MANURE INJECTION/INCORPORATION EXPERT PANEL REPORT

AGRICULTURE WORKGROUP UPDATE

DEC. 15, 2016

Panel Members

Name	Affiliation	Role
Curt Dell	USDA-Agriculture Research Service	Panel Chair
Art Allen	University of Maryland – Eastern Shore	Panel Member
Dan Dostie	USDA-Natural Resources Conservation Service	Panel Member
Robb Meinen	Penn State University	Panel Member
Rory Maguire	Virginia Tech	Panel Member
Chris Brosch	Delaware Department of Agriculture	Watershed Technical Workgroup representative
Jeff Sweeney	CBPO	Modeling Team representative

Technical support provided by Mark Dubin (University of Maryland), Lindsey Gordon (CRC Staffer), and Don Meals (Tetra Tech).

Practice Definitions

- Practices address subsurface placement of manures and other organic nutrient sources (such as biosolids and composts)
- **Injection**: Low disturbance, immediate incorporation, single pass operation, slot closure
- **Incorporation**: Tillage incorporation of broadcast applied manure, incorporation within 24 hr for full ammonia emission reduction credit and 1-3 days for reduced credit, and incorporation within 3 day for N and P runoff reduction credit
  - Low Disturbance: ≥30% residue cover retained
  - High Disturbance: <30% residue cover retained

CONSIDERATIONS

- ONLY N AND P LOSS REDUCTION ADDRESSED. SEDIMENT BEST HANDLED BY CONSERVATION TILLAGE PANEL
- SEPARATE AMMONIA REDUCTION FACTOR
  - DIRECTLY IMPACTS EMISSIONS IN AIRSHED MODEL
  - INDIRECTLY IMPACTS WATERSHED MODEL BY INFLUENCING MANURE N CONTENT AND APPLICATION RATE
- WATER QUALITY BENEFIT ONLY FROM REDUCING RUNOFF N AND P
  - LEACHING LOSSES NOT IMPACTED BY THESE PRACTICE

CONSIDERATIONS

- UPLAND REGIONS (PIEDMONT, RIDGE AND VALLEY, AND ALLEGHANY PLATEAU): ASSUMING 80% OF P LOSSES WITH RUNOFF
- COASTAL PLAIN : ASSUMING 48% OF P LOSSES WITH RUNOFF
    - ASSUMING 60% OF LOSSES WITH RUNOFF ON WELL DRAINED SOILS (TYPICALLY NATURALLY DRAINED) (~75% OF CROPLAND)
    - ASSUMING 10% OF LOSSES WITH RUNOFF ON POORLY DRAINED SOILS (TYPICALLY DITCH OR TILE DRAINED) (~25 OF CROPLAND)
- SINGLE N FACTOR FOR ENTIRE WATERSHED: ASSUMING 25% OF N LOSSES AS RUNOFF

REDUCTION FACTORS FOR UPLAND REGIONS

	Nitrogen			Phosphorus	
Category	Time to incorp.	Ammonia emission reduction	Reduction in N loading	Time to incorp.	Reduction in P loading
Injection	0	85%	12%	0	36%
Low Disturb. Incorp.	≤24 hr 24-72 hr	50% 34%	8% 8%	≤72 hr	24%
High Disturb. Incorp.	≤24 hr 24-72 hr	75% 50%	8% 8%	≤72 hr	0%[1]

[1]12% reduction recommended by NY during public comment period

REDUCTION FACTORS FOR COASTAL PLAIN

	Nitrogen			Phosphorus	
Category	Time to incorp.	Ammonia emission reduction	Reduction in N loading[1]	Time to incorp	Reduction in P loading[2]
Injection	0	85%	12%	0	22%
Low Disturb. Incorp.	≤24 hr 24-72 hr	50% 34%	8% 8%	≤72 hr	14%
High Disturb. Incorp.	≤24 hr 24-72 hr	75% 50%	8% 8%	≤72 hr	14%

RESPONSE TO PUBLIC COMMENTS

General Comments

Ken Staver, UMD: Concern expressed over P reduction credit for reduced tillage in instances where manure is applied and not incorporated.

- Response:

  Incorporation required within 3 days for P reduction credit (immediate incorporation with injection).

