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Water Management at Agricultural Catchment - Sustainable & Technological Approaches for Pollution Control

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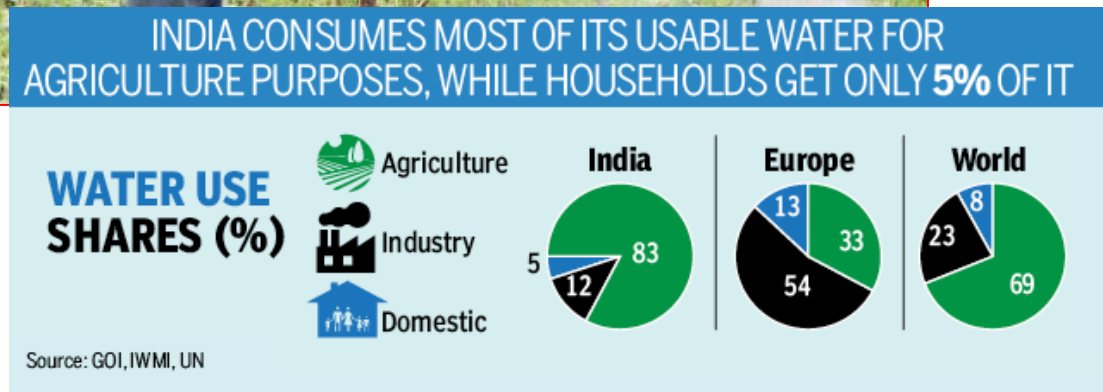
INTRODUCTION

Surface water management at agricultural catchment level is one of the challenging and most difficult tasks due to the multidimensional and non-point contamination sources. Contamination of surface water by various emerging pollutants released from agricultural has drastically increased due to difficulties in identification of contamination type and sources.

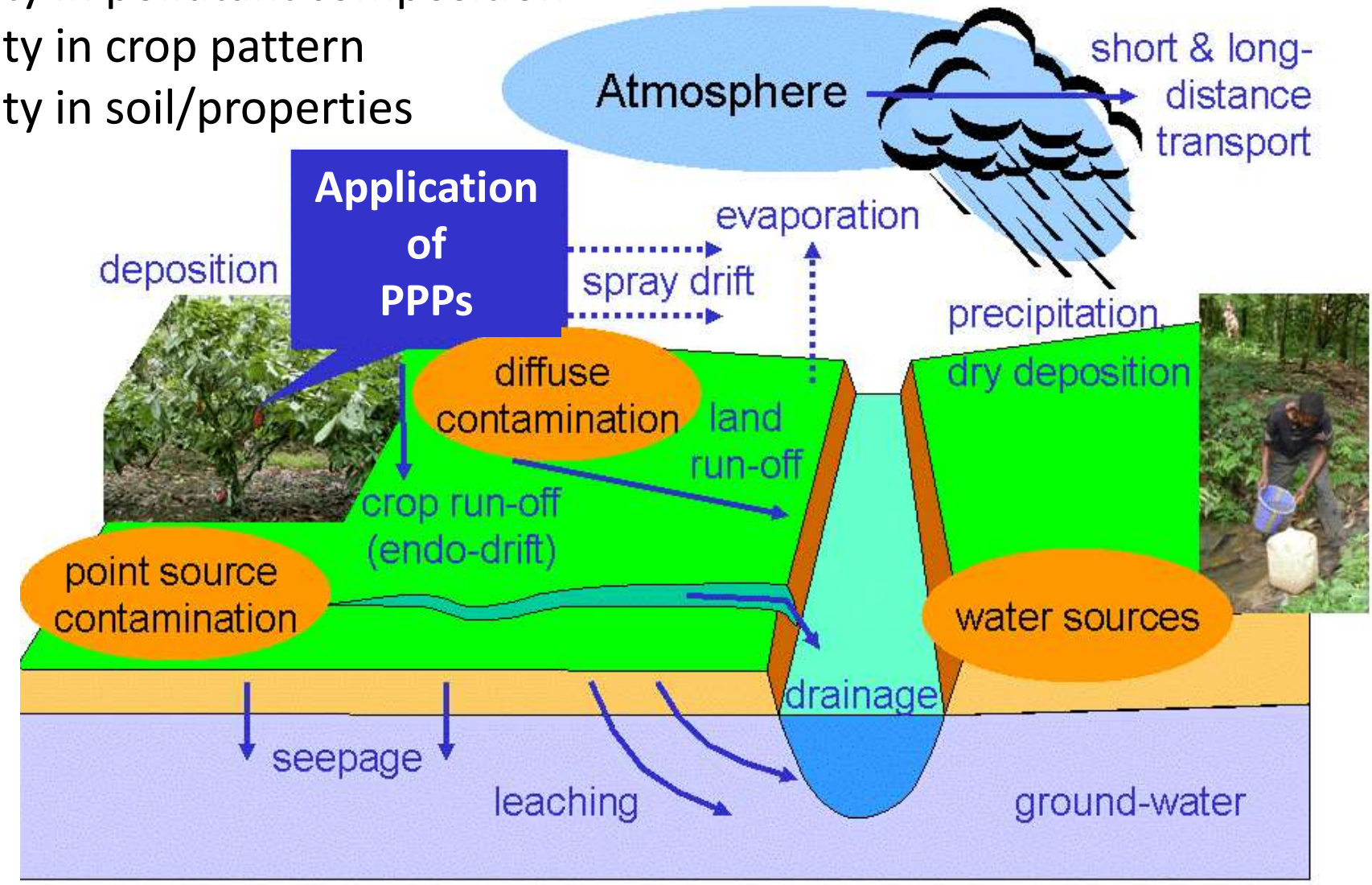
Plant protection Products (PPPs)

