



nutrient stewardship

THIS ARTICLE IS ABOUT...

RIGHT
SOURCE

RIGHT
RATE

RIGHT
TIME

RIGHT
PLACE

Highlights

- Many services can perform the soil and tissue testing while you're in the field, so you can test, apply nutrients and prepare the soil without any time lags.
- Nutrient budgets help you understand the balance between crop inputs and outputs.
- Replacing soil nutrients on farms should be standard operating procedure because we only get one shot at a crop every year. Test it. Balance it. Apply it!



Nutrient Budgets Make Bigger Cash Budgets

Just as you wouldn't begin an operating year without a financial budget, it's just as important that you establish a nutrient budget. Nutrient budgets offer insight into the balance between crop inputs and outputs. In short, they compare nutrients you apply to the soil to nutrients taken up by crops. This article describes what nutrient budgets are, how they work on the farm and how to implement them.

Nutrient Budgets SOP for One Grower

Ron Hansen grows corn and soybeans near Kankakee, IL. He's also a strong advocate for soil testing and nutrient budgeting. He uses a three- to four-year soil-testing program depending on soils, combined with a tissue-testing program at sidedress for fields that are strip-tilled with fall anhydrous.

He says soil testing has advanced over the years with more-site specific equipment and regularly scheduled testing helps show relatively in your tests over time. Many services can perform the soil and tissue testing while you're in the field, so you can test, apply nutrients and prepare the soil without any time lags.

"The primary advantage to a balanced soil nutrient program is more dollars in your pocket," Hansen says. "Years ago we were

over-fertilizing because our soil tests showed we needed it. Our yields hit a plateau and wouldn't break above it. We started balancing nutrients and our yields went up. It was more efficient, environmentally friendly and the hybrids responded better." He says not replacing nutrients is similar to building a house on a poor foundation. "No matter how much money you put in the top part of the house, it's subject to premature decay because of that poor foundation," he says. "Balanced base elements are the foundation for plants to maximize yield."

Balanced Nutrients, Balanced Production

As the world population grows, so does its need for more food, feed, fiber and energy. This means farmers must make greater and more efficient use of mineral and

organic nutrient sources. Locally and worldwide, farmers today are expected to grow crops in well-managed and sustainable systems by neighbors, legislators, consumers and raw-material buyers.

Hansen is quick to point out that best management practices (BMPs) help you do just that. One critical component of BMPs is the nutrient budget. Nutrient budgets help you understand the balance between crop inputs and outputs. Inputs include fertilizers, nitrogen (N) fixation by legumes and applied manure, phosphorous (P) and potassium (K). Outputs, or crop nutrient removal, take the form of grains, oilseeds, fruits, vegetables, fiber, hay and forage that are harvested. Additional outputs include erosion loss, leaching, volatilization and nitrate reduction.

What a Nutrient Budget Includes

A nutrient budget isn't as exact as a financial statement. An assortment of variables affects each tract of land. For example, parcels near CAFOs may have had too much manure applied over time or it may have been unevenly distributed. Previous flooding could throw things off, too. It's normal to incorporate limits and assumptions when compiling your budget.

A nutrient budget includes:

Soil test: this component is complementary to the budget and lets you know what nutrients are already available to crops and helps you plan input purchases. It is a critical BMP in the 4R strategy.

- **Yield history:** by examining the historical yields of crops taken from specific fields, you can calculate nutrient removal over time. Yield history may also help better predict the amount of uptake that will occur with similar crops planted in the future.

Testing for N: a good estimate of established numbers for testing for soil N, especially in the Great Plains and western states, will give you a basis to predict what will happen in terms of N carryover into the next season.

- **Previous applications:** knowing what's been applied to the field in years past will offer insight into what may already be in the ground or what nutrients may no longer be present.
- **Water:** consider what kind of water has been applied to the field. Does irrigation water contain dissolved nutrients such as N, S or Cl? If so, it should be counted as input.
- **What's around you:** consider water sources that could run into your field. Is there a CAFO nearby? A manufacturing facility? What makes up these water sources can impact how you plant.

Once you've gathered this information, you can use the average nutrient removal rates shown in Tables 1 and 2 or work with your Extension agent, area crop protectant or seed representative to determine even more specific rates for your crops and conditions.

As Hansen says, "Replacing soil nutrients on farms should be standard operating procedure, because we only get one shot at a crop every year. **Test it. Balance it. Apply it!**"



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The information presented here is mostly general and conceptual. For more specific information regarding safe rates of in-furrow fertilization for specific crops and conditions, one should refer to university extension resources, and/or consult a knowledgeable and experienced crop advisor or industry professional. Also, an Excel decision support tool is available online. Visit the IPNI website www.ipni.net/toolbox.

Source Material

Better Crops, 2002, page 20,
*Nutrient Budgets in North
America* by P. Fixen & A. Johnston
The Fertilizer Institute, www.tfi.org
International Plant Nutrition
Institute, www.ipni.net