

Agro-Economic Impact of Nano Urea Application on the Scientific Cultivation of Rice in Imphal West District of Manipur, India

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Abstract

The present study was conducted as an alternative source of urea granule fertilizer in rice cultivation because of having due advantages for efficient use of resources in the rice production scenario so as to assess the agro-economic impact of Nano urea application in scientific cultivation of rice with the existing farmer's fertilizer practices in the state of Manipur. A sensitization programme was conducted through on-line mode with the IIFCO-Guwahati, IIFCO-marketing Manipur region along with the scientific and farming communities of Manipur under a novel initiative of ICAR-KVK, Imphal west. The IIFCO-Guwahati, ICAR-KVK agreed to conduct a trial on the farmers' fields of 2 districts (Imphal west and Kakching districts) of Manipur. KVK approached a local agriculture Drone service provider (Glazing Info-Tech., Nameirakpam, Manipur) and the trial cum demonstrations on the application of Nano urea using agriculture Drone was conducted on 25 farmers field covering 10 ha in Imphal West and 5 ha in Kakching district. Data on agronomic and economic attributes were taken to study the impact of Nano urea application on the agro-economic aspects under the supervision of ICAR-KVK, Imphal. The results of the demonstration were highly significant with a percent increased of 11.2% average yield over the Farmers Fertilizer Practice (FFP). The gross costs were found to Rs.71000 for FFP and Rs.70000 in the technology intervention with a net return of Rs.60000 for Nano urea application over the FFP of Rs. 43000. The response of the farmers for Nano urea application revealed that majority of them are not aware of the new technology intervention and they came to know only when the ICAR-KVK sensitized and implemented the technology in their field. Only 80%, 12%, 8% responded yes to perceptions such as the Know-how of Nano urea application, use of agriculture drone and Power sprayer. However, 96% responded that the productivity of the rice increased in case of the Nano urea application Thus, the Nano urea application had resulted in cost & drudgery reduction, thereby saving resources, increased the yield by 11.12% and enhanced farmers' income in rice production in the state of Manipur.

Keywords: Nano urea; Drone; Glazing Info-Tech; IIFCO-Guwahati; FFP, Nameirakpam, Kakching

Introduction

Indian Farmers Fertilizer Cooperative Limited (IFFCO) has put India on the Nano fertilizer map, the new chapter in farm technology with its Nano (liquid) urea. The new invention can radically transform agriculture, raise farm productivity, reduce water usage and contamination, and slash the Centre's fertilizer subsidy bill. Nanotechnology enables designing ultra-

small particles that offer higher surface-mass ratios, and help in the controlled delivery of plant nutrients. The benefits include the reduction in the excessive use of urea, improvement in soil health, more efficient water-use, lesser wastage and lower input costs for farmers.

The annual consumption of urea is 30 million tonnes. Typically, a farmer uses two bags per acre. Field trials show that a 500 ml bottle of Nano urea can

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replace one bag of conventional urea, and reduce the urea requirement by 50%. The product is priced at ₹ 240 per 500 ml bottle without subsidy, 10% lower than a bag of conventional urea. Today, urea prices are not decontrolled and the government pays a subsidy of around ₹ 15,000 per tonne. If 15 million tonnes of *Nano urea* is used instead of conventional urea, the savings in fertilizer subsidy will be around ₹ 22,500 crores. This means a 28% reduction in the budgeted fertilizer subsidy of ₹ 79,530 crores in 2021-22. A large portion of conventional urea is lost to the atmosphere or surface water bodies, polluting the ecosystem. Nano urea is ecologically better. IFFCO claims that the nitrogen present in *Nano urea* could raise yields by 8%, and reduce storage costs (Anon., 2021).

Manipur is a tiny state in the north eastern part of India and is the home for 30 lakhs peoples. In Manipur, rice is considered to be the major dominant crop and it occupies 90% of the total Gross Cropped Area (GCA). Agriculture or farming in their dwelling lands accounts for 80% of the state economy. Rice cultivation in both the *pre-kharif* and *kharif* seasons have been the major source of livelihood for majority of the farm families. Next to Assam, Manipur ranks second in the lists of rice production amongst the North-eastern states of India. Rice cultivation has been the only primary source of livelihood for the pro-poor farmers of the entire state of Manipur and the average productivity of rice in the valley district (90%) accounts for 3.2t/ha.

Urea fertilizer is an indispensable critical input use for rice production in the entire state of Manipur both in the kharif and pre-kharif season whereas other fertilizers like SSP and MOP are optional to the pro-poor and small & marginal farmers (35%) of the state. Every year, the availability of urea fertilizer during the peak rice cultivation season is limited due to lack of Govt. apathy and intentional hoarding coupled with black market of urea in the various urea marketing channels resulting in artificial scarcity and thereby the price of the urea granule usually increases to more than Rs. 1000/bag. However, the subsidized rate of urea fertilizer is only Rs.266/bag and the farmers are often panic during the rice growing season. The present study focuses the agro-economic impact of Nano urea application on the scientific cultivation of rice in Imphal west district of Manipur.

