CENTRAL AND EASTERN EUROPE AND CENTRAL ASIA
Best Practices for Water Quality Protection and Replication

Introduction

Minimising nutrient pollution in this region requires an integrated systems approach based on lessons learned. Projects funded by UNDP, World Bank and Global Environmental Facility during the last 20 years have helped identify practices and management systems to reduce nutrient losses. It is critical that new or intensive production systems are both ecologically and economically sustainable, and this requires regional cooperation, systems approaches to production and pollution control and adaptive management to refine systems and practices based on replication and experience.

The Living Water Exchange synthesised project information and prioritised best environmental practices (BEPs).* These approaches have demonstrated substantial potential for positive impacts on water quality, are replicable and scalable, and can be applied systematically. While most practices are agricultural, several, such as wetlands and buffers, can be also applied in urban settings. The eight priority BEPs identified were: nutrient management; manure management; wetland restoration/creation; riparian buffers; conservation tillage/erosion control; cover crops; grazing management; and ecological/organic production systems. Implementing these practices in a systematic fashion with an emphasis on "farming systems" as part of ecosystems will provide greater water-quality benefits than would be achieved through individual, random implementation.

Framework for Replication

This paper summarizes the practices and outlines a framework for a systematic, adaptable approach to improving and/or maintaining water quality in the region, and perhaps globally:

Nutrient and Manure Management – Agricultural production is site-specific. Climate, topography, soils and hydrology combine to determine the ecological and economical "best-fit" for the commodity to be produced. However, nutrient management is a fundamental BEP for all production systems in all situations. In animal production areas nutrient management must be coupled with manure management. This includes soil and manure testing in addition to managing the amount, source, placement and timing of nutrient application. The Serbian Danube River Enterprise Pollution Reduction Project and the Moldova Agricultural Pollution Control Project exemplify the establishment of nutrient management programmes and associated soil-testing programmes. The Turkey Anatolia Watershed Rehabilitation Project resulted in farm-based manure storage platforms with a goal of establishing manure management systems for 10 percent of the households in the project area. The platforms are also being used for composting. In areas with limited animal numbers per farm, community-scale manure storage/handling facilities may be more economical.

Integrating with Organic Farming – Establishment of ecological/organic production systems is not really a BEP but rather a system that relies on organic inputs. Nutrient and manure management are standard requirements for ecological agriculture and many other BEPs, such as riparian buffers, should be expectations. Growing crops ecologically (organically) can make long-term nutrient management and erosion control more challenging than in conventional production systems. The Russia and Estonia Lake Peipsi/Chudskoe Basin Management Programme included eco-farming practices as one approach to control pollution from crop production. The project supported BEPs including vegetative buffer strips, new drainage systems, and the need to follow good agricultural practices. This illustrates how an eco-farming system can drive the incorporation of BEP systems. Ecological agriculture can also provide a platform for farmers to produce products for export markets at premium prices. This should require them to implement and document water quality protection while providing sufficient revenue to do this profitability. Thus, although not actually a BEP, ecological agriculture could promote implementation of many other BEPs.

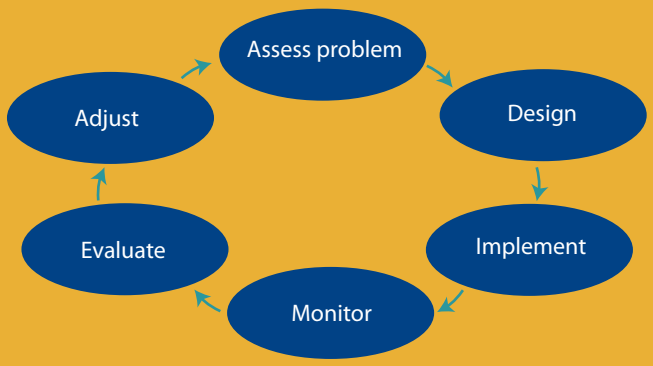
Reducing Nutrient Losses Compared to Bare Soil – Bare soil is a primary factor in soil erosion and the loss of unused crop nutrients, both of which impact water quality. Four of the BEPs (buffers, cover crops, conservation tillage, and grazing management) when used in combination can greatly reduce soil and nutrient loss compared to bare soil. These BEPs keep the soil surface covered with plants or residues at all times. Buffers, either grass or forest, are used to maintain the integrity of stream channels and shorelines and to

