Fertilizer in small doses yields higher returns for less money

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This shows farmland in Zimbabwe. Credit: Teresa Barnes

Crop yields in the fragile semi-arid areas of Zimbabwe have been declining over time due to a decline in soil fertility resulting from mono-cropping, lack of fertilizer, and other factors. In collaboration with the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), University of Illinois researchers evaluated the use of a

precision farming technique called "microdosing," its effect on food security, and its ability to improve yield at a low cost to farmers.

"Microdosing involves applying a small, affordable amount of fertilizer with the seed at planting time or as top dressing three to four weeks after emergence," explained U of I agricultural economist Alex Winter-Nelson. "So, instead of spreading fertilizer over the entire field, microdosing uses fertilizer more efficiently and ultimately improves productivity. Our research shows that smallholder farmers' investment in microdosing has really unlocked the power of chemical fertilizers in some of the low-rainfall areas of Zimbabwe."

Training is the key to adoption of the technique. "About 75 percent of households receiving microdosing training used fertilizer in 2011," said Winter-Nelson. "This compares to less than 25 percent of households that had not received training. Another way of looking at it is that training in microdosing raised the probability of adoption by 30 to 35 percentage points. Knowledge of microdosing changed people's attitudes about fertilizer. Those who had training generally disagreed with the common notion that fertilizer is not worth its price or that it burns crops."

Winter-Nelson said that there are some hurdles to overcome, however. "Sustaining and expanding the benefits of microdosing technology will require efforts to ensure that private agrodealers are able to stock the product in a timely manner and to package it in a manner that smallholder farmers find useful," he said. "This is complicated by the financial capacities of agrodealers and by difficulty in projecting fertilizer demand, which varies with rainfall.

"We also need to work on extending training to underserved areas and to train extension personnel in low-rainfall areas," he said. "Female-headed households were significantly less likely to adopt microdosing than

others, possibly reflecting labor shortages or difficulties accessing fertilizer. Understanding the particular constraints that female farmers face and adapting the methods or the training to their circumstances could also help extend adoption of the technique."

The research data were collected via a structured household survey in eight districts in semi-arid areas with additional information about fertilizer availability and demand from key informant interviews with local extension service providers, non-governmental organizations, and agrodealers. Focus group discussions were also utilized. The household survey included questions about assets, cropping patterns, agricultural production, training in microdosing, extension techniques, and fertilizer use and adoption, with particular attention paid to management practices and output on cereal plots two previous cropping seasons.

"What was particularly encouraging from the data is that, when comparing the costs of research, development, and promotion of microdosing in Zimbabwe to the gains achieved through a 30 percent adoption rate and an estimated productivity effect, the data suggest an internal rate of return on the investment in microdosing of over 40 percent," Winter-Nelson said. "And that's a good motivation to continue to try to get more farmers in Zimbabwe to try microdosing."

Provided by University of Illinois at Urbana-Champaign

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