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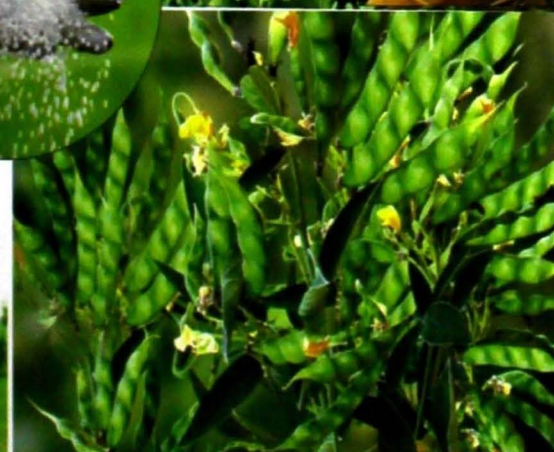
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AERC Report

Agro-Economic  
Research Centre  
(AERC)

Impact of Neem-coated Urea on Production,  
Productivity and Soil Health in India -  
A Case of Sugarcane and Tur in Selected  
Districts of Maharashtra

Jayanti Kajale  
Sangeeta Shroff  
Varun Miglani



February 2017

Submitted to  
Department of Agriculture, Cooperation and Farmers Welfare  
Ministry of Agriculture and Farmers Welfare  
Government of India

**Impact of Neem-coated Urea on Production, Productivity and  
Soil Health in India – A Case of Sugarcane and Tur in  
Selected Districts of Maharashtra**

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## **Foreword**

The Government of India made it mandatory for all the indigenous producers of urea to produce 100 percent of their total production of subsidized urea as Neem Coated Urea (NCU) in 2015. The usage of neem oil coating on urea reduces the release of nitrogen from urea and therefore reduces consumption of the fertiliser thereby increasing its use efficiency. In view of this, the present study was undertaken to examine the coverage of NCU, its adoption behaviour, its impact on yield of selected sugarcane and tur farmers and to study the status of implementation of the soil health card scheme in Maharashtra.

The analysis of the primary data reveals lower but increasing adoption of NCU and reduced per acre consumption of total urea by NCU farmers as compared to the Non-NCU farmers. For both the crops, application of NCU had positive impact on returns of the NCU farmers. Farmers appeared to be satisfied with the quality of NCU used. The data however revealed that only around 37 percent of the farmers had got their soil tested since 2013-14. Out of the total farmers who got their soil tested, only 54 percent possessed the soil health card at the time of survey and only 58 percent could understand the information given on it. The responses reveal inadequate outreach of the machinery in creating awareness about soil testing.

The policy implications therefore include creating more awareness about NCU and its benefits as compared to urea and ensuring adequate and timely availability of NCU. Fertiliser training camps need to be organized so that the farmers are given suggestions about judicious fertiliser usage under changing weather conditions and are convinced about benefits of soil test based nutrient management. There is a need for increasing manpower resources engaged in collection of soil samples and distribution of soil health cards, more soil testing labs and capacity building of the staff so that the cards are distributed before the sowing season.

This study would be very useful for the researchers as well as policy makers. I thank Jayanti Kajale, Sangeeta Shroff and Varun Miglani for undertaking this study.

Gokhale Institute of Politics and Economics,  
(Deemed to be University Under section 3  
of the UGC Act, 1956),  
Pune – 411004

Rajas Parchure, Professor and  
Officiating Director,  
February 2017.

## **Acknowledgements**

This report titled 'Impact of Neem-coated Urea on Production, Productivity and Soil Health in India – A Case of Sugarcane and Tur in Selected Districts of Maharashtra' was conducted by the Agro-Economic Research Centre of Gokhale Institute of Politics and Economics, Pune, at the initiative of the Ministry of Agriculture, Government of India, New Delhi. The report was coordinated by ADRTC, Institute for Social and Economic Change, Bangalore. We sincerely thank Dr. Ramappa, who coordinated the study and Dr. Maruthi, Head of ADRTC for their cooperation and efforts taken in coordinating the study and organising a workshop based on the study. Our sincere thanks to Shri.P.C.Bodh and Shri. Rakesh Kumar from the Ministry of Agriculture and Farmers Welfare for their support and guidance throughout the completion of the study. We thank all the participating AERCs for their useful comments during the workshop.

The study could be completed due to the co-operation and support received by us from many in the Institute. We would like to thank Prof. Rajas Parchure, Officiating Director, for giving us an opportunity to undertake this project and the motivation provided for completing the work. We also thank Mr. Rajesh Bhatikar, Registrar of the institute for providing us the necessary infrastructure and support.