- Plant Nutrients
- Pesticide
- Insecticides
- Plants residues, etc

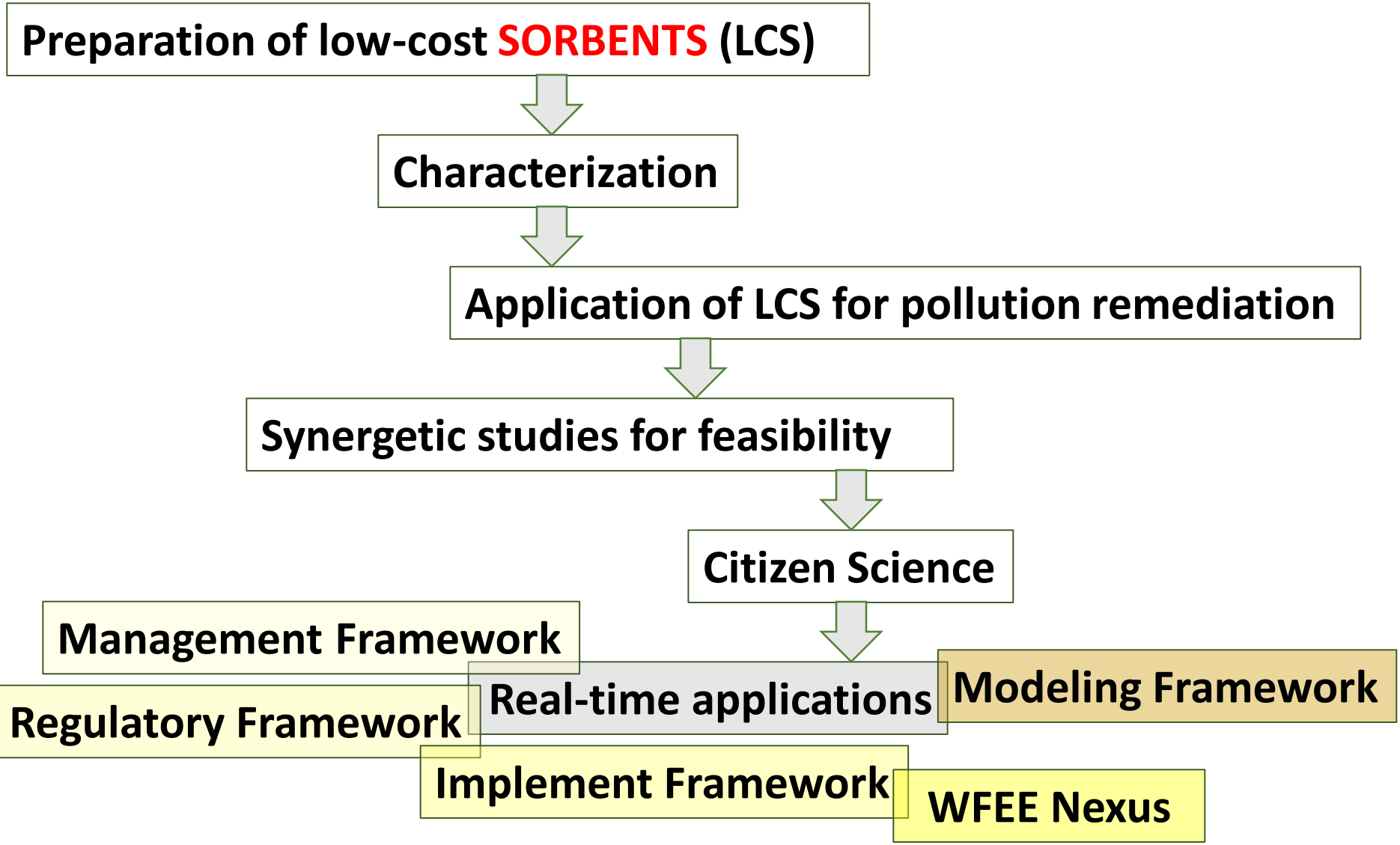


PRACTICAL CHALLENGES AT AGRICULTURAL CATCHMENT

- Non-point (Un-defined) pollution sources
- Diversity in pollutant composition
- Diversity in crop pattern
- Diversity in soil/properties



OVERVIEW OF THE STUDY



LOW-COST & INDIGENOUS ACTIVE LCS FOR POLLUTION REMEDIATION

