Indian Farmers Fertiliser Cooperative Limited
IFFCO Sadan, C-1, District Centre,
Saket, New Delhi -110017

(Recording and/or screenshot of the VC is prohibited)
**NITROGENOUS FERTILISER SCENARIO**

1. Urea accounts for > 82% of the nitrogenous fertilizers applied to crops

2. Globally, 188 million MT of Urea is applied to crops every year.

3. NPK ratio is skewed and distorted due to overuse of fertilizers.

4. Low use efficiency of Urea (30-40 %) – Compromises health of Soil-Air-Water
• Excess use of Urea causes environmental issues & results in susceptibility of crops to Insects, Pests & Diseases

• Excessive foliage growth leads to crop lodging

• It leads to deterioration of soil health due to mining of micronutrients
Use of N-fertilizers causes NOx emissions

1 Kg of NOx emission is equivalent to 298 Kg of Carbon dioxide

Part of Urea gets converted in NOx and emitted to atmosphere

Use of N-fertilizers causes NOx emissions

NANO UREA BENEFITS

Nano Urea will help in eliminating NOx and Ammonia emissions

Potential to help in meeting the UN Sustainable Goals and help in achieving the objectives of Paris Climate Agreement of limiting Global Warming below 2 Deg C
Runoff to rivers, lakes and oceans causing excessive algae growth

Excess Nitrates leaching to Ground/Drinking water

Excessive algae impacts fish and aquatic life due to oxygen depletion

Excessive Nitrates in Drinking Water harmful for human health

Nano Urea will help in improving the soil health, improving aquatic life, reduce nitrate leaching losses and improve ground water quality
IFFCO - Nano Biotechnology Research Centre (NBRC)
NANO UREA FOR SUSTAINABLE AND PRECISION AGRICULTURE

- Evaluated by the ICAR and DST approved labs.
- Tested as per OECD and DBT- Govt of India guidelines for Nano Agri Inputs-2020

PRODUCE MORE
Improves Crop Productivity

REQUIRE LESS
Reduces use of Conventional Urea

NON TOXIC

ECONOMICALLY AFFORDABLE

BIO/ECO - SAFE
Improves Soil Health
IFFCO NANO UREA

- Nano-technology based revolutionary agri-input, provide nitrogen fertilizer to plants.

- Easy to use! Mix with water and spray on plant leaves.

- Tested on over 11000 farm fields on 94 crops and 20+ agricultural research institutes/universities on 43 crops.

- Approved by Govt. of India.

- Compliance with national (India) and international safety/toxicity guideline to test nanomaterials.

- Promote sustainable and precision in agriculture.
DEVELOPMENT OF NANO FERTILIZERS: Testing & Validation

1. Efficacy trials by the research institutes and universities affiliated with ICAR

2. Validation studies for nanoscale characterization, stability and safety (biosafety – toxicity) fulfils the Department of Biotechnology (DBT) guideline-2020 for the evaluation of on Nano Agri Input Products (NAIPs) and International OECD Testing Guidelines (TGs)

3. Products were evaluated by the NABL accredited, GLP certified and DST approved laboratories of Bioscience Research Foundation (BRF), Chennai and Department of Nano Science & Technology (NST) of Tamil Nadu Agricultural University (TNAU), Coimbatore
Nano Urea is applied @ 500 ml/acre at initial growth stage and before flowering

- When sprayed on leaves initially it gets absorbed easily and also enters through stomata and other pores
- It is translocated & metabolically assimilated as proteins, amino acids etc. as per the plant’s need

Nano Urea is a viable alternative to wean the farmers away from Urea.

Source: Wang et al. 2013
NANO UREA – DELIVERED TO PLANTS BY FOLIAR SPRAY

Spray by **Drones** and **Backpack Sprayers**
## Multi location- Multi Crop - Farmer Field Trials (FFT’s)

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>STATE / UT’s</th>
<th>State wise No. of Trials (Rabi 2019-20)</th>
<th>STATE / UT’s</th>
<th>State wise No. of Trials (Rabi 2019-20)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ANDAMAN AND NICOBAR ISLANDS</td>
<td>4</td>
<td>MANIPUR</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>ANDHRA PRADESH</td>
<td>170</td>
<td>MEGHALAYA</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>ASSAM</td>
<td>111</td>
<td>MIZORAM</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>BIHAR</td>
<td>423</td>
<td>NAGALAND</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>CHHATTISGARH</td>
<td>96</td>
<td>ODISHA</td>
<td>318</td>
</tr>
<tr>
<td>6</td>
<td>GUJARAT</td>
<td>619</td>
<td>PUNJAB</td>
<td>660</td>
</tr>
<tr>
<td>7</td>
<td>HARYANA</td>
<td>594</td>
<td>RAJASTHAN</td>
<td>900</td>
</tr>
<tr>
<td>8</td>
<td>HIMACHAL PRADESH</td>
<td>119</td>
<td>TAMIL NADU</td>
<td>503</td>
</tr>
<tr>
<td>9</td>
<td>JAMMU AND KASHMIR</td>
<td>24</td>
<td>TELANGANA</td>
<td>386</td>
</tr>
<tr>
<td>10</td>
<td>JHARKHAND</td>
<td>96</td>
<td>TRIPURA</td>
<td>4</td>
</tr>
<tr>
<td>11</td>
<td>KARNATAKA</td>
<td>158</td>
<td>UTTAR PRADESH</td>
<td>1459</td>
</tr>
<tr>
<td>12</td>
<td>KERALA</td>
<td>30</td>
<td>UTTARAKHAND</td>
<td>80</td>
</tr>
<tr>
<td>13</td>
<td>MADHYA PRADESH</td>
<td>679</td>
<td>WEST BENGAL</td>
<td>725</td>
</tr>
<tr>
<td>14</td>
<td>MAHARASHTRA</td>
<td>548</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Total / Average | 8719 |

