



## Nano DAP

**For Prelims:** [Interim Budget 2024-25](#), Nano Fertilizer, [Indian Farmers Fertiliser Cooperative \(IFFCO\)](#).

**For Mains:** Nano DAP, Issues Related to Using Nano DAP.

**Source:** IE

### Why in News?

Recently, the Finance Minister in the [Interim Budget 2024-25](#) has announced the expansion of the application of **Nano DAP (Di-Ammonium Phosphate)** as a [Fertilizer](#) on various crops in all agro-climatic zones.

- Nano fertilisers are **highly efficient types of fertilisers** that provide nutrients like nitrogen to crops through fine granules.

### What is Nano DAP?

- **DAP (Di-Ammonium Phosphate):**
  - DAP is the second most commonly used fertilizer in India after urea.
  - DAP is a preferred fertilizer in India because it contains both **Nitrogen and Phosphorus** which are primary macro-nutrients and **part of 18 essential plant nutrients**.
  - Fertilizer grade DAP **contains 18% Nitrogen and 46% Phosphorus**. It is manufactured by **reacting Ammonia with Phosphoric acid** under controlled conditions in fertilizer plants.
- **Nano DAP:**
  - **Nano DAP is a specialised form of DAP** designed with the goal of improving the fertiliser's effectiveness in promoting plant growth and development.
  - In 2023 [Indian Farmers Fertiliser Cooperative \(IFFCO\)](#) launched its Nano DAP, containing **8% Nitrogen and 16% Phosphorus by volume**.
  - Unlike conventional DAP, which comes in granular form, IFFCO's Nano **DAP is in liquid form**.

### Primary Macro-nutrients Essential for Plant Growth

Nutrient	Contribution to Plant Growth
Nitrogen	Essential for <b>leaf and stem growth</b> , protein synthesis, and overall vigour
Phosphorus	Crucial for <b>root development, flowering, fruiting</b> , and energy transfer
Potassium	Aids in <b>overall plant health, stress resistance</b> , and regulation of water

Calcium	Important for <b>cell wall structure, cell division</b> , and enzyme activation
Magnesium	Essential <b>component of chlorophyll, involved in photosynthesis</b> and metabolism
Sulfur	Necessary <b>for protein synthesis, enzyme function</b> , and nutrient uptake
Carbon	Main component of <b>organic molecules, essential for photosynthesis</b>
Hydrogen	Critical for <b>biochemical reactions</b> , water uptake, and maintaining pH
Oxygen	Involved in <b>respiration, energy release, and nutrient transport</b>
Iron	Key for <b>chlorophyll synthesis, electron transfer</b> , and enzyme activation
Zinc	Essential for <b>enzyme function, hormone regulation</b> , and protein synthesis
Manganese	Required for <b>photosynthesis, enzyme activation</b> , and nitrogen metabolism
Copper	Important for <b>enzyme activity, lignin formation</b> , and nutrient uptake
Boron	Facilitates <b>cell division, sugar transport, and hormone regulation</b>
Molybdenum	Needed for <b>nitrogen fixation, enzyme activity</b> , and amino acid synthesis
Chlorine	Involved in <b>photosynthesis, water regulation</b> , and ion balance
Nickel	Required for <b>nitrogen metabolism, enzyme activation</b> , and seed development
Cobalt	Essential for <b>nitrogen fixation, vitamin B12 synthesis</b> , and enzyme activity

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## NANO DAP

Nano DAP is a nanotechnology based revolutionary agri input which provides nitrogen and phosphorous to plants. Nano DAP is a sustainable option for farmers towards smart agriculture and to combat climate change. Nano DAP is bio available to plants because of its desirable particle size (<100 nm), more surface area and more particles per DAP prill.

### Benefits



Higher Crop Yield



Increase in Farmer's Income



Quality Food



Reduction in Chemical Fertilizer Usage



Environment Friendly



Easy to Store & Transport

## What is the Significance of Promoting Nano DAP?

- **More Efficient than Conventional DAP:**
  - This tiny particle, **size less than 100 Nanometre (nm)**, makes Nano DAP **more efficient than its conventional counterpart**, enabling the fertiliser **“to enter easily inside the seed surface** or through stomata and other plant openings”.
  - Better assimilation of the fertiliser inside the plant system in turn leads to **“higher seed vigour, more chlorophyll**, photosynthetic efficiency, better quality and increase in crop yields.”
- **Pocket-Friendly:**
  - It is more pocket-friendly than its conventional counterpart. A 500 ml bottle of Nano DAP, equivalent to a 50-kg bag of conventional DAP, is priced at only Rs 600 (compared to Rs 1,350 for the bag).
  - Since the government provides significant subsidies on DAP, the adoption of a more inexpensive fertiliser will **likely be a significant relief to the government’s subsidy burden**.
- **More Convenient for Farmers:**
  - For farmers, Nano DAP is significantly more convenient as it comes in small 500 ml bottles, which are **easier to carry, store, and apply than heavy 50kg bags**.
  - To use Nano DAP, farmers simply mix 250-500 ml of it with water and spray it on their crops, with this amount being needed per acre per spray.
- **Reduction of Import Burden:**
  - India currently imports significant quantities of fertiliser to meet domestic demand.
  - The adoption of domestically-produced **Nano DAP (produced in Kalol, Gujarat)** is set to significantly reduce this import burden.
  - It will not only take Indian agriculture forward in foodgrain production but it will also make **India self-reliant in fertiliser production**.
- **Lesser Impact on Environment:**
  - Because of its liquid nature, nano DAP will have less impact on the environment, which leads to lower land contamination than other fertilisers.
  - By utilising liquid DAP and liquid urea, farmers may increase the number of earthworms in their fields and transition to natural farming without sacrificing productivity or profitability.

