

Perspectives on Agricultural Best Management Practice Effectiveness and Verification

Virginia Trading Ratio Panel

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What causes uncertainty in BMP efficiencies?

- Science/knowledge base
- Landscape variability factors
- Climate
- BMP differences
- Implementation (to definition)
- Operation and maintenance (to definition)
- Farm management decisions and/or actions that compromise BMP function
- Allowed “flexibility” and good intentions

Was uncertainty addressed in 2006-2009 BMP Project?

- Only in limited attempt to adjust for differences in knowledge base between BMPs
- Due to wide variability in research results, used median values, rather than means
- For a few practices with limited data tried to estimate values between 1st quartile and median but usually deferred to BPJ
- Two BMP efficiencies adjusted by their panels “ to account for difference between research and application” (Initial values were high so urged to adjust to make them more realistic and consistent with expert recommendations for other BMPs)
- Causes of uncertainty were identified and discussed but only addressed in a limited manner

Uncertainty In Knowledge Base

- Wide variations in amount of research and data for BMPs
- Wide variation in reported efficiencies for the same BMP
- Uncertainty remains for the BMPs with the most data
 - Lot of data but mostly in one hydrologic/geomorphic/soils setting
 - Lot of data but plot or transect rather than watershed or landscape based
 - Recent research indicates lower efficiency than larger body of older work
- As result of above, knowledge base for “most certain” BMPs have substantial uncertainty
- There is even uncertainty in land use change BMPs due to uncertainty in load estimates for former and new land uses.

Different levels of uncertainty for different BMPs

- Knowledge base
- “Self-sustainability” of practice
- Operation, management and maintenance requirements
- Susceptibility to climatic events
- Ease of verification
- Audit/re-verification expectations

Assumptions made when applying BMP efficiencies to reported implementation

- Practice was designed and implemented consistent with CBP definition
- Practice is managed, operated and maintained according to CBP definition
- No change in cropping system, animal numbers or hydro-modification that would affect practice function
- Above continue for life of practice
- There is no assumed uncertainty in performance.

Verification of implementation and ongoing management and O&M to CBP BMP definition is critical

- Much uncertainty cannot be overcome so critical to know that it is implemented and managed, operated and maintained according to CBP definitions and assumptions
- By evaluating potential causes of uncertainty during assessments, can recommend actions that will minimize impacts of identified sources
- Independent verification encourages good management and O&M and improves confidence of purchaser, state and stakeholders that credits are truly offsetting increased nutrient discharges

Uncertainty cannot be an excuse for inaction

- Numerous National Academy of Science and EPA Science Advisory Board panels and SWCS book on topic, all conclude there is adequate knowledge to take action to reduce nutrient pollution
- All also propose an adaptive management approach that uses existing knowledge base and at set intervals updates BMP efficiencies

Frequently used logic in these reports: BMP efficiencies are:

- Directionally correct – Are resulting in improvement in water quality
- Proportionally correct – Order of efficiencies for different BMPs, from high to low, are generally correct
- Magnitudinally correct – Are not grossly wrong

Adaptive management for BMP efficiencies and (un)certainty ratios???

- Recommended by Bay National Academy Panel for BMP efficiencies
- Review and revise definitions and efficiencies at planned intervals (3-5yrs; ts 5-10yrs)
- Can BMPs be grouped into general categories that are given (un)certainty ratios and reviewed when BMP AM reviews occur?

Could we have different ratios for different levels of uncertainty???

- Acknowledge different BMPs have different (un)certainities)
- Use a “KISS” approach with 3-4 categories (“bins”)
- Revise groupings during BMP review periods
- Possible categories (all assume verification):
 - High certainty of efficiency – Monitored discharges or monitored BMPs
 - Moderately high – Most certain –land retirement, buffers
 - Moderate – Reasonable certainty and understand uncertainty factors – covered loafing areas, stream fencing, enhanced NM (reduced application)
 - Low certainty – Limited data and/or uncertain due to uncontrollable factors, annual/management dependent practices
- New practices evaluated for class but assumed Low w/o supporting data to move to higher class





The need for site specific verification in trading

1000 feet

700 feet

- 16A field was split into 20 35ft wide buffers that were each 1,000ft long
- Given credit for treating 385 upslope acres of row crops for N and 192 acres for P
- In coastal plain area with very high grassed buffer efficiencies

Problems:

- Field already had 100-300ft forest and wetland buffer between it and water
- Total field converted to switchgrass so corn “upgradient”
- Even if not existing buffer, would have been grass buffer against hay w/o nutrients crop land use