

Title: Effectiveness of Urea Super Granule Application on Rice Cultivation in Bangladesh

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ABSTRACT

Rice production in general, and boro rice production in particular is the major production as well as economic activity in Bangladesh. Sustaining and enhancing rice production in the face declining land and water resource through increasing input use efficiency and productive efficiency is a challenge ahead to meet increasing demand for a growing population. Among the fertilizer inputs, increasing use efficiency of fertilizer nitrogen (N), the most essential and limiting nutrient to rice cultivation is of crucial importance. This study was taken to assess the effectiveness of USG, in comparison with conventional PU, on rice production in Bangladesh.

The study, conducted in seven upazilas under seven districts of Bangladesh with a total 534 farmer respondents (267 USG farmers and 267 PU farmers), analyzed the socio-economic parameters of the farmers, input use, costs, returns and efficiency (technical, economic and allocative). Multiple regression analysis was used to measure the productive efficiency. Translog stochastic production function and translog stochastic revenue function were used to estimate the technical efficiency and economic efficiency. Technical and economic inefficiency effect was also estimated.

Average boro cultivation by a farmer was 0.735 ha of which 0.095 ha (12.93%) was cultivated by using USG and 0.64 ha (87.07%) was cultivated using PU. In terms of input use major difference between PU farmers and USG farmers was observed in applying urea fertilizer in the form of PU and USG. PU and USG farmers used 235 and 159 kg urea per ha, which was significantly different. USG farmers used 76 kg (32.34%) less urea than PU farmers. No significant difference was observed in other major inputs like other fertilizer, manure, total labourer and mechanical power cost. Labourer requirement for urea application was 5.06 by the PU farmers and 10.78 by the USG farmers, i.e. USG farmers had to use 5.72 additional labourer than PU farmers. Total labourer requirement was 128 and 129 by PU and USG. PU farmers incurred significantly higher pesticide cost than USG farmers (Tk. 1774 and 1439 per ha). Contrary to this, USG farmers incurred significantly higher irrigation cost than PU farmers (Tk. 9297 and 8676 per ha).

Significant difference was observed between PU and USG farmers regarding paddy yield, as PU farmers obtained 5306 kg and USG farmers obtained 5877 kg/ha. USG farmers produced 571 kg paddy (10.76%) higher than PU farmers. Total cost of producing paddy per ha was Tk. 80213 and 79729 by PU and USG farmers. Paddy return by PU and USG farmers was recorded Tk. 80297 and Tk. 90116 i.e. USG farmers received significantly higher return by Tk. 9819 (12.23%) than PU farmers. From paddy, PU and USG farmers obtained gross margin Tk. 26611 and Tk. 34996 per ha. USG farmers received a significantly higher gross margin than PU farmers by Tk. 8385 (31.51%). Net return from paddy as obtained by PU and USG farmers was Tk. 84 and Tk. 10387 per ha. USG farmers received a significantly higher net return from paddy than PU farmers, which is 123 times than PU farmers. BCR for paddy on cash cost basis by PU and USG farmers was 1.51 and 1.65 in the all farmer category. USG farmers showed a significantly higher BCR than PU farmers than PL" farmers, which is 9.27%. BCR for paddy on total cost basis by PU and USG farmers was 1.00 and 1.13.

From the estimates of production function, the coefficients of urea, other fertilizer and irrigation were found positive and non-significant, which were 0.3264, 1.3842 and 0.3167 respectively. It means that 1% additional application of these inputs would increase the paddy output by 0.3264%, 1.3842% and 0.3167%. The coefficients of seed, total labourer and mechanical power were found negative and non-significant, which were -3.77, -3.39 and -1.73 respectively. It means that 1% additional application of these inputs would decrease the paddy output by 3.77%, 3.39% and 1.73%. From the estimates of technical inefficiency effect model it was summarized that more experienced and educated farmers producing boro in clay and clay loam soil were less inefficient. USG alone was found to reduce technical inefficiency significantly by 13.02%.

From the estimates of revenue function, the coefficients of other fertilizer cost, and irrigation cost were found positive and insignificant, which were 1.6999 and 0.088 respectively. It means that additional 1% increase in the cost of those inputs would the paddy return by 1.6999% and 0.088% respectively. The coefficients of seed cost, urea cost, total labourer cost and mechanical power cost were found negative and non-significant, which were -1.59, -0.169, -0.307 and -1.516 respectively. It means that additional 1% increase in the cost of those inputs would decrease the paddy revenue by 1.59%, 0.169%, 0.307% and 1.516% respectively. From the estimates of technical inefficiency effect model it can be condensed that more experienced and educated farmers producing boro in clay and clay loam soil using USG were less inefficient USG alone was to reduce economic inefficiency significantly by 14.47%. The estimated average technical efficiency (TE) in paddy production by PU and USG was 84.07% and 94.80%. Significant differences between PU and USG farmers observed regarding technical efficiency. The technical efficiency results show that is considerable room for improvement of boro rice production using the existing i of resources in both cases i.e. PU and USG. And, only by using

USG instead of PU, farmers can increase technical efficiency by a significant margin. The average economic efficiency (EE) in paddy production by PU and USG farmers was estimated at 83.21% and 94.49%, which showed significant difference between PU and USG farmers. The economic efficiency results show that there is enough room for improvement of boro rice production using the existing level of resources in both cases i.e. PU and USG. And, only by using USG instead of PU, farmers can increase economic efficiency by a significant margin. The estimated mean AE in paddy production by PU and USG farmers was 98.95% and 99.65%. Regarding allocative efficiency, significant difference between PU and USG farmers was observed. As the estimated mean AE of both PU (98.95% or 0.9895) and USG (99.65% or 0.9965) farmers was close to 100%, overutilization of input use was very-low and/or negligible.