## What is Nano Urea?

- **About:**
  - **Nano Urea** is urea in the form of a nanoparticle. It is a **nutrient (liquid) to provides nitrogen to plants as an alternative** to the conventional urea.
    - Urea is a chemical nitrogen fertiliser, white in colour, which artificially provides nitrogen, a major nutrient required by plants.
  - It is **developed to replace conventional urea** and it can curtail the requirement of the same by at least 50%.
    - It **contains 40,000 mg/L of nitrogen in a 500 ml bottle** which is **equivalent to the impact of nitrogen nutrient provided by one bag of conventional urea**.
- **Developed at:**
  - It has been indigenously developed at **Nano Biotechnology Research Centre, Kalol, Gujrat in line with Atmanirbhar Bharat** and Atmanirbhar Krishi.
    - India is dependent on imports to meet its **urea requirements**.
- **Objective:**
  - It is aimed at **reducing the unbalanced and indiscriminate use of conventional urea**, increasing crop productivity, and reducing soil, water, and air pollution.

## What are the Concerns About Using Nano DAP?

- **Reduced Fertiliser Input:**
  - While **nano urea and nano DAP offer convenience** in handling and application, their **use may lead to a reduction in the total volume of fertilizer applied** compared to conventional fertilizers.
  - This reduction can result in lower nutrient availability to crops, **leading to decreased productivity.**
- **Nutrient Imbalance:**
  - Nano formulations may **alter the nutrient balance in soil and plants**, potentially affecting crop growth and development. This imbalance could result in **deficiencies or toxicities of certain nutrients**, impacting overall yield and quality.
- **Environmental Impact:**
  - The long-term environmental impact of nano-fertilisers is not yet fully understood. There are **concerns about the potential accumulation of nanoparticles in soil** and water, which could **affect ecosystems and biodiversity.**
- **Health and Safety:**
  - Concerns include the **potential for these particles to enter the food chain** and impact human health. It's **crucial to assess the potential risks associated with exposure to nanoparticles during production**, application, and consumption.
  - Excessive **concentrations of nano-sized particles pose health risks** due to their ability to deeply penetrate the body's tissues and cells.

## Note

IFFCO is one of India's biggest cooperative societies which is wholly owned by Indian Cooperatives.

- Founded in **1967 with just 57 cooperatives**, today it is an amalgamation of over 36,000 Indian Cooperatives with diversified business interests ranging from General Insurance to Rural Telecom apart from its core business of manufacturing and selling fertilisers.

## Conclusion

It's important to note that ongoing research is being conducted to address these concerns and to better understand the benefits and risks associated with nano-fertilizers. As with any new technology, a cautious and well-informed approach is crucial to ensure sustainable and responsible use in agriculture.

## UPSC Civil Services Examination, Previous Year Question (PYQ)

### Prelims:

**Q. With reference to chemical fertilizers in India, consider the following statements: (2020)**

1. At present, the retail price of chemical fertilizers is market-driven and not administered by the Government.
2. Ammonia, which is an input of urea, is produced from natural gas.
3. Sulphur, which is a raw material for phosphoric acid fertilizer, is a by-product of oil refineries.

**Which of the statements given above is/are correct?**

- (a) 1 only
- (b) 2 and 3 only
- (c) 2 only
- (d) 1, 2 and 3

**Ans: (b)**

**Exp:**

- The Government of India subsidizes fertilizers to ensure that fertilizers are easily available to farmers and the country remains self-sufficient in agriculture production. The same has been achieved largely by controlling the price of fertilizer and the amount of production. Hence, statement 1 is not correct.
- Ammonia ( $\text{NH}_3$ ) has been synthesized from natural gas. In this process, natural gas molecules are reduced to carbon and hydrogen. The hydrogen is then purified and reacted with nitrogen to produce ammonia. This synthetic ammonia is used as fertilizer, either directly as ammonia or indirectly after synthesis as urea, ammonium nitrate, and monoammonium or diammonium phosphates. Hence, statement 2 is correct.
- Sulfur is a major by-product of oil refining and gas processing. Most crude oil grades contain some sulfur, most of which must be removed during the refining process to meet strict sulfur content limits in refined products. This is done through hydrotreating and results in production of  $\text{H}_2\text{S}$  gas, which is converted into elemental sulfur. Sulfur can also be mined from underground, naturally-occurring deposits, but this is more costly than sourcing from oil and gas and has largely been discontinued. Sulfuric acid is used in the production of both Monoammonium Phosphate (MAP) and Diammonium Phosphate (DAP). Hence, statement 3 is correct.
- Therefore, option B is the correct answer.

**Mains:**

**Q.** What are the different types of agriculture subsidies given to farmers at the national and at state levels? Critically, analyse the agricultural subsidy regime with reference to the distortions created by it. **(2013)**

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