For writing the report, information had to be collected from various officials. Our thanks to Mr. Vikas Deshmukh, Commissioner of Agriculture, Government of Maharashtra for all support during the study. Special thanks to Mr. R. M. Kawde, Deputy Director of Agriculture, Fertilisers, Government of Maharashtra Mr. Hanmant Shinde, Technical Officer (Fertiliser), Government of Maharashtra and Mr. Chandrakant Gorad, Deputy Director of Agriculture, Soil Survey and Soil Testing, Government of Maharashtra for providing the necessary secondary data for the study. We are also grateful to the District Superintending Agriculture Officers of the sample districts viz. Ahmednagar, Kolhapur for sugarcane survey and Latur, Yavatmal for tur survey for their cooperation. We also thank the Taluka Agricultural Officers, staff of the Panchayat Samitis and Gram Panchayats of the sample districts.

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Economics, (Deemed to be University  
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**February, 2017**

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## List of Acronyms

CoC	Cost of Cultivation
DAP	Diammonium Phosphate
FAI	Fertilizer Association of India
GCA	Gross Cropped Area
GIA	Gross Irrigated Area
GoI	Government of India
GoM	Government of Maharashtra
HH	Household
K	Potassium
MOP	Muriate of Potash
MRP	Maximum Retail Price
N	Nitrogen
NCU	Neem Coated Urea
NFL	National Fertilizers Limited
NOA	Net Operated Area
Non-NCU	Normal Urea
NUE	Nitrogen-Use Efficiency
P	Phosphorus
PACs	Primary Agricultural Cooperatives
<i>t</i>	T-Statistic
T.E.	Triennium Ending

## **Executive Summary**

In 2015, Government of India made it mandatory for all the indigenous producers of urea to produce 100 percent of their total production of subsidized urea as NCU and took various steps to promote NCU with a view to improve soil health status and also realise higher yield per hectare. The present study was undertaken by the Ministry of Agriculture and Farmers Welfare, Government of India to examine the coverage of NCU, its adoption behaviour and its impact on yield among the selected crops. The study was conducted for the state of Maharashtra which is the second largest fertiliser consuming state of India.

### **Objectives of the Study**

1. To analyze district wise and state level trends in usage of urea and Neem Coated urea and trends in prices of urea in Maharashtra.
2. To analyze the adoption behavior of NCU sample farmers in irrigated and unirrigated tracts.
3. To analyze the impact of adoption of NCU on crop productivity and farmers' income.
4. To document the status and implementation of soil health card scheme.
5. To suggest suitable policy measures for adoption of NCU.

### **Data and Methodology**

The study relies on secondary as well as primary data collected from the sample households for the reference period kharif 2015. Irrigated and unirrigated kharif crops in the state using urea were to be selected. Accordingly, sugarcane was selected which is a 100 percent irrigated crop. Tur was selected as an unirrigated crop as the area under irrigation was only 1.6 percent of total tur area in 2012-13. Based on the urea usage as well as discussions with state government officials, for sugarcane, districts Ahmednagar and Kolhapur were selected. For tur, districts Yavatmal and Latur were selected. From each of the districts, two talukas were selected. From each of the selected talukas, two clusters of villages comprising three to four villages per cluster were selected for conducting the survey. Fifty farmers from each taluka, and a total of 100 farmers in case of each district, and a total of 200 farmers for each crop were selected. Thus in all, a sample consisting of 400 households was selected. Households were selected randomly for assessing the use of

NCU fertilisers and its impact on crop production. Care was taken to select NCU users as well as urea users (Non-NCU farmers) for comparing the impact of NCU usage and urea usage. For sugarcane out of a total of 200 sample farmers, 68 percent farmers were NCU users and 32 percent were Non-NCU users. In case of tur, 42 percent were NCU users and 58 percent were Non-NCU users. Thus, a total of 220 farmers (55 percent) were NCU users in the total sample of 400 farmers. Households from different farm size groups were selected.