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Rice husk


Water Hyacinth


Coontail


Coconut shell

Cleaning → **Shredding** → **Pyrolysis** → **Soaking**

Husk & trace dust

Small pieces

In muffle furnace (**T-800°C, 5-8 h**)

in $CaCl_2$ 24h

Drying → **Pyrolysis** → **Grinding & Sieving**

In hot air oven (**T-75°C**)

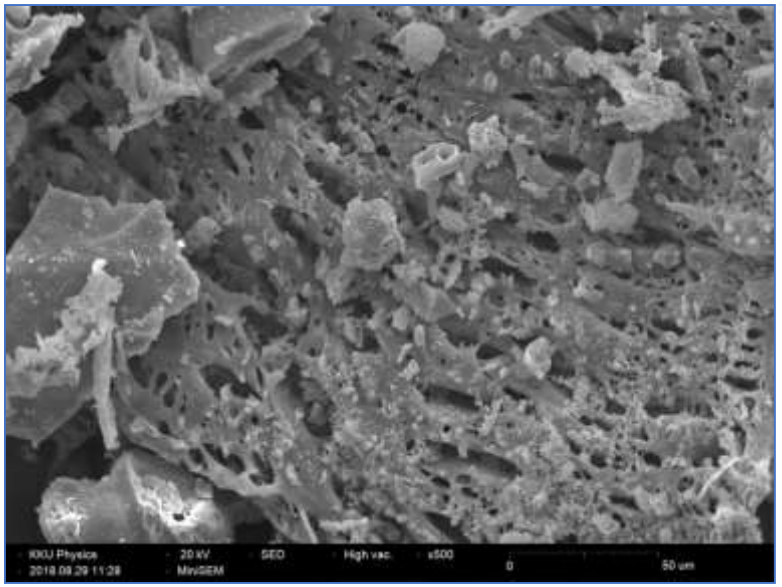
In muffle furnace (**T-900°C, 1 h**)


