

## Ground-truthing fertilizer and manure application rates

Summary: Producers can assess their fertilizer or manure application rates using an in-field calibration strip.

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BOZEMAN – With a little effort, producers can ground truth their fertilizer or manure application rates to determine if they are applying fertilizer or manure at rates for maximum yields. A ramp calibration strip method to assess a range of nutrient application rates on annual or perennial crops was developed by researchers from Oklahoma State University and has been adopted by personnel from Manitoba Agriculture, Food and Rural Initiatives.

For a ramp calibration strip, an area 10-feet wide by 80- to 120-feet long is marked in a representative area of the field. The strip is segmented into 10-foot long sections, or 100 square-foot cells, with each cell receiving a different rate of fertilizer or manure. Ideally the rate would range from zero (an untreated check), to a high rate of fertilizer or manure. The rates are increased, or ramped up, at increments of 10 to 30 pounds nitrogen or phosphorus (or any other nutrient of interest) per acre. For example, in 100 square-foot cells, each 10 pounds of nitrogen per acre increase requires an additional 0.8 ounce of urea (46-0-0). Each 10 pounds P<sub>2</sub>O<sub>5</sub> per acre increase requires 0.7 ounce of monoammonium phosphate (11-52-0). The quantity by which to increase manure is more difficult to calculate because manures are highly variable in their nutrient concentrations. Labs can provide nutrient analyses of manure. It is best if the product is applied by small hand held equipment in these relatively small cells, using pre-measured bags of fertilizer or manure.

The crop grown in the ramp calibration strip is then visually inspected or evaluated with a chlorophyll meter mid-season to determine the effectiveness of the different rates.

“Plant height and leaf color are good indicators of plant health and are useful to help calculate in-season adjustments of plant-available nutrients, such as nitrogen or sulfate,” said Clain Jones, Extension Soil Fertility specialist in the Department of Land Resources and Environmental Sciences at Montana State University. A producer can note at what rate there is reduced growth or color change, determine the approximate fraction of nitrogen that should have been taken up by that plant growth stage, and calculate how much nitrogen to add. For example, wheat takes up approximately half of its required nitrogen by mid-tillering. If at mid-tillering the strip with 60 pounds of available nitrogen (soil plus

fertilizer) per acre is the lowest nitrogen rate without a noticeable growth decrease, then the field should have at least 120 pounds available nitrogen per acre for optimal production. If the whole field had 90 pounds of available nitrogen pre-plant, then the grower should add at least 30 pounds of nitrogen per acre at mid-tillering to optimize yield. The Montana State University Extension publication *Nutrient Uptake Timing by Crops: to assist with fertilizing decisions* offers guidance on these steps.

Yield and grain protein can be measured at harvest to help with future fertilizer decisions.

“Using yield and protein results from ramp strips along with crop prices and fertilizer costs can help determine the best economic rate to apply to the whole field the next growing season,” said Jones. He encouraged producers to keep good written and photographic records of the ramp strips, along with notes on prior crop and growing season conditions, as valuable information to guide future fertilizer or manure applications.

Photos of an example ramp calibration strip are available in the April 2011 issue of *Top Crop Manager (West)*

([http://www.topcropmanager.com/index.php?option=com\\_content&task=view&id=5592&Itemid=182](http://www.topcropmanager.com/index.php?option=com_content&task=view&id=5592&Itemid=182)). For an online copy of *Nutrient Uptake Timing by Crops: to assist with fertilizing decisions*, go to Extension publications at <http://landresources.montana.edu/soilfertility/>. For printed copies, please refer to <http://www.msueextension.org/store/> or call Extension Publications at (406) 994-3273. Contact your local MSU Extension agent (<http://www.msueextension.org/localoffices.cfm>) or crop adviser for help with specific fertilizer decisions.