reduce losses from upland sources of pollution by trapping or filtering sediments, nutrients, and other chemicals. To assess reduction impact care should be taken to better describe the type and width of buffers. Buffers should not be fertilised or have manure added but may be flash grazed or have a once yearly hay harvest. In situations where the recommended 10m buffer is not feasible, a 5m mini-buffer may have to suffice. There are numerous examples of buffer implementation including the Living Water Exchange Project in Western Ukraine which established a 5m plum tree buffer along the Irshavka River. At the Olsavica Valley reclamation site of the UNDP/GEF Danube Regional Project – Strengthening the Implementation Capacities for Nutrient Reduction and Transboundary Cooperation – grasslands were restored to buffer streams from cropland. Stream fencing was also used to exclude grazing animals from a number of spring-wetlands.

Conservation Tillage and Cover Crops – For row crops, conservation tillage and the use of fall planted cover crops can be implemented in existing farming operations. Conservation tillage requires maintaining at least 30 percent soil coverage with crop residue with minimal tillage. Cereal cover crops reduce erosion and the leaching of nitrogen into groundwater by maintaining a vegetative cover on cropland and holding nutrients within the root zone over winter. This practice involves planting cereal crops after summer crop harvest. Nutrients are not applied to cover crops. Legumes may also be used as cover crops to provide ground cover and "fix" nitrogen for the following crop. The Croatia Agricultural Pollution Control project is demonstrating cover crop technologies. The goal is to show reduced nutrient loss, protection from soil erosion and compaction, and maintenance of soil organic matter. Creating a culture of growing early planted fall cereal grain cover crops to "trap" residual nitrogen from the summer crop could provide substantial soil and water quality benefits with minimal adjustments to the next summer's production system.

Wetlands Restoration – Finally, a great deal of emphasis has been placed on wetland restoration or creation to address nutrient pollution in both agricultural and urban settings. Wetland restoration and creation are different BEPs. Wetland restoration restores the natural hydraulic condition in a field that had

THE ADAPTIVE MANAGEMENT PROCESS



subsurface or surface drainage. Wetland creation establishes a wetland designed to manage water to optimise nutrient reduction before discharge. Created wetlands may have planned/controlled water inputs whereas restored wetlands accept the natural water flow from their catchment. Total nitrogen and total phosphorous removal depends on wetland size compared to flow or catchment area and water retention time, with three-seven days retention as optimum. The GEF-World Bank Bulgarian project on Wetlands Restoration and Nutrient Reduction illustrates a cost effective restored wetlands. The project restored 30 percent more wetlands than planned and will quantify nutrient reductions but is a model with high replication value.

Conclusion

Further reducing nutrient losses to water and minimising losses as agriculture re-intensifies are critical for Central and Eastern Europe. Urban runoff and treated municipal wastewater must also be managed to minimise nutrient releases. A systems approach that uses BEPs at key intervention points including pollution prevention, process management, field or facility management, in-field or on-site treatment and off-site remediation can minimise losses from all sources and has been adapted by the Living Water Exchange for use in agriculture based on an industrial pollution control model.* Nutrient rate reduction/optimisation, nutrient management, conservation tillage, cover crops and buffers used in sequence provide a chain of control equivalent to the industrial pollution control model. Knowledge of the effectiveness of BEPs is evolving.

The importance of good operation and maintenance has been recognised and work is ongoing to expand the list of priority BEPs. Using an adaptive management approach to refine this systems approach as we learn and identify new BEPs for adaptive needs shows great promise to reduce current nutrient losses and to build profitable new production systems while improving water quality in Central and Eastern Europe and globally.

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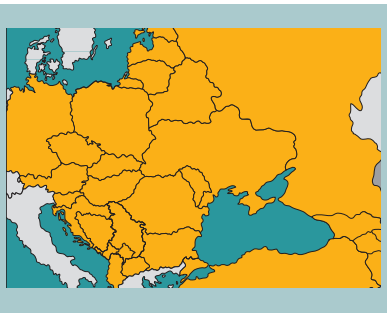

About the Living Water Exchange

The Living Water Exchange, a GEF/UNDP project promoting nutrient reduction best practices in Central and Eastern Europe, will share information and accelerate the replication of the most appropriate nutrient reduction practices developed from GEF and other investments in the region.

For more information, please visit
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