Scientific Authenticity of Nano Liquid Urea

For Prelims: Scientific Authenticity of Nano Liquid Urea, Indian Farmers and Fertiliser Cooperative (IFFCO), Climate Change, Ocean Acidification, Ozone Depletion.

For Mains: Scientific Authenticity of Nano Liquid Urea. Issues Related to Using Nano Liquid Urea.

Source: DTE

Why in News?

Recently, an opinion paper published in the **journal "Plant and Soil"** has raised concerns about the scientific validity of **Nano Liquid Urea** produced by the **Indian Farmers and Fertiliser Cooperative (IFFCO).**

- The paper questions the **claims made about the efficacy and benefits** of the product, emphasizing the **need for rigorous scientific scrutiny** before launching nano fertilizers into the market.

What is Liquid Nano Urea?

- **About:**
  - It is urea in the **form of a nanoparticle.** It is a nutrient (liquid) to provide **nitrogen to plants as an alternative** to the conventional urea.
    - Urea is a chemical nitrogen fertilizer, 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.**
- **Significance:**
  - Liquid Nano Urea has been **found effective and efficient for plant nutrition** which increases production with improved nutritional quality.
    - It can boost a balanced nutrition program by reducing the excess use of Urea application in the **soil and make the crops stronger, healthier** and protect them from the lodging effect.
  - It has a positive **impact on the quality of underground water,** a very significant reduction in global warming with an impact on **climate change and sustainable development.**

What is the Background?

- IFFCO had asserted that **a small quantity of nano liquid urea could replace a substantial amount** of conventional urea.
- The central government and IFFCO have ambitious plans to expand nano urea production and export.
- The researchers express concerns about the **potential consequences of these plans, as exaggerated claims could lead to severe yield losses**, impacting food security and farmer livelihoods.

What are the Concerns Raised By the Paper?

- **Discrepancy Between Claims and Outcomes:**
  - Nano liquid urea was introduced as a promising alternative to traditional granular urea.
  - Nano liquid urea has failed to **deliver noticeable results i**n the field. Farmers using the fertiliser have **experienced increased input costs** without corresponding improvements in crop yield.
  - This highlights the **discrepancy between product claims and real-world outcomes.**
- **Environmental Concerns:**
  - While IFFCO advertised nano urea as environmentally friendly, the paper finds **no scientific basis for this claim.**
  - It emphasizes that nitrogen, a vital compound for crop growth, has been linked to **numerous environmental issues such as Climate Change**, **Ocean Acidification**, **and** Ozone Depletion.

What are the Recommendations of the Study?

- The study underscores the **need to address excess nitrogen** due to its adverse impact on the environment.
- The opinion paper highlights the **importance of transparent and rigorous scientific evaluation** before introducing novel agricultural technologies.
- With implications for food security, farmers' livelihoods, and the environment, this controversy underscores the need for responsible innovation and evidence-based **decision-making in the agricultural sector.**

What is Indian Farmers Fertilizer Cooperative Limited?

- **About:**
  - It 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 fertilizers.
- **Objective:**
  - To enable Indian farmers to prosper through timely supply of reliable, high quality agricultural inputs and services in an environmentally sustainable manner and to undertake other activities to improve their welfare.

Conclusion

- The Nano Liquid Urea controversy underscores the **necessity for transparency, and responsible innovation** in the agricultural sector.
- Striking a balance between technological advancements and **environmental sustainability is vital** for the well-being of farmers, **Food Security,** and the planet.

UPSC Civil Services Examination, Previous Year Question (PYQ)

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 (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 H_2S 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.**