RESEARCH WITH IMPACT

P. Fixen/IPNI Image

THE CHALLENGE:

Most crop nutrition research is conducted over relatively short periods of time, typically in the 2 to 5-year range. These studies are generally limited to a few years due to various constraints, including cost and space restrictions.

While short-term experiments provide valuable information regarding 4R-based nutrient management, there are inherent limitations in evaluating the long-term impacts of fertilizer management on crop yield and quality, soil health, and environmental impacts. Many of these parameters change very slowly or have seasonal variation that require long-term assessment. Additionally, evidence of gradually declining soil fertility in under-fertilized plots provides the information necessary to halt soil degradation with proper nutrient management.

There are few studies in the world that are truly long-term (e.g., >50-year duration), and those that do exist are routinely threatened with termination for various reasons, most often involving funding.

Farmers increasingly need science-based information on the role of balanced plant nutrition to optimize profitability and minimize environmental impact.

THE RESEARCH SOLUTION:

IPNI recognizes that long-term crop nutrition research is essential for understanding the 4R pillars–economic, environmental, and social sustainability of crop production. IPNI has supported an on-going study in western Kansas, USA that began in 1961. A key objective of this study is to evaluate effects of fertilizer nitrogen (N) and phosphorus (P) application rates on corn, and the effect of N, P, and potassium (K) rates on sorghum.

The main focus of the study has been on crop yield; however, other issues such as nutrient use efficiency, nutrient loss, and changes in soil properties have also been addressed.

Long-term Research Documents Importance of Balanced Plant Nutrition

THE RESULTS:

In the beginning of the study there was no yield benefit from P fertilization, but the benefit from added P has steadily increased with time due to the drawdown of the native soil P supply, so the observations here will be limited to the latter years of the study.

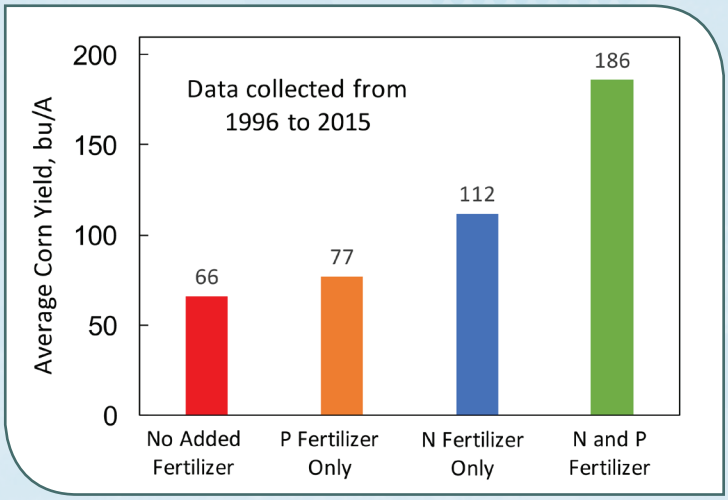
Yield increases: Over a recent 20-year period from 1996-2015, corn grain yield increased by an average of 18% due to application of P alone and 71% with N alone. When N and P were applied together, grain yield increased up to 183% compared to the unfertilized control.

Improved nutrient recovery: When fertilized at the recommended N rate and supplemented with 40 lbs P_2O_5, the average (1992 to 2010) apparent N fertilizer recovery by grain was 44%. When P fertilizer was omitted, recovery of added N by corn was cut in half. There was an additional 35 lbs N/A recovered in the grain when P was supplied. This balance of N and P fertilizer increases yield and reduces the amount of N remaining in the soil after harvest, thereby improving the economics of N fertilization and reducing the risk of N "leakage" into the environment.

Results from this IPNI-supported study show that long-term field experiments provide an invaluable resource to scientists and practitioners in developing and communicating improved agricultural management practices.

FURTHER READING:

See IPNI Research Database for scholarly and popular press articles. http://research.ipni.net/page/RNAP-4367



***A combination of both N and P fertilizer** results in greater corn yields than either one alone (average from 1996 to 2015). The concept of "balanced nutrition" considers the plant requirement for all essential nutrients in the correct proportion.*