Farmers First: Ensuring Farmer-Centric Digital Transformation

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About Innpact Solutions

We are

2020

Registered Start-up

#startupindia

Core members of :

esri | IWA the international water association | NFSSM ALLIANCE | AUTODESK Technology Impact

Team includes Data scientist, Geo-Informatics Expert, Planner, Tourism Expert, Civil engineer, and Economist

Verticals includes Climate change, Geo AI, WASH, and Tourism

Completed over

40 projects across **8** countries –

India, Bangladesh, Nepal ,Sri Lanka, Thailand, Saudi Arabia, UAE and Mozambique

Collaboration with:

BILL & MELINDA GATES foundation | GWSC Global Water & Sanitation Center | THE WORLD BANK IBRD • IDA | ADB ASIAN DEVELOPMENT BANK | AIIB | USAID FROM THE AMERICAN PEOPLE | AFD | IsDB Islamic Development Bank

Climate Change Impact on Agriculture (Drought Management)

- **1.1°C warming** → higher heat stress & faster evapotranspiration.
- **~30% rise in droughts** disrupting rain-fed farming.
- **8–10% higher rainfall variability** delaying sowing seasons.
- **70% of freshwater used in agriculture**, but aquifers & reservoirs are declining.
- **Soil moisture down 5–12%** in drought-prone regions.
- **10–25% yield losses by 2050** in major cereals (IPCC).
- **15–20% reduction in livestock productivity** due to heat & fodder scarcity.
- **Pest/disease incidence up 15–35%** with warming.
- **$30B annual drought losses** globally, impacting small farmers the most.