### **Major Findings of the Study**

#### **Major findings emerging from analysis of the secondary data**

- It is observed from the analysis of the secondary data that although Maharashtra is the second largest fertilizer consuming and third largest urea consuming state in the country, its per hectare fertilizer and urea consumption was about 120.5 kg and 108.6 kg respectively for the T.E. 2014-15, which was 7.6 percent and 29.3 percent respectively less than the all India average.
- The urea consumption in the state increased at the rate of 4.1 percent per annum during the period 2000-01 to 2015-16. Across years, urea consumption seems to have been affected by occurrence of droughts, since 2009.
- The district-wise data for T.E. 2014-15 reveals that district Kolhapur had highest per hectare usage of urea which is followed by Nandurbar and Jalgaon districts with 188.3 and 171.4 kg per hectare respectively. These are the only districts with more than all India consumption per hectare average.
- From 2009-10 to 2015-16, the rate of increase in urea price was 17.5 percent, which was quite less as compared to that in MRP of DAP (171.2 percent) and MOP (277.6 percent).

#### **Major findings that emerged from the analysis of the primary data.**

##### ***The Socioeconomic Characteristics***

- The analysis reveals that 57 percent of the sugarcane farmers belong to general category. Though they owned comparatively smaller size of landholdings, the extent of the land irrigated was very high i.e. around 90 percent. The tur farmers belonged to general (43 percent) as well as OBC (29 percent) categories. Their landholding size was comparatively bigger than the sugarcane farmers. However, the extent of irrigation was only 38 percent for these farmers.

- For both the crops, the extent of higher education as well as the extent of irrigation was higher for the sugarcane and tur NCU farmers.
- The analysis revealed that overall the NCU farmers had a better socioeconomic background.

### ***Costs, Returns and Fertiliser Usage***

- The output and the net returns were higher for the NCU farmers than the Non-NCU farmers for both the crops in 2014 as well as 2015. The extent of increase in output and in net returns from 2014 to 2015 was also higher as well for the NCU farmers.
- The difference between output efficiency of urea (in 2015) of NCU farmers and Non-NCU farmers was significant for sugarcane as well as tur and indicated reduced usage of total urea consumption in case of NCU farmers (without adversely impacting the yield) as compared to Non-NCU farmers.
- The difference between productivity was significant only for tur farmers. For sugarcane, the difference was non-significant. This indicated that usage of NCU had not impacted productivity of sugarcane NCU farmers significantly and that factors other than NCU usage could have played an important role in causing production levels to be the same.
- For sugarcane, urea cost per acre was significantly lower for NCU farmers and they benefited mainly due to reduced usage of total urea. However the difference was non-significant in case of main and by product yield, prices and overall gross returns. For tur, the total input cost, yield as well as gross returns were significantly higher for the NCU farmers. The increase in the gross returns is mainly due to the yield effect rather than the price effect.
- The data relating to application of recommended doses of fertilisers based on soil test report showed that there had been either under application or over application of various fertilisers including urea in comparison to the recommended doses of fertilisers by the farmers. In case of urea, there was underestimation for sugarcane and overestimation for tur.
- The partial budgeting exercise revealed that the incremental net added returns were higher than the incremental net costs by more than 10 times for the NCU sugarcane farmers and by 30 times for NCU tur farmers. Thus, for both the crops, application of NCU had positive impact on returns of the NCU farmers.

### ***Awareness and Perceptions about NCU***

- Around 70 percent of the sugarcane and 42 percent of the tur farmers were aware about the NCU. All the farmers were able to differentiate between NCU and Non-NCU. The consumption of NCU was very low in the year 2014 for sugarcane and nil for tur and that of urea was higher. It increased in 2015 for both the crops.
- Overall, farmers appeared to be satisfied about quality and availability of NCU and majority (above 80 percent) of them thought that the application of NCU led to improvement in soil health.

### ***Problems in adoption of NCU***

- About 53 percent of the farmers were unable to report any problem in adoption of NCU. The major problem reported by 37 percent of the farmers was that there was shortage of NCU.

### ***Soil Health Cards***

- The secondary data relating to distribution of soil health cards showed that for the state as a whole, the soil sample collected was more than the target set. Overall, 94 percent of the sample that was collected was tested. Nearly 85 percent of the samples that were collected were distributed at the state level. However, in a number of districts, the targets have not been met and this clearly suggests need for strengthening of the distribution machinery.
- Primary data revealed that only 74 sugarcane farmers (37 percent) and 72 tur farmers (36 percent) got their soil tested since 2013-14. The main sources of information on NCU were the state agricultural department and Agricultural universities.
- It was observed that around 87 percent of the soil tested farmers got the soil tested for understanding the fertiliser requirement of their soil. 254 (64.5 percent) farmers did not get their soil tested for various reasons as mainly they did not know whom to contact and that the testing labs were not available in the vicinity.
- 79 percent of the farmers felt that soil testing was not required as their respective soils were in good condition.