RESPONSE TO PUBLIC COMMENTS

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Section 3: Effectiveness Estimates

PA SCC & DEP: Unclear whether efficiencies are comparable to CT panel recommendations.

Response:

1. Low Disturbance Incorporation (MII panel) and Conservation Tillage BMP only categories that correspond for the two panels.
2. Finer regional breakdown by CT panel, but weighted average for HGMs for CT within uplands or Coastal Plain similar to Low Disturbance Incorporation credits
3. MII panel only considered organic nutrient sources
4. May be advisable to allow credit for either CT or Low Disturbance Incorporation because of overlap

RESPONSE TO PUBLIC COMMENTS

Section 3: Effectiveness Estimates

PA SCC & DEP: **PA SCC & DEP:** Is the difference in the ammonia emission reduction efficiencies between High Disturbance and Low Disturbance Incorporation attributed to a higher level of manure incorporation for the high disturbance, thereby increasing the reduction potential of ammonia emissions?

Response: Yes. Less mixing with low disturbance. More manure on surface and susceptible to volitalization

RESPONSE TO PUBLIC COMMENTS

Section 3: Effectiveness Estimates

Jim Cropper, Northeast Pasture Consortium: Recommendation to separate comparisons between manure incorporation/injection and tillage practices. Suggested the manure incorporation BMP should compare efficiency estimates to control settings where "the appropriate tillage is applied well outside the 3-day window chosen" for the manure application rate being applied.

Response: Logical, but would be difficult to modify modeling approach at this stage.

RESPONSE TO PUBLIC COMMENTS

Section 3: Effectiveness Estimates

Jim Cropper, Northeast Pasture Consortium: Concerns raised regarding 0% P efficiency credit for high disturbance incorporation in upland regions. Argued that no-till systems in these areas will generate higher P loading rates, and that this recommendation may discourage high disturbance tillage in these regions.

Response:

1. Nutrient loss reduction credit for no-till systems is only considered by this panel when injection is used.
2. O% credit for P reduction with High Distubance Incorp. recommended because lit values ranged for decrease to no impact to increased losses.
3. Panel was concerned that high disturbance tillage on sloping upland soils would frequently result in increased sediment-bound P losses that would offset reduction in water soluble P losses.
4. Literature limited and not definitive, Best Professional Judge can vary on this issue

RESPONSE TO PUBLIC COMMENTS

Section 3: Effectiveness Estimates

NYS Department of Ag & Markets: Concern over 0% P reduction credit for high disturbance incorporation in upland regions: Recommend 12% reduction in P loading; this value is more conservative than the 14% used with the coastal plain.

Background: For those farmers who use high disturbance tillage as their standard practice, the high till will happen regardless of when manure is applied relative to the tillage event. When such farms shift management to apply manure just before (<72 hrs), their normal high disturbance tillage regimen for the season (i.e., no additional tillage pass for incorporation), there is a P loss reduction relative to applying manure many days/weeks/months before their normal high disturbance tillage because the manure P is incorporated into the soil profile rather than left on the soil surface. This is a common thread in applied research literature on manure P runoff management, including those cited in this report. The current zero value is also in conflict to current and proposed P Index work, where incorporation of manure in a timely manner within a farm's normal tillage approach is credited with P loss risk reduction.

Response: Panel did not have time to convene to discuss the proposal and defers to the workgroup.

RESPONSE TO PUBLIC COMMENTS

Section 5: Application of Practice Estimates

PA SCC & DEP: Page 14 – Ancillary benefits to manure injection and incorporation are stated, however there are no citations. Please cite the research that supports the ancillary benefits, in particular, the benefit of the reduction of the hormone losses, pathogens and emerging contaminants.

1. Citations added for odor reduction and reduced need for supplemental fertilizer application.
2. Indication of reductions in losses of hormones, pathogens, and emerging contaminants was modified to say that those benefits are predicted based on similarity in transport mechanisms compared to N and P.

RESPONSE TO PUBLIC COMMENTS

Section 5: Application of Practice Estimates

NYS Department of Ag & Markets: Regarding applicable land uses, please include Legume Hay, Other Hay, and Pasture land uses. We already have European grassland injectors and similar implements in NYS and expect more in the next 10 years.

Response:

1. Intended to apply to all manure eligible land uses. List has been modified
2. Tillage incorporation practices may only be applicable during pasture/hayland establishment.