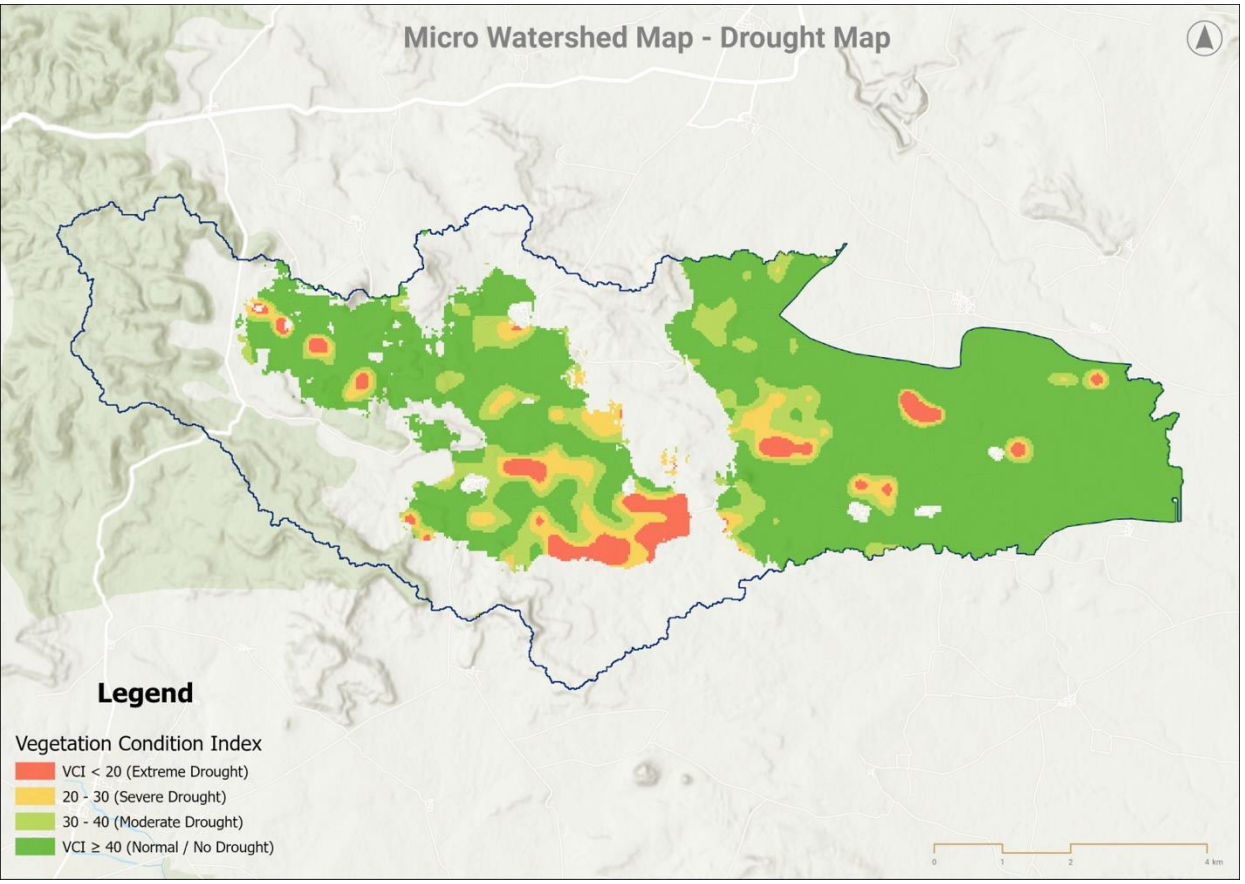
Framework of Drought Management

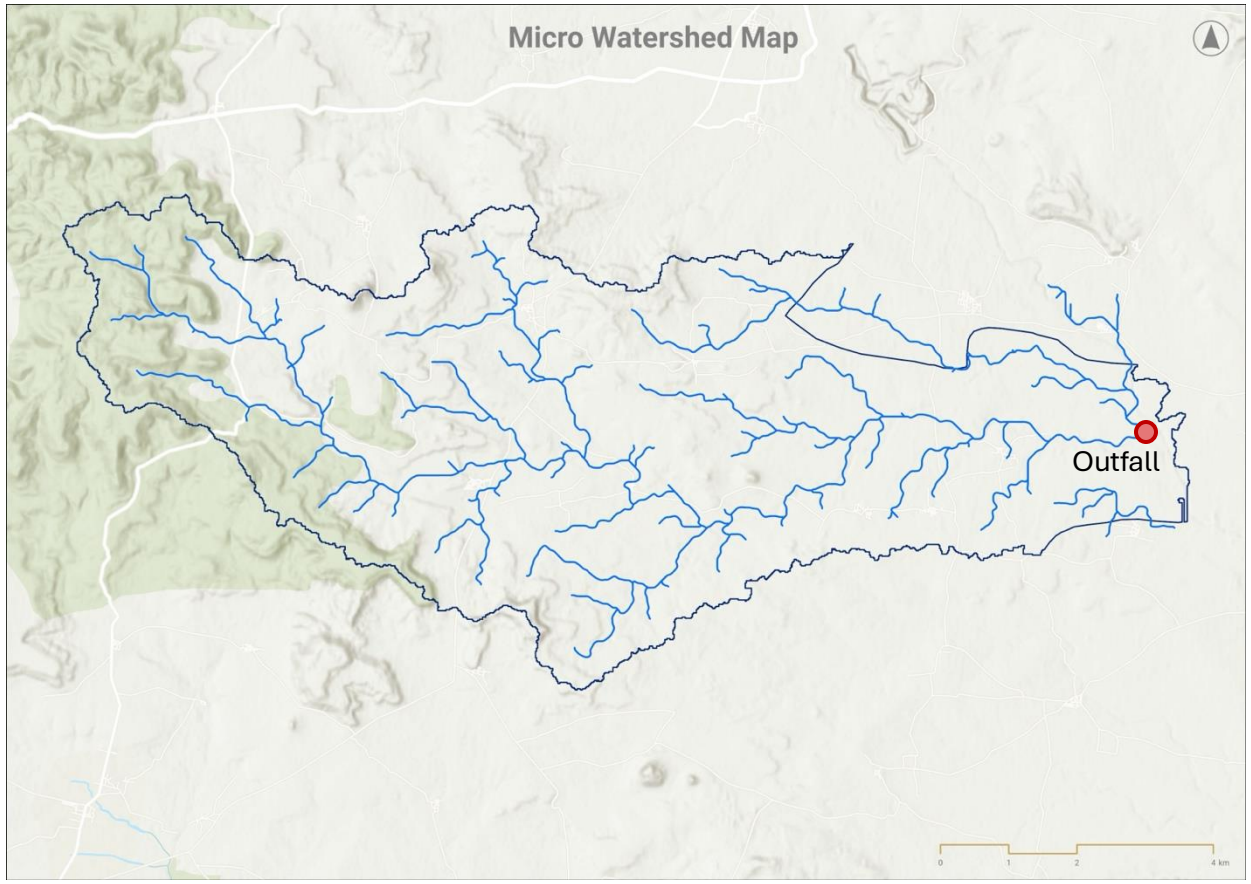
1. **Select the Watershed**
   Choose a watershed as the planning unit for its natural boundary and clear outlet.
2. **Analyse Hydrology**
   Assess rainfall–runoff, infiltration gaps, storage potential, and overall water flow.
3. **Map Suitability Potential**
   Evaluate slope, soil, land use, drainage lines, and low-lying areas to locate feasible recharge/storage zones.
4. **Place NBS Interventions**
   Position contour trenches, check dams, recharge pits, swales, and percolation tanks based on suitability.
5. **Run Performance Scenarios**
   Compare baseline vs improved cases to estimate infiltration gains, runoff reduction, and recharge potential.
6. **Finalise Implementation Plan**
   Prioritise micro-watersheds, sequence actions, and prepare an execution-ready plan.