### ***Policy Implications***

- (i) Secondary data shows that per hectare consumption of fertilisers is comparatively lesser in Maharashtra. As per hectare urea / fertiliser consumption is largely related to availability of water, increasing the extent of irrigation along with increasing

area under the crop is important to increase per hectare usage of urea wherever necessary.

- (ii) With production of 100 percent urea as NCU, all the farmers would be now using NCU. Overall, the analysis of the primary data revealed that majority of the NCU farmers were satisfied with the quality of NCU and were unable to report any problem. The only problem reported by 37 percent of the farmers was shortage of NCU. Thus, it is essential to ensure adequate timely supply of NCU at village level.
- (iii) In view of the difference between actual usage and recommended doses of fertilisers, and for increasing output efficiency and productivity of urea and judicious use of all fertilisers, there is need for organising fertiliser training camps at regular intervals at the village level so that farmers can be given suggestions about its usage ( recommended doses of fertilisers) under changing weather conditions. All the farmers need to be given information about relative benefits of NCU over urea and accordingly about requirement of doses of NCU as compared to urea.
- (iv) Only around 37 percent of the sugarcane as well as tur farmers got their soil tested since 2013-14. This percentage is very low. The responses reveal inadequate outreach of the machinery in creating awareness about soil testing. Hence, the outreach of the extension machinery needs to be improved so that the target set for soil testing is fulfilled and all the farmers get their soil health cards before the sowing season. Also, there is a need to convince the farmers about benefits of soil test based nutrient management.
- (v) Out of the total farmers who got their soil tested, only 54 percent possessed the soil health card at the time of survey and only 58 percent could understand the information given on it. Thus, there is need to educate the farmers about benefits of possessing soil health card and about its contents.
- (vi) There is a need for increasing manpower resources engaged in collection of soil samples and distribution of soil health cards, more soil testing labs and capacity building of the staff so that the cards are distributed before the sowing season.

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## **Annexure I**

**Comments on the report “Impact of Neem Coated Urea on Production, Productivity and Soil Health in India” submitted by AERC, Maharashtra.**

**1. Title of the draft report examined**

Impact of Neem-coated Urea on Production, Productivity and Soil Health in India – A Case of Sugarcane and Tur in Selected Districts of Maharashtra.

**2. Date of receipt of the Draft report December, 2016**

**3. Date of dispatch of the comments January, 2017**

**4. Comments on the Objectives of the study**

All the objectives of the study have been addressed.

**5. Comments on the methodology**

Common methodology proposed for the collection of field data and tabulation of results has been followed.

**6. Comments on analysis, organization, presentation etc**

- (i) In Summary, Conclusions and Policy Suggestions, whole introduction chapter is reproduced. Better to avoid tables and figures in this Chapter. Summarize the results obtained in a précised manner with a suitable policy suggestions based on the results obtained.
- (ii) The partial budgeting framework adopted seems to be incomplete (Table 7.5). Estimations should be reported indicators-wise using partial budgeting (i.e., Added costs due to NCU in different indicators such as cost on pest & diseases, labor costs, fertilizers etc. should be reported separately). Kindly, recheck the BC ratios; it should be in the form benefits obtained for per rupee investment. Accordingly, revise the Tables 6.7 and 6.8.
- (iii) In Page No. 88 and 89, complete phrase is highlighted and is in italics, which is not required. Hence, align the complete report by following the standard guidelines.
- (iv) Please, provide suitable policy suggestions in the last Chapter based on the results obtained.
- (v) It is suggested to copy edit the report before finalizing.

**7. Overall view on acceptability of report**

Authors are requested to incorporate all the comments and submit the final report along with soft copy of the data for consolidation.

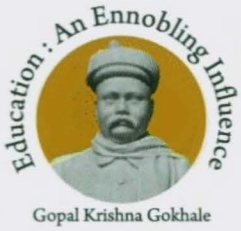
## **Annexure II**

### **Action Taken Report by the Authors**

#### **Comments on analysis, organization, presentation etc.**

1. All the tables in the chapter 'summary, conclusions and Policy Implications' have been removed and results are summarised in a precise manner. Suitable policy suggestions based on results obtained.
2. Table 7.5 has been removed and tables 6.7 and 6.8 have been revised suitably.
3. Suitable changes have been made on pages 88 and 89 of the draft report.
4. Suitable policy suggestion mentioned.

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