

Nutrient Management Best Practice Training Workshop Summary

Background

The Global Environment Facility (GEF) and the United Nations Environment Programme (UNEP) project “**Global foundations for reducing nutrient enrichment and oxygen depletion from land based pollution, in support of global nutrient cycle**” held a training work shop regarding the rationale behind and implementation of key nutrient management best practice and associated underlying policy questions. This training session served a “primer” on what, how and why to develop systems of nutrient reduction best practices. Approximately 20 -25 for GEF project managers, ministerial representatives and other experts attended on Sunday October 16, 2011. There was a good dialogue between the participants and the presenter – Dr. Tom Simpson of Water Stewardship, Inc.

Objectives

The objectives of this training session are:

- To build awareness and capacity among ministerial representatives, regional/national policy experts and GEF project managers regarding implementation and adoption of nutrient management best practices; and,
- To receive feedback on the use of policy tool box

Approach

The following provide the key elements the of session approach:

- Central Question: What can be done to achieve success?
- Emphasize: Need to tailor practices and recommendations to a given area through applied research. Requires yield trials and monitoring to improve efficacy of recommendations.
- Audiences: Ministry Officials more interested in policies; Technical Project Managers with science backgrounds – not necessarily related to agriculture, chemistry or water quality
- Topics: Mini-modules on specific nutrient science, sources and practices.
- Start with strategic targeting: Watershed location connecting the dots to highlight high risk settings, high N loading situations and then go into solutions

Perspective for the Discussion

Agricultural production must intensify to meet demand of population growth expected in the coming decades and the more than 1 billion people that face chronic hunger today. This fact will require more fertilizer, particular nitrogen – from organic or inorganic sources. Therefore, proper nutrient management best practices must be scaled-up to ensure the long-term stewardship, conservation and sustainable management of our soil health and water resources.

Key Discussion Points

The following are the key discussion points and issues raised during the session:

- We should consider creating a coordinated network of applied research and outreach centers focused on regional conditions and needs. There is a need for multi-disciplinary expertise to be delivered at such regional centers. Building capacity could be accelerating through regional train-the-trainer opportunities that increase local awareness and capability to implement practices on-the-ground.
- We should target/prioritize programs to highest loading sources and/or risk of delivery based on current knowledge and “politics/country specific policy directions.” How can the GEF IW assist in delivering tools and resources to assist countries and farmers address this issue?
- Small landholders and limited resources farmers (SL-LRF) must consider applying at the “right rate:”
 - What should yield target (goal) be?
 - Maximum economic yield
 - Maximum ROI (ecologically optimum yield?)
 - Incentives for soil testing and incremental increase to maximum ROI for SL-LRF
 - Encourage maximum ROI rather than maximum yield
 - Should soil testing be made available for SL-LRF?
- Programs must incentivize side dressing and/or incorporation of ammonia containing materials and mixing of P fertilizer or manures into soil. Use the amount, timing, placement, and method of application to determine application rate based on soil productivity.
- For SL-LRF, manure application should be based on P, with supplemental N, to avoid P build-up. (and who pays for N?)
- Fall planted annual legumes should be considered an economical N source while allowing manure application based on P:
 - Best choice is manage P at agronomic (crop need) levels
 - *For many small holders/limited resource farmers, getting to agronomic P levels is the challenge*
- Diversified rotations (long-term multi-year rotations) that reduce nutrient loss to water while providing other production benefits should be encouraged. Unfertilized cereal grain cover crops might be promoted as means of “trapping” residual N?
- SL-LRF should focus on getting nutrients at the “Right Rate” for their soils and management level from manures, legumes and residual soil nutrients and then supplement with inorganic fertilizers as needed. The International Plant and Nutrition Institute, local certified crop advisors and extension can offer “trusted” expertise and resources to local SL-LRF but request that they include water quality impacts in their recommendation.
- Appropriate manure management approaches critical for water quality:
 - Collect and store under cover or in “sealed” pond
 - Divert runoff from barnyard/manure storage areas
 - Composting stabilizes manure but lose ammonia

