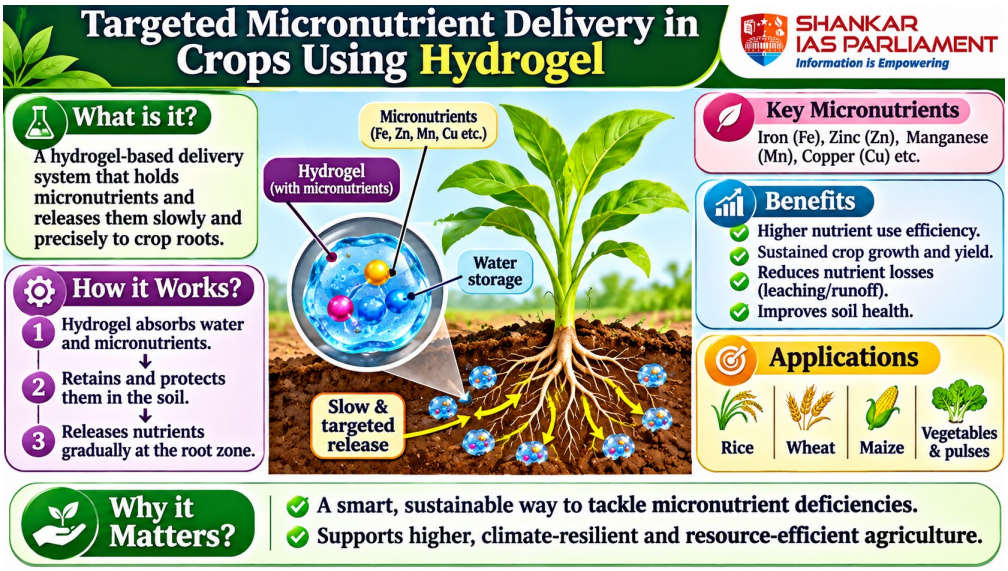
Targeted Micronutrient Delivery in Crops

Prelims: *Current events of National and International Importance| Science and Technology*

Why in News?

Researchers at IIT Gandhinagar have adapted a targeted drug-delivery mechanism from cancer therapy to create pH-responsive, seaweed-based hydrogel microbeads for crops.

- **Mechanism-** Inspired by localized cancer therapy and wound care, the ~3.5 mm hydrogel beads remain dormant until plant roots secrete organic acids due to nutrient stress, lowering the surrounding soil pH (rhizosphere).
- **Targeted Release-** Acidic triggers cause the beads to swell and release vital micronutrients—such as iron, zinc, manganese, and copper—directly where roots need them.
- **Composition-** Formulated using kappa carrageenan (derived from red seaweed) and trans-ferulic acid (a natural antioxidant), cross-linked with calcium chloride.
- Lab tests show significantly higher nutrient release in acidic conditions (pH 4) compared to neutral or alkaline environments.
- **Impact & Status-** This approach minimizes the runoff and soil-locking issues typical of conventional mineral fertilizers.
- Published in *ACS Omega* and recognized at the SOMS 2026 Summit, an Indian patent has been filed as the team seeks industry partnerships for field trials.



Reference

The Indian Express| Targeted Micronutrient Delivery in Crops