Activate Sorbents

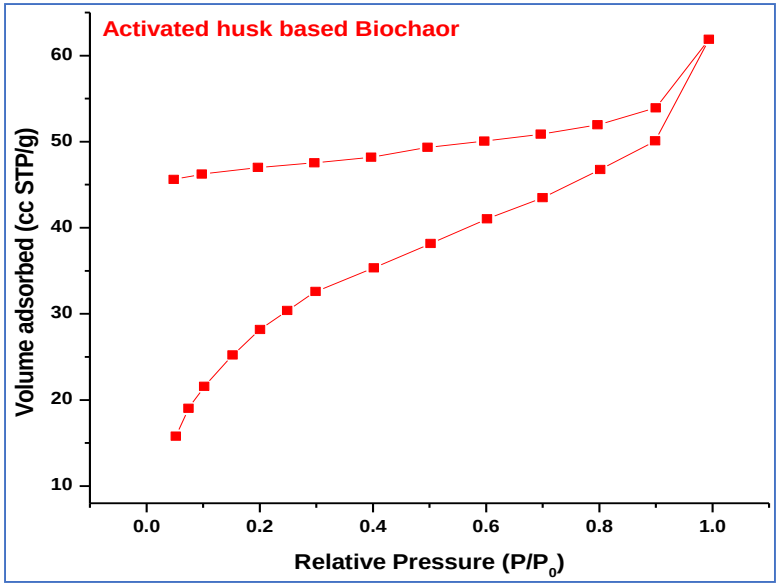
CHARACTERIZATION OF ACTIVE LCS

SORPTION PROPERTIES

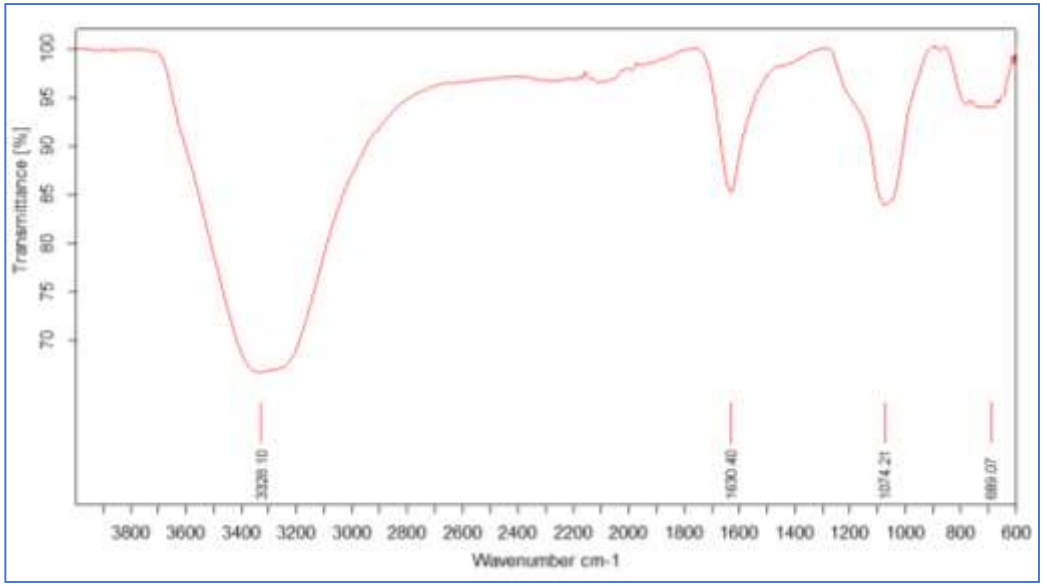
- Porosity and surface area
- Surface functionality
- Morphology
- Chemical stability
- Chemical composition (Redox), etc



