IMPLEMENTING THE 4Rs

Agriculture is being challenged to maintain profitable farm economics, while meeting the increased product demands of a growing population, and responding to increased scrutiny of land and resource management. Agricultural sustainability means addressing economic, environmental and social goals.

4R nutrient stewardship is an innovative approach to fertilizer best management practices (BMPs) to help achieve agricultural sustainability. The 4Rs imply there are four aspects to every fertilizer application and it provides a simple framework to assess whether a given crop has access to the necessary nutrients. To help identify opportunities to improve fertilizer efficiency and prevent nutrient movement from each field, ask:

Was the **RIGHT FERTILIZER SOURCE** *given to the crop at the* **RIGHT RATE, RIGHT TIME,** *and in the* **RIGHT PLACE?**

The four aspects of fertilizer management are interconnected, and none of the four can be right when any one of them is wrong.

PUT 4R NUTRIENT STEWARDSHIP TO WORK FOR YOU!

A key finding, detailed in multiple United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) reports, indicates that groups of best management practices work better than single practices. In fact, USDA NRCS strategies include encouraging management efforts to address nutrient source, rate, time, and place. For specific BMP recommendations, contact a local crop advisor, extension agent or other trusted agronomic advisor.

- **EDUCATE YOURSELF**
- **EXPAND YOUR 4R PRACTICES**
- **SPREAD THE WORD!**

Visit www.4Rstewardship.com for more information. (Available March 2011)

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nutrient stewardship

IMPLEMENTING
4R Nutrient Stewardship *on the* FARM RIGHT NOW

The Fertilizer Institute
Nourish, Replenish, Grow

4R NUTRIENT STEWARDSHIP

THE RIGHT TIME IS RIGHT NOW.

4R PRINCIPLES

The 4R nutrient stewardship principles are the same globally, but how they are used locally varies depending on field and site specific characteristics such as soil, cropping system, management techniques and climate. The scientific principles of the 4R framework include:

RIGHT SOURCE – Ensure a balanced supply of essential nutrients, considering both naturally available sources and the characteristics of specific products, in plant available forms.

RIGHT RATE – Assess and make decisions based on soil nutrient supply and plant demand.

RIGHT TIME – Assess and make decisions based on the dynamics of crop uptake, soil supply, nutrient loss risks, and field operation logistics.

RIGHT PLACE – Address root-soil dynamics and nutrient movement, and manage spatial variability within the field to meet site-specific crop needs and limit potential losses from the field.

STEPS TO IMPLEMENTING THE 4Rs ON THE FARM

STEP 1 – Identify economic, social and environmental goals that cropping system objectives should address specific to each field and operation.

STEP 2 – Select BMPs that are specific to the soil, climate, cropping system and goals identified by the grower.

STEP 3 – Integrate BMPs for all goals and adjust as needed.

STEP 4 – Document the 4R nutrient stewardship plan.

EXAMPLE GOALS FOR STEP 1

Goals will likely vary between farm operations and may even vary between fields; the following are some commonly identified grower goals.

ECONOMIC GOALS

- Improve net farm income.
- Contribute to improved regional economic development.

SOCIAL GOALS

- Improve the quality of farm family housing, diet and education.
- Improve productivity of farm labor by appropriate use of emerging technologies that increase efficiencies of field operations and reduce costs per unit of crop harvested.
- Improve access to sources of information to assist in farm management decision making.

ENVIRONMENTAL GOALS

- Maintain or reduce unwanted losses of nutrients to the environment:
  - Reduce soil erosion of nutrient containing soil particles;
  - Reduce volatile ammonia (NH_3) emissions;
  - Reduce nitrification / de-nitrification losses of nitrous oxide (N_2O) and di-nitrogen (N_2).
- Reduce energy use per harvested unit of farm production.
- Improve recycling of crop nutrients from crop residues and livestock manures.

EXAMPLE BMPS FOR STEP 2

SOURCE – Select appropriate fertilizer and on-farm nutrient sources for the cropping system including consideration for commercial fertilizer form, enhanced efficiency fertilizer products, manure or biosolids.

RATE – Utilize grid or zone soil testing and rate recommendations, use nutrient budgets to plan management and application schemes (including yield goal analysis, crop removal balance and plant tissue analysis); utilize variable rate application technologies to address spatial variability; use in-season methods to make in season decisions such as leaf color charts, chlorophyll meters, or optical sensors.

TIME – Follow recommended times for nutrient applications; when necessary utilize enhanced efficiency fertilizers for controlled nutrient release and urease or nitrification inhibition; utilize split applications to improve crop nutrient uptake.

PLACE – Utilize application methods that limit nutrient losses; incorporate fertilizers; adjust applications to avoid unnecessary applications to non-crop areas; couple applications with appropriate soil conservation practices; utilize controlled drain management in tile drained fields.

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