Basic hypothesis of the study

1. Recent IFFCO invention of Nano fertilizers has

propounded that Nano formulation and its application in crop production has resulted in the efficient use of fertilizers and thereby crop- fertilizer response changes significantly.

2. The present study was conducted as an alternative source of urea granule fertilizer in rice cultivation having due advantages for efficient use of resources in the rice production scenario so as to assess the agro-economic impact of Nano urea application in scientific cultivation of rice with the existing farmer's fertilizer practices in the state of Manipur

Statement of the problems and initiatives

During the kharif 2021-22, there was an artificial acute scarcity of urea in the state of Manipur and farmers were panic for the crop failure. It was reported in the local and national news about the death of a young farmer when he went to collect urea fertilizer during the stress C-19 pandemic period. ICAR-KVK Imphal West, ICAR Research Complex for NEH Region, Manipur Centre approached IFFCO Guwahati & Manipur Region with a request for supply of Nano urea.

Methodology

A sensitization programme was conducted through an on-line mode with the IFFCO-Guwahati, IFFCO-marketing Manipur region along with the scientific and farming communities of Manipur under Table 1: Demonstration cum trial on Nano urea application in the scientific cultivation of rice in Imphal West District of Manipur

Crop	Main <i>Kharif</i> Rice
Variety	RC-Maniphou-13
Duration	125-130 days
Seed rate	40 kg /ha
Date of sowing	12.07.2021
Transplanting age	16 -21 days with single seedling/hill
Spacing	25 cm x 10 cm
Area	15ha
Weeding	30 DAT & 45 DAT by Cono-weeder
Farmers Fertiliser Practice (FFP): T1	(50% urea and 100% SSP & MOP /ha as basal application) + 25% urea (30 DAT) +25% urea (60 DAT@3ml/lt)
Recommended Technology:	T2 (50% urea, 100 % SSP & MOP/ ha as basal application) + spray of Nano urea at 30 DAT + spray of Nano urea at 60 DAT @3ml/lt)

a novel initiative of ICAR-KVK, Imphal west. The IIFCO-Guwahati, ICAR-KVK agreed to conduct a trial on the farmer’s fields of 2 districts (Imphal west and Kakching districts) of Manipur. KVK approached a local Agriculture Drone service provider (Glazing Info-Tech., Nameirakpam, Manipur) and the trial cum demonstrations on the application of Nano urea using agriculture Drone were conducted on 25 farmers field covering 10 ha in Imphal West and 5 ha in Kakching district. Data on agronomic and economic attributes were taken to study the impact of Nano urea application on the agro-economic aspects of the rice grower in the adopted village of the ICAR-KVK, Imphal West.

The results of the demonstration were highly significant with a percent increased of 6% average yield over the Farmers Fertilizer Practice (FFP). The gross cost was found to Rs.71000 and Rs.74000 for Nano urea application and FFP respectively. Thus, Nano urea application resulted in cost & drudgery reduction, thereby saving resources and enhances

farmers’ income in rice production in the state of Manipur.

Results and Discussion

The on-farm testing of the FPP with 2 treatments (T1: Farmers Fertiliser Practice (FFP) (50%N and 100% PK Kg/ha as basal application + 25%N at 30 DAT & 25%N at 60 DAT and T2: FFP (50 % N, 100 % PK/ha as basal application) spray of Nano urea at 30 DAT (Tillering stage) + spray of Nano urea at 60 (Panicle Initiation stage) DAT) were recorded and analyzed. The results of the technology testing on agronomic attributes revealed much better in treatment 2 as against the treatment 1. The average plant height, no. of effective tillers, grain yield and straw yield were found to be 112.03 cm, 15, 58.5q and 63.50q in T1 whereas in T2 the corresponding results were recorded as 118.24 cm; 21 and 65 q and 67.5 q respectively. The agronomic attributes were highly significant in FPP trial (T2) over the FPP trial (T1)

Table 2: Agronomic attributes of Nano urea application in Imphal West District of Manipur

Treatment	Average Plant Height (cm.)	No. of effective Tillers (Av.)	Grain Yield (Kg/ sq.m)	Grain Yield (q/ha)	Straw Yield (q/ ha)
T1	112.03	15	0.58	58.50	63.50
T2	118.24	21	0.65	65.00	67.50

T1: Farmers Fertiliser Practice (FFP) (50%N and 100% PK -kg/ha as basal application)

T2: Recommended Practice (50 % N, 100 % PK-k/ha as basal application) + spray of Nano urea at 30 DAT (Tillering stage) + spray of Nano urea at 60 (Panicle Initiation stage) DAT