SEM images

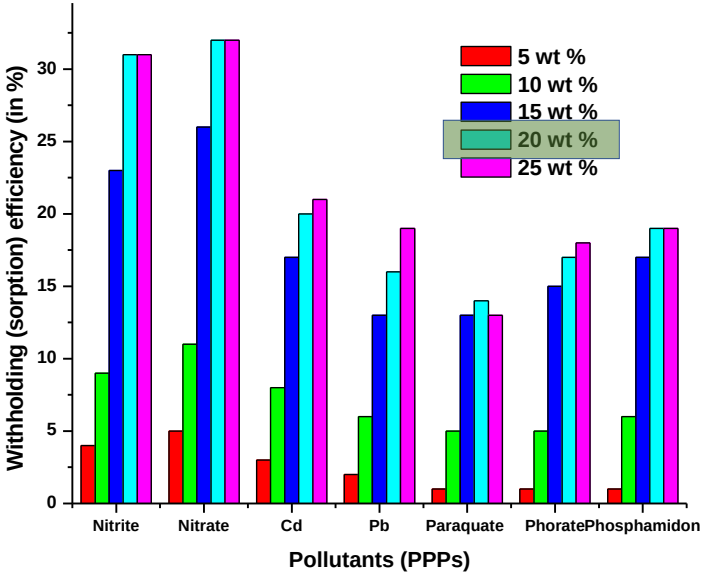


BET surface area



FTIR spectrum

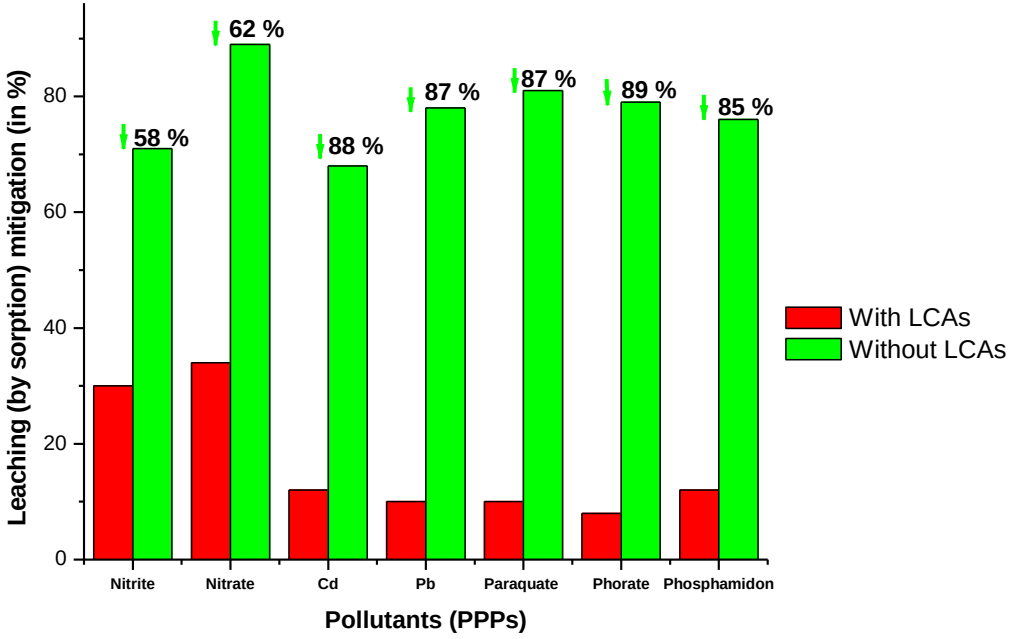
APPLICATION OF LCS FOR REMEDIATION OF POLLUTANTS (PPPs, etc)



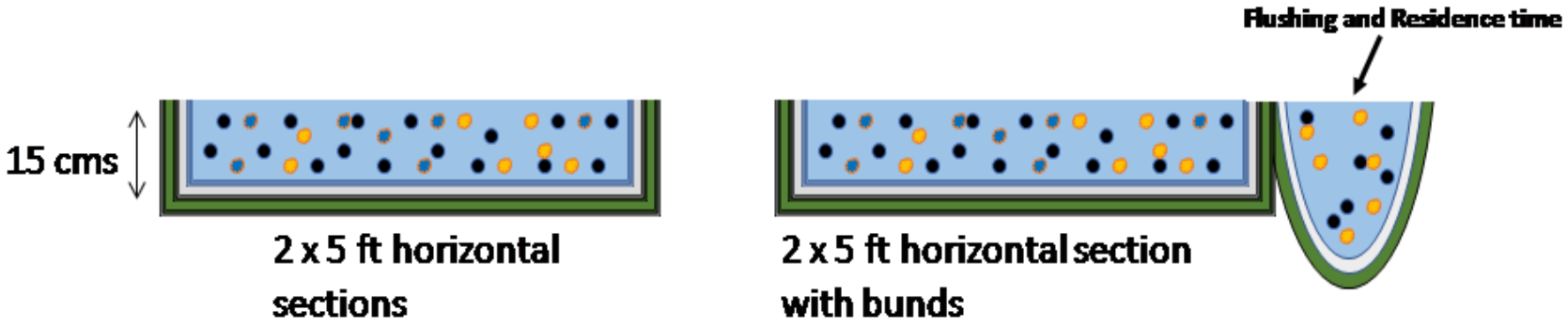
Water infiltration: **1-1.5 mm²/day (after saturation with normal evaporation)**

