

Nano-fertilizer: Role in Sustainable Agriculture

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Introduction

Nano fertilizers are defined as materials in the nanometre scale, usually in the form of nanoparticles, containing macro and micronutrients that are delivered to crops in a controlled mode. Nano Technology is playing important role in agriculture sector, with the help of nanotechnology we can reduced the amount of fertilizer through the smart delivery of active ingredients, helpful in increased nutrient uptake and nutrient use efficiency, provide better yield and may help in reducing the soil pollution due to excessive use of fertilizers and decrease the different ways of fertilizer losses through volatilization, leaching and runoff

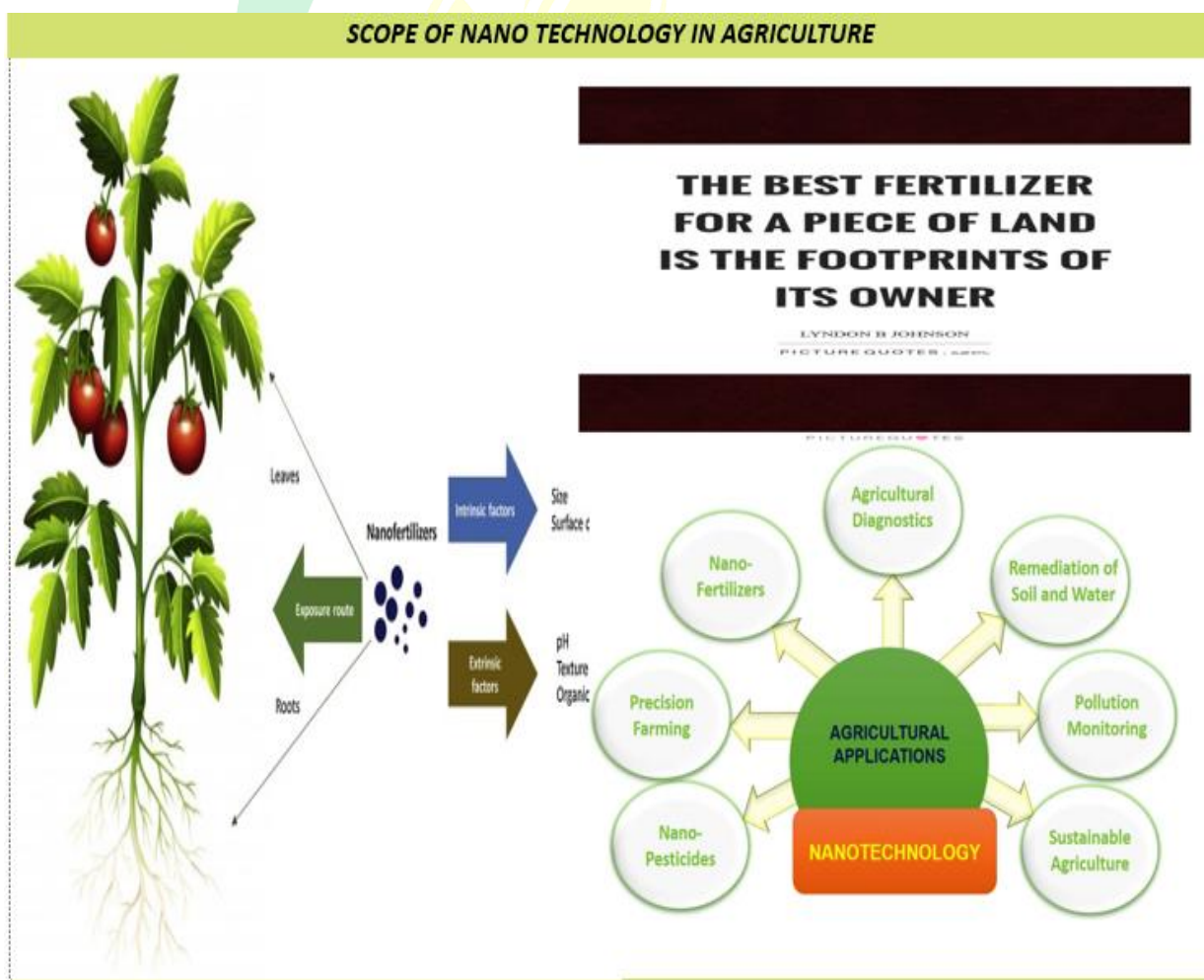
Advantages of nano fertilizer in sustainable development

- In conventional nutrient management systems, it is very difficult to control the micronutrient delivery to a specific crop, but Nano fertilizer provides the opportunity to the growers for supplying adequate amount of nutrients. They also increase bioavailability of nutrient through their high specific surface area, miniature size and high reactivity
- Three times increase in Nutrient Use Efficiency (NUE).
- Prevent the loss of nutrients.
- Reduce the demand for fertilizers About 80 to 100 times
- Improve water-holding capacity and soil quality.
- Increase microbial activity
- The interaction between gold nanoparticles and plant growth promoting rhizobacteria was shown to exert positive effects.
- Using small quantities of Nano Fertilizer the soil does not get loaded with salts that usually are prone to over-application using conventional fertilizers on a short- or long-term basis.

- Advantage for using, Nano fertilizers can be synthesized according to the nutrient requirements of intended crop crops.

Disadvantages of nano fertilizer in sustainable development

- It can lead to serious health risk due to cyto-and genotoxicity aspects. It is seen that zinc oxides nano fertilizers disturb the symbiotic relationship of rhizobia-legumes thereby affecting the nitrogen process.
- Nano-materials can interact with soil components and may cause toxicity.
- Nano-fertilizers can accumulate in plant parts, leading to growth inhibition, generation of reactive oxygen species, and cell death
- Can accumulate in food parts and, when consumed, may cause human health problems.
- Reactivity and variability of nano-materials have raised safety concerns for workers



Future Prospects:

Developing countries such as India and several others have extensive agriculture practices, which are being mitigated in the rural background. Bad impact of excessive use of fertilizer cause problem like Eutrophication, Acidity in soil, Pollute the ground water table through leaching and Soil pollution. The use of nano fertilizer may control this Problem by applying it in small quantity than conventional fertilizer, which full fill the nutrient demands of the plants that's why Nano-fertilizer are alternative for conventional fertilizer. It Provide good Substitute to farmer and also may help in raising farmer income. Nano-fertilizers could play in enhancing the efficiency of transport, delivery, and plant uptake of nutrients which would enable their optimal use. Therefore, scientists and media personnel must initiate harmonious and committed joint efforts along with reliable governmental support so that the exact scientific rationale for nano-fertilizer usage is understood.

Conclusion:

- To meet sustainable development goals, agriculture production needs to be increased and pollution and GHG emission related to farming activity need to be decreased.
- The application of biotechnology and nanotechnology has the potential to facilitate improved nutrient management and their ill effect in agro ecosystem.
- Nano fertilizer based on slow/controlled -release systems have been shown to improve crops yield, soil productivity and lower nutrient loss as compared to conventional fertilizer.
- More research are required globally to study the effect of Nano fertilizer in different climatic zones

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