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- Incentives for manure management?
 - Apply manure based on crop recommendations for N or P
- The simple measures for keeping animals out of streams;
 - Fencing (or hardened crossings), remote watering, shade important
 - Incentives for excluding animals from streams?
- Characteristics of riparian buffers to reduce losses include:
 - 10-30M that is needed to provide optimum benefit may be more than most SL-LRF can afford to retire
 - Drains and ditches cannot bypass flow through buffer
 - If demand for biomass for fuel, bedding, etc is high, might be willing to install 10M “coppice” buffer?
 - “Retired” land – Very difficult for small land holders but may be critical to protecting stream area and treating upland area flowing through 10-30 meter riparian zone
- Implementing a whole farm systems approach, which allows many small actions to add up to major nutrient reductions may result in major nutrient loss reductions while minimizing impact on farm – allows most impact on priority areas while looking at whole farm impacts
- Challenges remain for village wastewater treatment:
 - Either simple and not very effective or effective but costly
 - Subsurface disposal of liquid does not address N
 - Well designed and maintained treatment wetlands work but only get partial pathogen and N removal
 - There are climate implications that must be considered.
 - Further work needed in village wastewater treatment. We need collection and pathogen removal before wetland treatment which can reduce nutrient loads
- Aquaculture systems can provide revenue on small areas but generate nutrient rich waste:
 - Opportunity to remove “green water” (highly nutrient rich water) and reuse clean water
 - Use “green water” as valuable fertilizer material
 - In salt water aquaculture, recycle to salt tolerant plant
 - Aquaculture may provide revenue and fertilizer source
 - Be sure aquaculture nutrients are removed for re-use or can become pollutant
 - Expansion opportunities for aquaculture for SL-LRF?

Other Issues and Questions

The following summarizes additional issues and questions discussed:

- Tile drainage systems often eliminate buffer effectiveness, and are a particular issue in the U.S.
 - Response: If a drainage system bypasses a buffer then it is ineffective. If drainage system spreads flow at edge of buffer, then buffer can operate effectively. As stated above, proper operation and maintenance is critical for buffers and many other practices

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- There is a connection between irrigation and drainage of riparian areas. Spray irrigation can be managed to not create run off, while furrow irrigation between the rows is collected and discharged.
 - Agree that spray irrigation SHOULD be done at rates that limit runoff. Furrow irrigation promotes runoff but “flow spreaders” that promote overland flow through adequately wide buffers (30-50M) should allow for reasonable (30-50%, not total) reductions in N, P and sediment
- Prioritize programs to address the highest loading sources where there is a clear risk – what are the “politics of incentives?”
 - Maintain funding towards highest ROI, not maximum yield that only rewards largest landholder, but does not produce maximum ROI for small scale farmer
- Farmers should match inputs to the real management requirements. The focus should be on maximizing the total ecological ROI yield.
- There should be incentives for the various types of nitrogen fertilizer:
 - Inorganic
 - Manure
 - Legumes
- How can you de-phosphorize? It is possible to store-up non-useable resources. It may be better to include row crops and buffers.
 - Use manure in a manner that balances P. We should not apply at N rates. We may want to use legumes to grow N or apply appropriate N to balance what is needed in manure.
- Could trees reduce more phosphorus? This might be actually based on how much biomass you have.
- Do small farmers have the equipment to do a small band P application? There is a major difference in yield.
- Conservation tillage – every five years farmers should mix up soil to move P down in the soil. P is often a key challenge in implementing effective conservation tillage systems. Do farmers follow the 4Rs? They may for large scale intensive operations in developed countries. All farmers should consider the right material at the right rate and right timing, applied using the right method or some version of the 4Rs. However, this is designed more for intensive agriculture and should be used by low input farmers as much as possible to gain efficiency and minimize loss potential. They may not be able to apply all four “Rs” beginning with not having access to the right amount.
- P is a significant issue for conservation tillage. We need to avoid a build-up of soluble P in the first few centimeters. Soil test should help with these issues.
- Is it possible to use less P?
 - Should programs incentivize side dressing?
 - What is the feasibility of anaerobic digesters? Energy savings and nutrient reductions are both challenging.
- Should policies be implemented to incentivize the use of legumes? This grows most the nitrogen. There are soil quality benefits. Is this a quick win opportunity in the IW portfolio?

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- Should we incentivize small storm water collection facilities? They are usually not very cost effective for small towns and villages but need to be looked at system wide
- Copping is an effective practice to put small amounts of land in a buffer that captures runoff. Biomass buffers, including hardwood coppicing, can generate needed biofuels for small landholders while allowing them to “retire” small riparian areas.
- How many acres of constructed wetlands do you need per person? Residence time in the wetland is important to ensure treatment effectiveness.
- Aquaculture use of "green water" does not take a lot of land. Small wetlands are also placed between ponds for treatment.

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