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Optimal Nitrogen Ratio and Neighbour Practices in Indian Cropping Systems: A Survey-Based Approach to Policy Guidelines

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Abstract

The overuse of nitrogen fertiliser in agriculture is a problem on a global scale. In developed countries the issue is discussed as a cause of water source pollution and various projects to contain nutrient pollution have been launched in the US and European countries. In the developed world, particularly in Asia where the use of modern inputs has been adopted to some extent, policy makers are worried about short and long-term productivity of agricultural soils, the income of farmers, and national food security.

In this paper, I use cost of cultivation survey data from India including information on inputs and outputs of around 300,000 plots from different years, to obtain the optimal nitrogen ratio for each cropping system. Semi-parametric estimation is used to determine the functional form of nitrogen ratio affect on yield. Input prices and information on supply-side cost shifters are used as instrumental variables for the choice of inputs in the yield equation.

The analysis offers a data based approach to create soil nutrition guidelines specific for different crops, locations and methods (irrigated vs. rain-fed). This is useful for areas where soil testing and precision agriculture are yet to be common practice, and at the same time some soil nutrition practice guidelines are necessary to direct farmers at gaining the most benefit from their soil. Some implications for future data collection methods can be made as well.

Finally, I identify over-users of nitrogen by comparing actual use to the optimal ratio according to the model, to analyse the characteristics of the over users and determine the extent of learning from neighboursämong farmers versus following crop specific guidelines.

Keywords: Agriculture, crops, cultivation, economic development, environmental economics, productivity

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