Decision Support Framework

Intervention	Prerequisites (Conditions Needed)	Application Area (Where to Use)	Benefits
Contour Trenches	2–8% slope; loamy/clayey-loam soil	Sloping agricultural fields; along contour lines	Slows runoff; increases infiltration; reduces erosion; improves soil moisture
Check Dams / Nala Bunds	1st–3rd order streams; stable banks	Small natural drainage channels	Holds flow; recharges groundwater; reduces channel erosion
Recharge Pits / Shafts	Low points; moderate/high infiltration soil	Drainage meeting points; farm depressions	Quick deep recharge; supports nearby wells
Percolation Tanks / Farm Ponds	Valley floors; adequate land; safe spillway	Natural depressions; off-stream areas	Stores runoff; gradual seepage; improves aquifer levels
Vegetated Swales	<2% slope; shallow channel possible	Flat farm areas; road edges; sheet-flow zones	Guides water; prevents flooding; promotes steady infiltration
Recharge Wells	Flat permeable terrain; filtration required	Flat farm areas; near drains with clean runoff	Deep aquifer recharge; improves borewell yield

Applied Geospatial Lens





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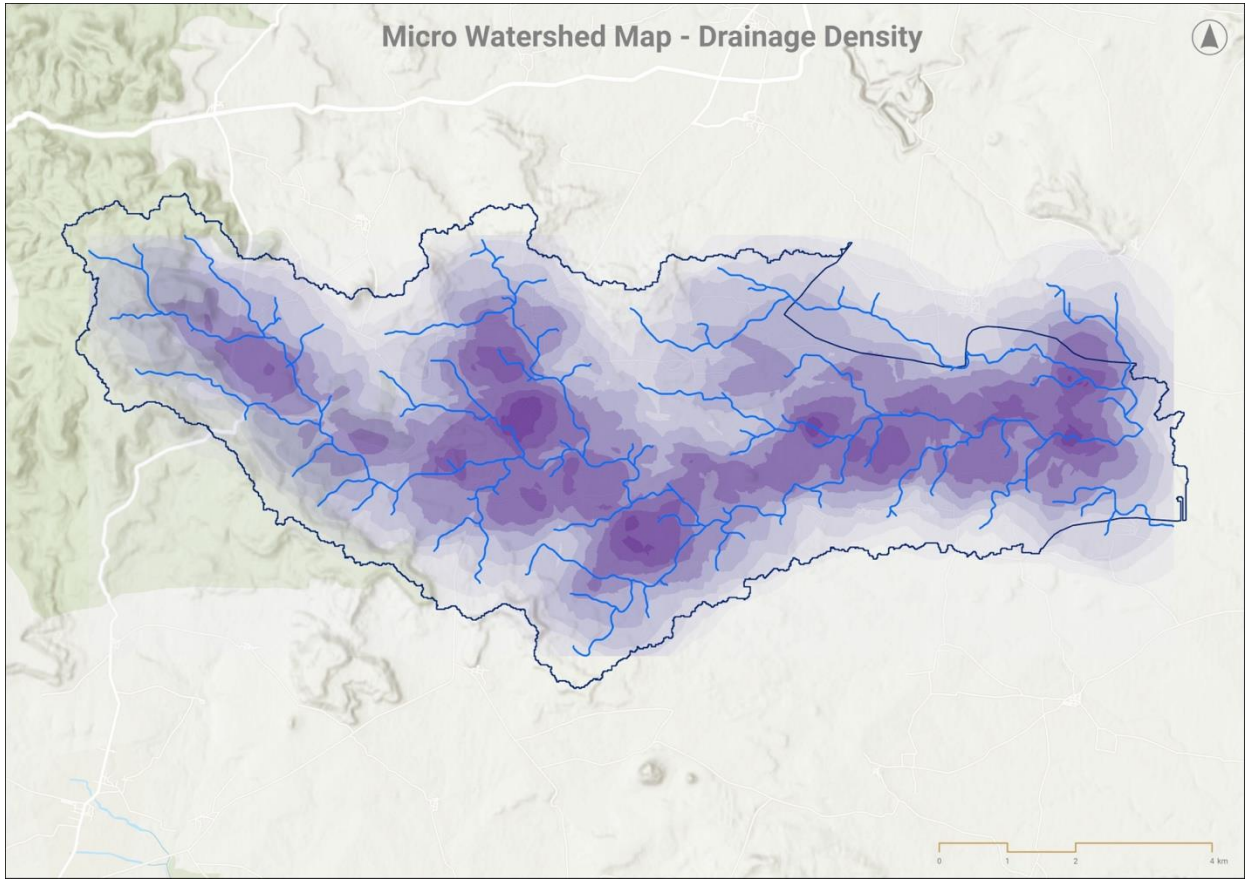
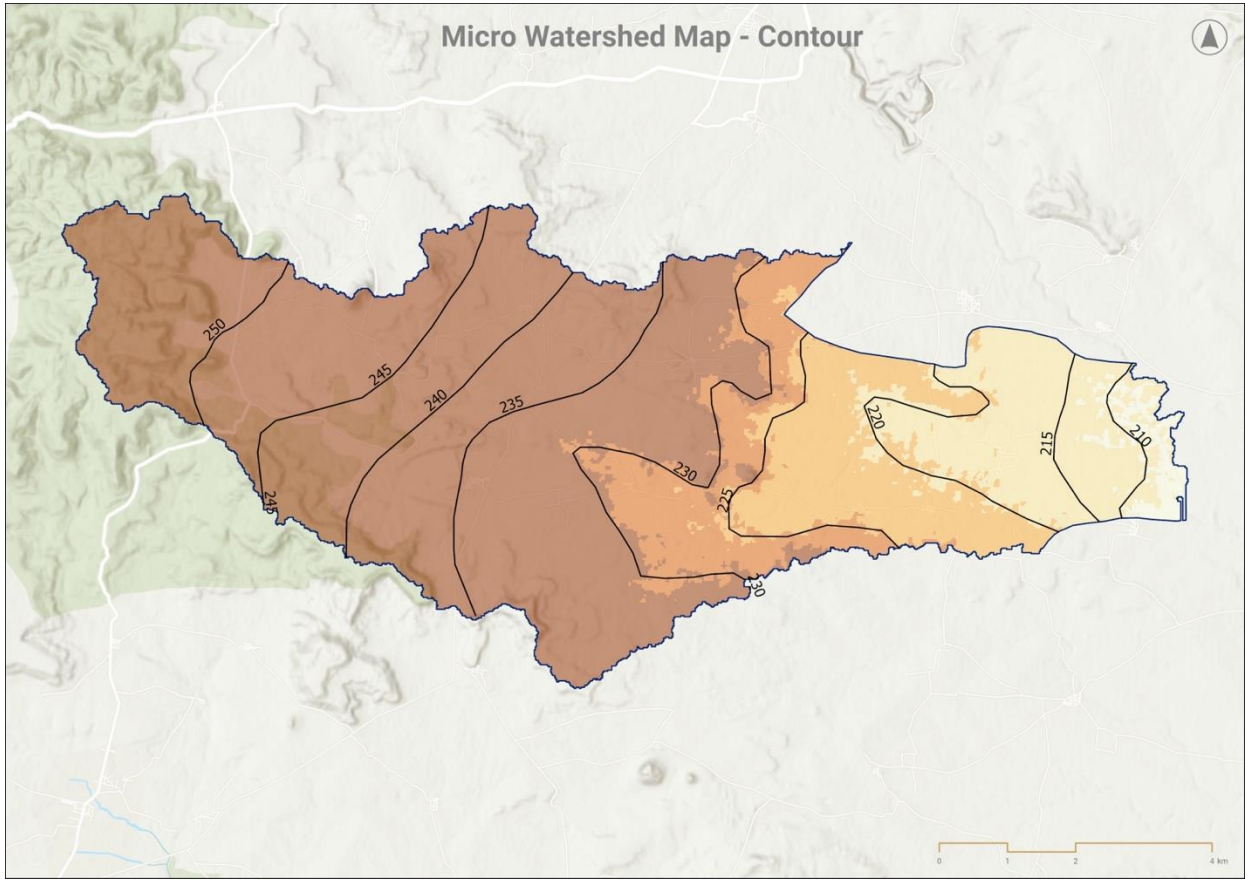
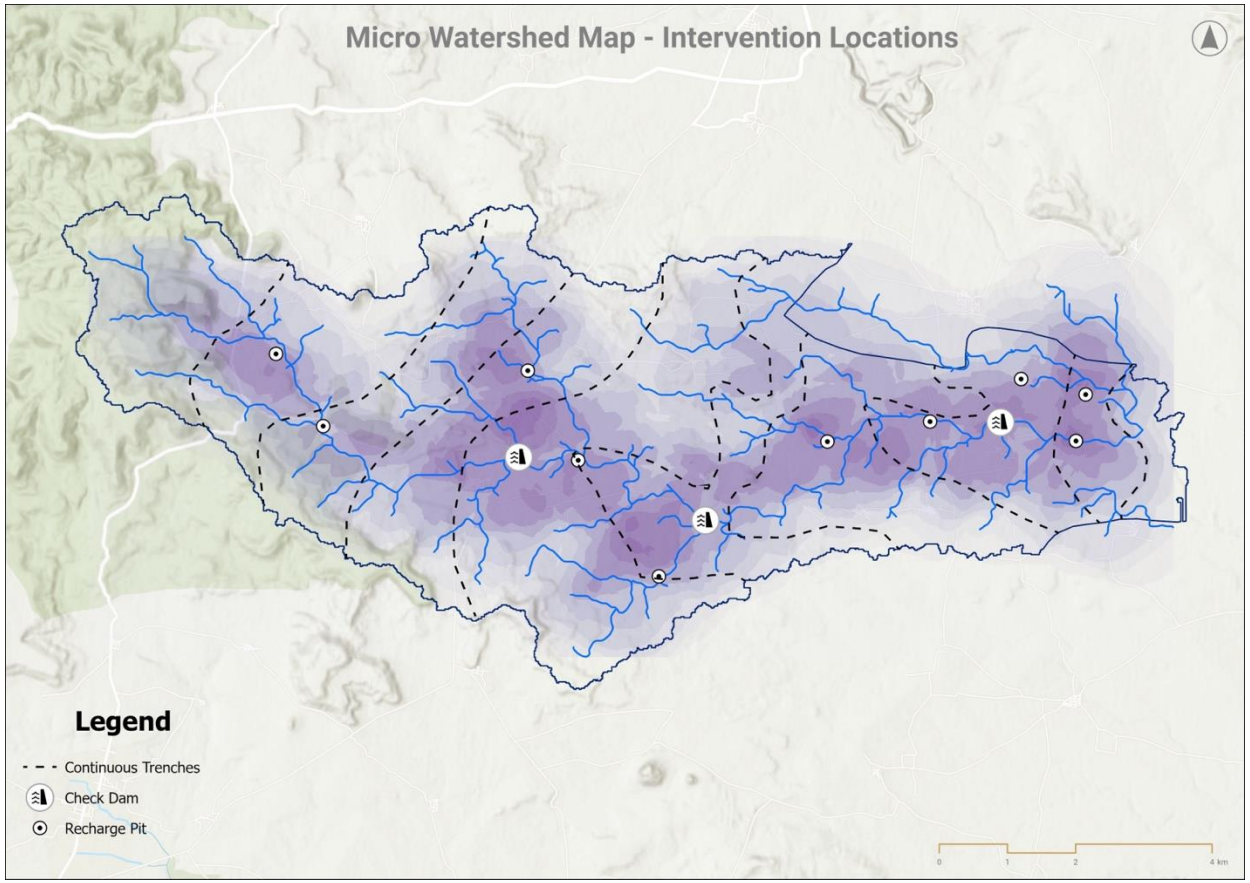




