

# **NUCLEAR RESEARCH LABORATORY**

## **(INDIAN AGRICULTURAL RESEARCH INSTITUTE)**

### **Ongoing and Future Research Programmes**

- 1) Characterisation of the spatial and temporal variations in the naturally occurring stable isotope ( $^{18}\text{O}$ ) signatures of rainfall, groundwater and surface water, and their chemical quality, to have a detailed and dynamic representation of the groundwater aquifer system.**
- 2)  $^{18}\text{O}$  signatures based investigations to assess groundwater flow regime, recharge characteristics, flow-pathways of mixing, groundwater-surface water inter-connections and influent/effluent seepage losses, and to delineate potential recharge zones, protection zones, hydrodynamic zones and zones of high yield.**
- 3) Investigations to clearly characterise the processes governing nitrate, fluoride, sulphate and heavy metal contamination of groundwater from point and non-point sources and to assess the extent of pollution, based on  $^{18}\text{O}$ -ion relationships.**
- 4) Investigations on  $^{13}\text{C}$  and  $^{18}\text{O}$  signature studies in water, plant and air interface to assess water-use-efficiency of C3 and C4 plants and water uptake/translocation in wheat grains.**
- 5) Assessment of general quality of groundwater and the causes of salinisation, as determined by the geochemical processes.**
- 6) Study of circulation pattern of moist air mass, based on spatial and temporal variations in  $^{18}\text{O}$  and  $^2\text{H}$  signatures of rainfall.**
- 7) Tritium ( $^3\text{H}$ ) tracer studies on moisture movement in the unsaturated soil zone and groundwater recharge.**

- 8) Groundwater replenishment characteristics and aquifer management under natural and stressed conditions.**
- 9) Environmental characterisation of non-point source pollution of groundwater. Spatial and temporal dynamics of groundwater contaminants.**
- 10) Development of diagnostic tools for water-use-efficiency of plants and soil organic matter dynamics.**
- 11) Relative importance of vegetative uptake of contaminants, denitrification potential of soil and geohydrology in limiting fresh water availability.**