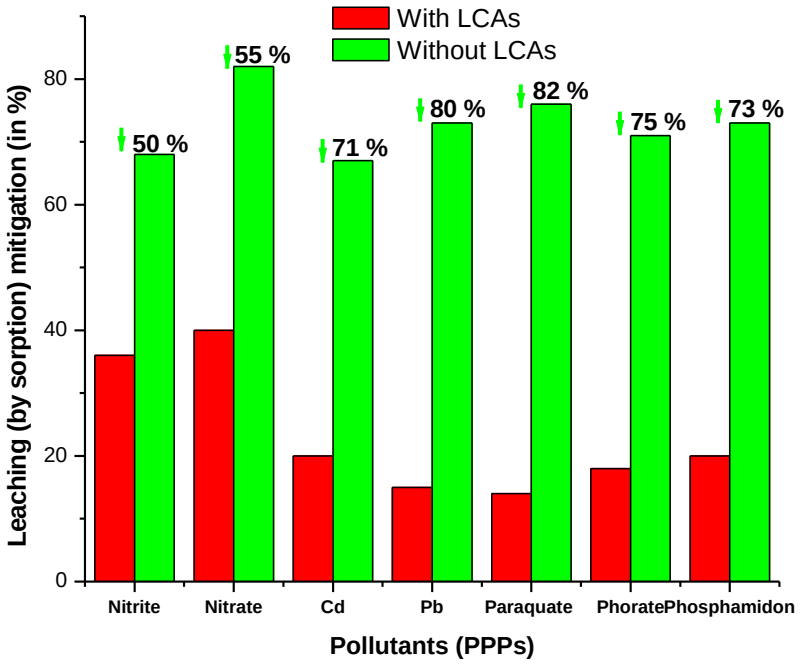
Total duration: **30 days**

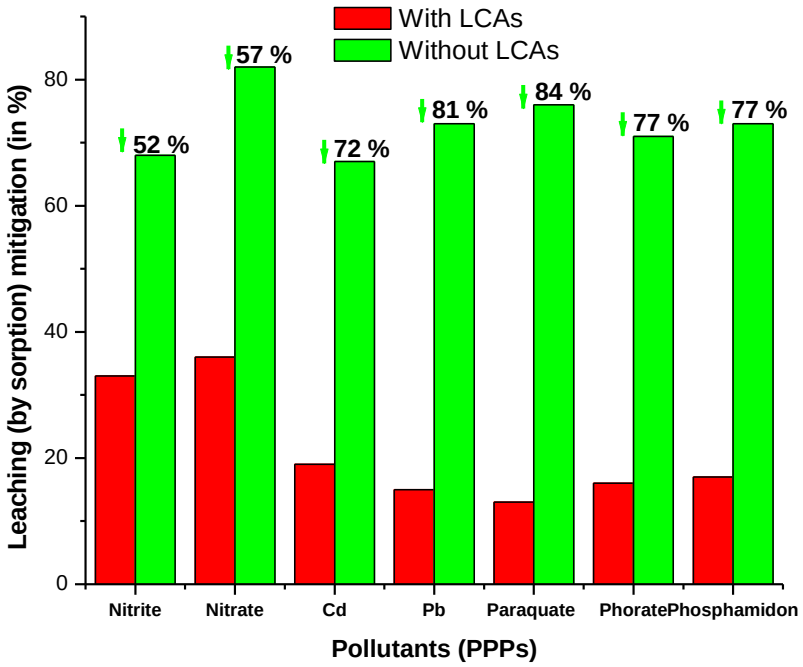
LCAs load: **20 wt %**



REAL-TIME APPLICATION OF LCS FOR POLLUTION (Pilot Scale)







SYNERGETIC STUDIES

Seed germination
Nutrition management
Consistency
Erosion & fertility

Plant growth rate (Visual Index)		
	Without LCS	**With LCS**
Vigna mungo (Black gram)	Averaged (8)	Good (13)
Cicer arietinum (Chickpea)	Averaged (9)	Extraordinary (16)
Poor (1-5); Average (6-10); Good (11-15); Extraordinary (16-20)		

Height
Stem size
Tissue volume
Fresh weight
Dry weight
Leaf size/Number
Color

CITIZEN SCIENCE AND PARTICIPATORY APPROACHES

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Implementation of Novel Framework for Surface Water Management in Agricultural