Output and Interpretation



Parameter	Scenario 1 – Baseline	Scenario 2 – With LID	Change
Total precipitation (mm)	70.0	70.0	—
Infiltration (mm)	22.7	37.0	+14.2 mm (+63%)
Surface runoff (mm)	47.2	27.0	–20.2 mm (–43%)
Final surface storage (mm)	0.05	5.9	+5.8 mm

Aspirational District Program Experience

Three interrelated pillars of rural resilience:

- Soil health and fertility: understanding spatial variations in soil productivity, organic carbon,nitrogen, pH, and other parameters.
- Market access: computing the distance of each village to the nearest government-regulated
- Mandi (APMC/RMC), as a proxy for farmers' ability to access fair and competitive markets.
- Climate risk: evaluating village-wise exposure to drought, heat stress, and flooding, to identify vulnerable clusters.

Data Source Mapping

Sl	Dataset	Source / Year	Resolution
1	Land Cover	ESA WorldCover, 2021	10 m
2	Soil Texture	ICAR–NBSS&LUP, 2020	1:50,000
3	Soil Slope	USGS/NASA SRTM, 2020	30 m
4	Watershed & Drainage	USGS/NASA SRTM, 2020	30 m
5	Soil Organic Carbon (SOC)	ISRIC SoilGrids, 2020	250 m
6	Total Nitrogen	ISRIC SoilGrids, 2020	250 m
7	Soil pH	ISRIC SoilGrids, 2020	250 m
8	Soil Productivity	ICAR–NBSS&LUP, 2020	1:50,000
9	Soil Erosion	ICAR–NBSS&LUP, 2020	1:50,000
10	Soil Moisture	ESA Sentinel-1, 2023	10 m
11	Drought Severity (VCI)	MODIS NDVI, 2015–24	250 m
12	Heat Stress (LST)	MODIS LST, 2024	1 km
13	Flood Hazard	JRC Flood Hazard, 2019	90 m

Thank You