grain with Manure
Grain without Manure
Leguminous Hay
Managed Hay
Managed Pasture
Other Agronomic Crops
Other Hay
Pasture
Silage with Manure
Silage without Manure
Small Grains and Grains
Specialty Crop High
Specialty Crop Low
Land Use
NitrogenNeed
InOrganicEligibleCropNeedacre
OrganicEligibleCropNeedacre
PANNutrientSourceacre
PlAfertilizerlbsacre
PlAmanurelbsacre
PlAbiosolidlbsacre


MD; N crop need and Plant Available Nitrogen Calculated Application
Lbs/acre
300
200
100
0
FNM
NNM
Progress
Double Cropped Land
Full Season Soybeans
Grain with Manure
Grain without Manure
Leguminous Hay
Managed Hay
Managed Pasture
Other Agronomic Crops
Other Hay
Pasture
Silage with Manure
Silage without Manure
Small Grains and Grains
Specialty Crop High
Specialty Crop Low
Land Use
NitrogenNeed
InOrganicEligibleCropNeedacre
OrganicEligibleCropNeedacre
PANNutrientSourceacre
PlAfertilizerlbsacre
PlAmanurelbsacre
PlAbiosolidlbsacre


NY; N crop need and Plant Available Nitrogen Calculated Application
Lbs/acre
300
200
100
0
FNM
NNM
Progress
Double Cropped Land
Full Season Soybeans
Grain with Manure
Grain without Manure
Leguminous Hay
Managed Hay
Managed Pasture
Other Agronomic Crops
Other Hay
Pasture
Silage with Manure
Silage without Manure
Small Grains and Grains
Specialty Crop High
Specialty Crop Low
Land Use
NitrogenNeed
InOrganicEligibleCropNeedacre
OrganicEligibleCropNeedacre
PANNutrientSourceacre
PlAfertilizerlbsacre
PlAmanurelbsacre
PlAbiosolidlbsacre


PA; N crop need and Plant Available Nitrogen Calculated Application
Lbs/acre
300
200
100
0
FNM
NNM
Progress
Double Cropped Land
Full Season Soybeans
Grain with Manure
Grain without Manure
Leguminous Hay
Managed Hay
Managed Pasture
Other Agronomic Crops
Other Hay
Pasture
Silage with Manure
Silage without Manure
Small Grains and Grains
Specialty Crop High
Specialty Crop Low
Land Use
NitrogenNeed
InOrganicEligibleCropNeedacre
OrganicEligibleCropNeedacre
PANNutrientSourceacre
PlAfertilizerlbsacre
PlAmanurelbsacre
PlAbiosolidlbsacre


VA; N crop need and Plant Available Nitrogen Calculated Application
Lbs/acre
300
200
100
0
FNM
NNM
Progress
Double Cropped Land
Full Season Soybeans
Grain with Manure
Grain without Manure
Leguminous Hay
Managed Hay
Managed Pasture
Other Agronomic Crops
Other Hay
Pasture
Silage with Manure
Silage without Manure
Small Grains and Grains
Specialty Crop High
Specialty Crop Low
Land Use
NitrogenNeed
InOrganicEligibleCropNeedacre
OrganicEligibleCropNeedacre
PANNutrientSourceacre
PlAfertilizerlbsacre
PlAmanurelbsacre
PlAbiosolidlbsacre


WV; N crop need and Plant Available Nitrogen Calculated Application
Lbs/acre
300
200
100
0
FNM
NNM
Progress
Double Cropped Land
Full Season Soybeans
Grain with Manure
Grain without Manure
Leguminous Hay
Managed Hay
Managed Pasture
Other Agronomic Crops
Other Hay
Pasture
Silage with Manure
Silage without Manure
Small Grains and Grains
Specialty Crop High
Specialty Crop Low
Land Use
NitrogenNeed
InOrganicEligibleCropNeedacre
OrganicEligibleCropNeedacre
PANNutrientSourceacre
PlAfertilizerlbsacre
PlAmanurelbsacre
PlAbiosolidlbsacre

Conclusions

- **Takeaway:**
  - ***NM implementation leads to more realistic N applications***
- Being in large excess (>20% Crop need) is rare
  - 6 counties have crops in large excess
- The model operates differently when NM is put in place
  - Without NM applications are much higher

Questions

Discussion

- Evidence suggests:
  - Differences exist in runoff for organic vs inorganic sources
  - Generally, farmers do not sacrifice yields
- Implications for replacement
  - Inorganic fertilizer runs off more easily
- Nutrient Management serves to mitigate application
- Likely to improve results if MT is combined with NM
- What initial reactions do people have?