- SKILLS
- ATTITUDE
- EDUCATION
- PARTICIPATORY
- SOCIAL
- ECONAMICAL
- ETHICAL
- LEGAL

Convincing Approaches

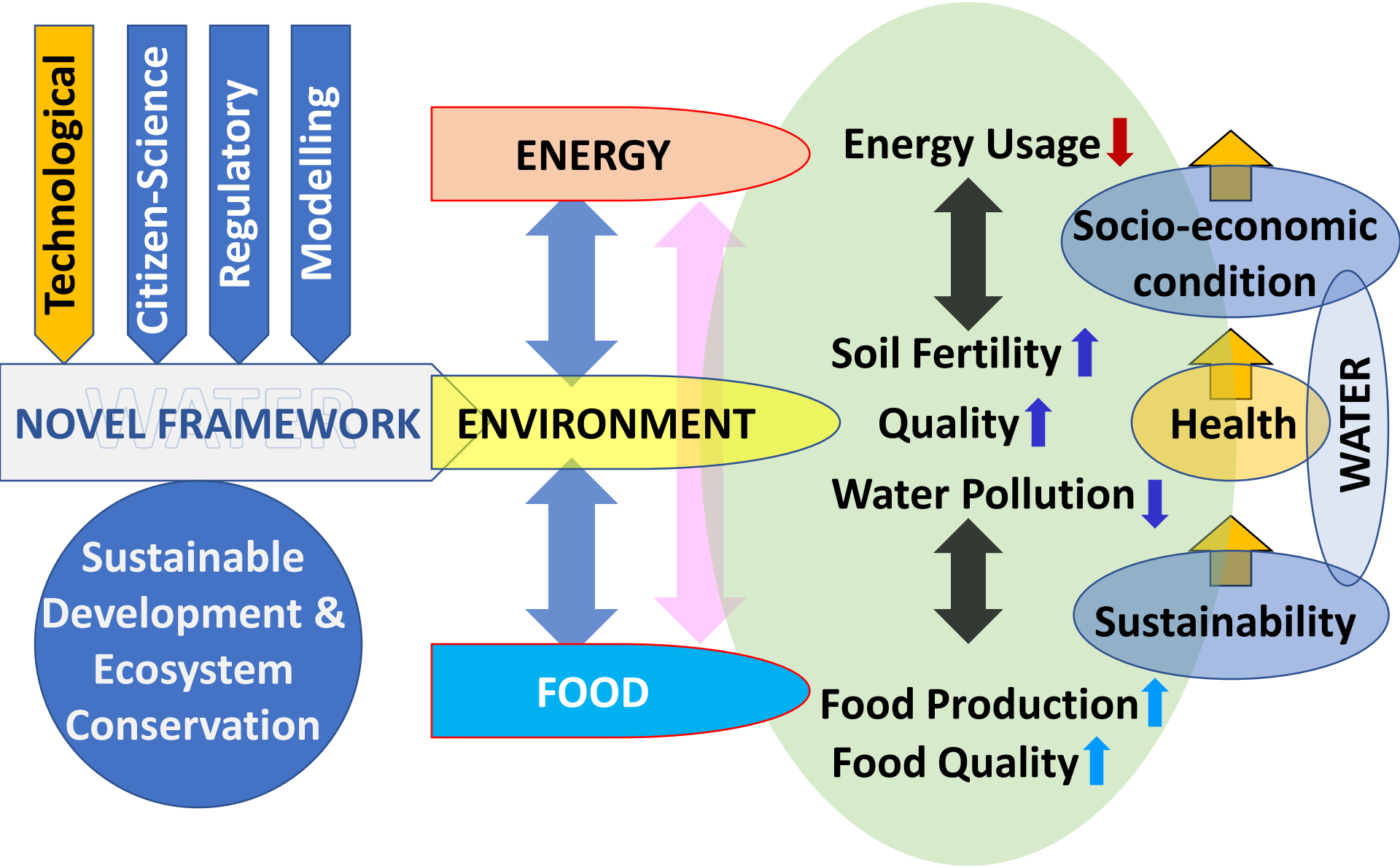
- Economic — 71 %
- Social — 11 %
- Environmental — 16 %
- Ethical — 03 %

BEHAVIORAL CHANGE

IMPLEMENTATION OF NOVEL FRAMEWORK

Water Pollution Remediation

NOVEL FRAMEWORK AND DYNAMIC INTERACTIONS ACROSS THE WATER-ENERGY-FOOD-ENVIRONMENTAL NEXUS



CONCLUSIONS

The integrated technological approaches can be implemented at catchment level for the potential management and mitigation of water contamination by undefined sources.

Self-sustaining remediation technique using low-cost and indigenous **SORBENTS** at agricultural catchments has great advantages both in sustainable crop management and surface water conservation.

Citizen science and understanding the dynamic interactions across the water-energy-food-environmental nexus can be used for the strengthening the safe and technological frameworks for surface water management at agricultural catchment level.

THANK YOU FOR
YOUR ATTENTION