Policy Brief

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Can information help reduce imbalanced application of fertilisers in India

Experimental evidence from Bihar

In brief:

- Imbalanced use of fertilisers is a serious problem in India, and in Bihar, the use of chemical fertiliser is much higher relative to the rest of India. The Government of India launched the flagship Soil Health Card (SHC) programme in 2015, in which, farmers receive SHCs with recommendations on the application of different fertilisers.
- This brief provides empirical evidence on whether the introduction of the SHC programme is able to reduce imbalanced use of chemical fertilisers in Bihar.
- The findings suggest there is no evidence of any impact of SHC on fertiliser use in Bihar. A lack of understanding and confidence of the SHC's recommendations and other factors such as credit constraints, were possible explanations for having no impact.
- To improve the effectiveness of the SHC, the following modifications in its implementation are needed: different ways to motivate farmers over the soil test results; strengthening the follow-up visits by trained extension workers; and an offer to cover potential downside risk from changing fertiliser use.
- The researchers recommend generating more evidence to test different ways in making the SHC effective, which will help in promoting the balanced use of fertilisers across India.

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Motivation for research

The imbalanced application of different types of chemical fertilisers in agriculture is a widespread problem in India. This imbalance affects soil fertility, crop productivity and farmers' net profits, and results in widespread pollution of water resources. In this context, the Government of India has launched the Soil Health Cards (SHC) programme to promote the balanced use of fertilisers in agriculture throughout India. More than 140 million SHCs are expected to be issued for 3 years to cover all plots and farmers in India. The programme aims to provide custom scientific information, which will encourage farmers to opt for a more balanced use of fertilisers. Under this programme, all farmers in India will receive the details over the nutritional status of their land and crop-wise yield specific recommendations for the application of different fertilisers. States like Gujarat have already implemented a similar programme where farmers received crop-specific fertiliser application recommendations for all plots of land with plot-level SHC information posted on the website. On the other hand, Bihar remains a laggard state in issuing SHC to its farmers.

However, this programme is based on certain implicit assumptions. First, it assumes that smallholder farmers, many of whom are illiterate, will be able to understand the contents of SHC. Second, even if farmers understand the content, the assumption is that they will trust the quality and reliability of the information. Third, farmers will alter their preferred use of fertilisers based on the information of the SHC. Finally, the farmers will be able to act on their altered preference without being constrained by other factors that may affect their choices.

Research question

Given these multiple sets of implicit assumptions, the vital question is – will the SHC be able to prompt farmers to modify their fertiliser use and, if yes, then how? The objective of this study is to provide empirical evidence of whether the information given in SHC can help farmers to reduce the imbalanced application of fertilisers in Bihar or not. The study also aims to explore the link between soil information on SHC on fertiliser usage and factors responsible for the lack of response.

Data and methodology

Randomised control trials (RCTs) were conducted in three districts (Bhojpur, Madhubani and Nawada) of Bihar where government SHCs programme were tested. The study was conducted in partnership with the Soil Department of Rajendra Agriculture University (RAU), Bihar. The treatment group consists of 493 rice and wheat-producing households in Bihar and a multi-stage sampling approach was used for the survey. The baseline survey covered both the control and treatment groups and the survey was done during Aril-May 2014. Soil samples from one plot of every treatment farmer were collected following the baseline survey. Experts of RAU analysed soil samples and recommended an appropriate dose of different types of fertilisers for wheat and rice crops. The results of the soil tests and final recommendations for appropriate fertiliser use were printed in Hindi in the SHC for each farmer in a standard format. These SHCs were delivered to farmers in November 2014, weeks before the sowing of the wheat crop. An additional survey in tandem was carried out with the distribution of the SHC in Dec-Jan 2015 to collect information on cultivation habits, fertiliser application and yields of the previous Rabi (wheat) season. Finally, an end line survey was carried out after the wheat was harvested in June-July 2015 to collect information on farmers' fertiliser application and production. An additional survey was also conducted with farmers to appraise the elicit willingness to pay for zinc, a micro-nutrient that is important for rice cultivation and often deficient in local soils.

Research findings

After the distribution of the SHCs for examining whether farmers understood the SHC recommendations issued to them, the researchers carried out a telephone survey among treatment farmers. The results based on the phone survey showed that there is a weak correlation between the

actual recommendations and those recalled by farmers. On average, 74–78% of farmers with nutrient-deficient soil correctly stated that the SHC recommended applying the relevant fertilisers. However, 67–68% of farmers with nutrient sufficient soil wrongly stated that the SHC recommended applying the relevant fertilisers. Farmers generally assumed that the SHCs recommended them to use more fertilisers. The findings of the study suggest that the lack of understanding of SHCs is prevalent in Bihar.

On the other hand, no relationship was found between farmers' elicited willingness to pay for the underused fertiliser (zinc) and the SHC information about the deficiency of that fertiliser.

The findings of the study reveal that farmers did not consider SHC recommendations to determine the fertiliser usage and application. These results suggest that receipt of an SHC had no effect on subsequent fertiliser application. Three possible explanations were found for the lack of response. First, farmers simply did not understand the contents of the SHC. Second, though some farmers understand it they did not found the information to be reliable enough. Third, even if information did in fact, alter some farmers preferred fertiliser mix, other factors, such as cost, prevented them to act on these preferences and to shift their usage.

Conclusion

The use of fertiliser has increased rapidly in Bihar over the last three decades. From 1981-82 to 2012-13, Bihar's average use of NPK (Nitrogen, Phosphorous and Potash) fertiliser has increased 10 times, while during the same period, the use of NPK has increased only four times in all India level. Interestingly, in Bihar, the use of chemical fertiliser use (Nitrogen, Phosphorous and Potash) is relatively much higher than rest of India but crop productivity remains significantly low suggesting a sub-optimal use of fertilisers in the state.

The findings suggest that the ongoing soil card programme may not lead to expected gains in its current form. The lack of expected gains could be due to lack of understanding of scientific information, lack of confidence in the recommendations over the use of fertiliser, or other factors like credit constraint which may inhibit farmers from switching fertiliser choice even if the information shifts their preferences.

Policy recommendations

To make the soil card programme effective, the study suggests the following policy recommendations:

- Different ways to motivate farmers and improve the trust in the soil test results and fertiliser use recommendations need to be tried and rigorously tested.

- Follow-up visits by trained extension workers needs to be done to discuss the benefits of the SHC and facilitate the process with farmers who struggled to understand and remember the information in the SHC.

- Farmers tend to be risk-averse, therefore an offer to cover the potential downside risk from changing fertiliser use will encourage more farmers to adopt scientific recommendations.

- Finally, a series of RCTs need to be done to test different types of approaches to make SHC more effective in reducing the imbalanced use of chemical fertilisers in Bihar. Given that imbalanced use of fertiliser is a serious problem, evidence generated from such experiments will help to improve the soil testing programme not only in Bihar but also the rest of India.

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