*Schedule spraying: 30 days & 60 days’interval @ 3ml/lt. water using Agriculture Drone

Table 3: Economic attributes of Nano urea application over farmers’fertilizer practice

Crop	Technology demonstrated	Demonstration Yield(q/ha)	Av Yield increase (%)	Gross Cost (Rs/ha)	Gross Return (Rs/ha)	Net Return (Rs/ha)	B: C Ratio		
		H	L	A					
Rice	T1:	63.00	54.00	58.50	11.12	74000	117000	43000	1.58:1
Rice	T2:	70.00	60.00	65.00	(T2 over T1)	70000	130000	60000	1.85:1

T1: Farmers Fertiliser Practice (FFP) (50%N and 100% PK Kg/ha as basal application + 25%N at 30 DAT & 25%N at 60 DAT)

T2: FFP (50 % N, 100 % PK/ha as basal application) spray of nano urea at 30 DAT (Tillering stage) + spray of nano urea at 60 (Panicle Initiation stage) DAT

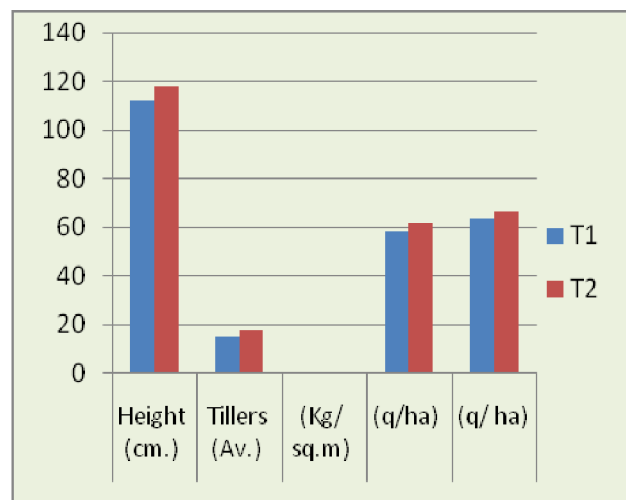


Figure 1: Agronomic attributes (Graphical representation)



Figure 2: Nano urea application using Drone

and it is shown in Table 1.

The analysis of the economic attributes of Nano urea application over farmers' fertilizer practice showed significant result with a percent increased of 11.2% average yield in Nano urea application (T2) over the Farmers Fertilizer Practice (FFP) T1. The gross costs were found to Rs.74000 for FFP and Rs.70000 in the technology intervention with a net return of Rs.60000 for Nano urea application over the FFP of Rs. 43000. The analysis of the benefit cost ratio revealed a significant ratio of 1.85:1 in T2 as against the 1.58:1 in T1. Thus, the Nano urea application had resulted in cost & drudgery reduction, thereby saving resources, increased the yield by 11.12% and enhanced farmers' income in rice production in the demonstrated area of the state of Manipur.

An investigation on the response of the farmers for Nano urea application revealed that majority of them are not aware of the new technology intervention and they came to know only when the ICAR-KVK sensitized and implemented the technology in their field. Interestingly, Nano urea is very new and it is first of its kind to all the farmers in the demonstrated area. Only 80%, 12%, 8% responded yes to perceptions such as the Know-how of Nano urea application, use of agriculture drone and Power sprayer. Also, 96% responded 'No' to drone availability and 80% are not aware of the Pros & cons of the Nano urea. However, 96% responded that the productivity of the rice increased in case of the Nano urea application.

Policy recommendation

Table 4: Farmers' perception on the application of Nano urea

S.No.	Perceptions	Respondent farmers	
		Yes (%)	No (%)
1	Nano Fertilizer is new to the farmer	100	0
2	Have the Know-how of application	80	20
3	Do you use agriculture drone	12	88
4	Do you use Power sprayer	8	92
5	Whether Nano urea is more economical than conventional urea and reduce drudgery	100	0
6	Is Nano urea readily available to the farmers	80	20
7	Is drone readily available to the farmers	4	96
8	Do you know the pros & cons of Nano urea	20	80
9	Whether productivity is increased from before	96	4

Although Nano urea is a boon for the Indian farmers, there are many drawbacks and lacunae for widespread adoption and acceptance of the technology at the farmers' level. The following recommendations/suggestions are kept for the policy makers so as to develop a sound fertilizer system and its uses at the grass-root level.

1. Provision of Agricultural Drone service provider through Custom Hiring Mechanism.
2. National level initiative for mass awareness campaign of nano urea regarding the pros & cons at the farmers' level.
3. Provision for subsidy of Drone and Power sprayer especially for the nano urea users.

4. Cluster approach must be implemented and adopted for the overall economy of the production system.

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