### Yield Increase Over Farmer Practice

<table>
<thead>
<tr>
<th>Nano N</th>
<th>Nano Zn</th>
<th>Nano Cu</th>
<th>Nano N, Zn, Cu</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.8%</td>
<td>4.3%</td>
<td>3.5%</td>
<td>7.9%</td>
</tr>
</tbody>
</table>

State/UT:
- 27

District:
- 474

Trials:
- 9,133

Harvest:
- 8719

Crops:
- 94

Crop Area (Ha):
- 1,476

Scientist Visits:
- 930

Res. Institutes / SAUs / KVKs Trials (Total):
- 43

[https://iffconano.in/analytics](https://iffconano.in/analytics)
Multi location- Multi Crop ‘On Station’ and ‘On Farm’ Efficacy Trials of Nano Fertilizers

<table>
<thead>
<tr>
<th>Research Institute / University</th>
<th>Crop</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICAR - Indian Agricultural Research Institute, New Delhi</td>
<td>Wheat, Mustard</td>
<td>Results indicate that 25 -50 % nitrogen fertilizer reduction in wheat and mustard is possible with 2 sprays of Nano Nitrogen.</td>
</tr>
<tr>
<td>ICAR – Indian Institute of Horticultural Research, Bengaluru, Karnataka</td>
<td>Tomato, Cabbage, Cucumber</td>
<td>Application of Nano N (two spray) can reduce the use of urea consumption by 50%. Nano nutrients increase plant growth and developments, moreover improves agronomic properties.</td>
</tr>
<tr>
<td>Anand Agricultural University (AAU), Gujarat</td>
<td>Wheat</td>
<td>Foliar application of nano N, nano Zn and Nano Cu significantly increased yield attributing characters of wheat. Application of nano fertilizer did not change the soil properties after harvest of the crop. Application of nano N can reduce the use of urea consumption by 50%. Combination of nano N, Zn and Cu shows synergistic impacts on plant growth and development.</td>
</tr>
</tbody>
</table>
## Multi location- Multi Crop - Farmer Field Trials (FFT’s) of Nano Fertilizers

<table>
<thead>
<tr>
<th>Location</th>
<th>Crop</th>
<th>Treatment</th>
<th>Mean Yield (Kg/ha)</th>
<th>% Increase (Overall)</th>
<th>Net Return (Rs / ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uttarakhand</td>
<td>Wheat (431 Nos.)</td>
<td>FFP@</td>
<td>4354</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>FFP (- 50 % N) + 2 Nano N Sprays</td>
<td>4779</td>
<td>9.76</td>
<td>8,182</td>
</tr>
<tr>
<td></td>
<td>Mustard (44 Nos.)</td>
<td>FFP</td>
<td>1708</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>FFP (- 50 % N) + 2 Nano N Sprays</td>
<td>1837</td>
<td>7.55</td>
<td>5,724</td>
</tr>
<tr>
<td></td>
<td>Potato (187 Nos.)</td>
<td>FFP</td>
<td>32,298</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>FFP (- 50 % N) + 2 Nano N Sprays</td>
<td>35,414</td>
<td>9.65</td>
<td>31,165</td>
</tr>
</tbody>
</table>

@ Farmer Fertilizer Practice (FFP)
## Some Glimpses of IFFCO Nano Fertilizers Tested Across India

<table>
<thead>
<tr>
<th>Location</th>
<th>Crop (Rabi 2019-20)</th>
<th>Organic Farming Area</th>
<th>Average Increase in Nano N plots over control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Khaliyawas, Rewari (Haryana)</td>
<td>Mustard &amp; Wheat</td>
<td>50 Acres</td>
<td>11.8 %</td>
</tr>
</tbody>
</table>

Results: More number of tillers & branches over control. More number of Siliqua/plant and number of grains per siliqua. Average 2.55 quintal incremental higher yield in Nano N and combination of Nano N + Nano Zn + Nano Cu plots.
NANO UREA ENHANCES NUTRITIONAL STATUS OF CROP PRODUCE

- Harvested grains of Nano Urea treated plots of wheat and chickpea crops recorded increase in nutritional content (Protein, Carbohydrate, Oil, Fiber) and mineral content (N, P, K, S, Zn, Cu, Fe).

- In Apple cultivar. Red Delicious variety in Kashmir Valley - Fruit quality (Colour, Firmness, Soluble sugar content) and nutrient content (N, P, K, Ca, Mg and S) improved with the application of Nano Urea.
IFFCO Nano Nitrogen, Nano Zinc and Nano Copper have been evaluated and validated according to the "Guidelines for Evaluation of Nano based Agri Input and Food Products in India" released by the Department of Biotechnology (DBT), Govt. of India.

Food toxicity and safety studies of harvested produce by NABL-GLP certified labs have also confirmed that IFFCO Nano fertilizers are safe and effectively assimilated inside the plant system with no toxic effect at recommended levels.
IFFCO Nano Urea is approved by FCO, Govt. Of India as a Nano fertilizer. It is cost effective & compatible with most of the agrochemicals, bio-stimulants and speciality fertilisers for application to crops.

Foliar application of nano fertilizers calls into focus efficient spray technologies with agritech solutions such as drone, improved sprayers etc. for better farming application practices.

Nano fertilizers are ‘Informed Choice’ available to farmers to address the limitations faced by today’s agriculture.

Nano fertilizers will lead to self-reliance and help in meeting the Sustainable Development Goals (SDGs) with reduced environmental footprints.
Thank You

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