

# Effective utilization of harvested water:

## Natural resource management initiatives under Farmer FIRST Programme

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*Efficient management of water resources is critical for sustainable agriculture, especially in semi-arid and rainfed regions. Under the Farmer FIRST Programme, several interventions were implemented to enhance water harvesting and its optimal utilization. These interventions included construction of farm ponds, installation of drip irrigation systems and rain guns, renovation of existing check dams, and demonstration of conservation furrows. This article highlights the effectiveness of these interventions in improving water availability, enhancing crop productivity, and reducing input costs for farmers.*

**Keywords:** Check dam, Conservation furrow, Drip irrigation, Farm pond, Sustainable agriculture, Water harvesting

**W**ATER scarcity and inefficient utilization of available water resources are major challenge in agriculture. With unpredictable rainfall pattern and depleting groundwater, efficient water management has become crucial for sustaining agriculture. Harvesting rainwater and ensuring its optimal use can significantly improve crop yields and reduce dependency on erratic rainfall. Under the Farmer FIRST Programme (FFP) of ICAR-CRIDA, a series of interventions were implemented like development of farm ponds, installation of drip irrigation and rain guns, community check dam renovation, and conservation furrows under the soil and water conservation module to help farmers make the most of harvested water in adopted villages. These interventions helped farmers in the adopted villages to harvest and utilize water effectively, boosting productivity and income.

### Interventions under FFP for effective water utilization

**Farm ponds for harvesting rain water:** Farm pond is a small water storage structure that collects and stores rainwater or surface runoff for irrigation during dry period. Under the FFP, two farm ponds were constructed in Devinoniguda and Rakamcharla villages. Each pond has a storage capacity of about 38.52 m<sup>3</sup>, providing protective irrigation for nearly one acre of farmland. Before these ponds were built, farmers often faced

moisture stress, leading to poor yields. Now, they are able to grow vegetable crops like cabbage, cauliflower, and okra even when rainfall is insufficient. The ponds ensured water availability at critical crop stages, reducing crop loss and improving productivity.

The results have been remarkable, farmers recorded around 25% higher yields compared to earlier seasons. The technology has also brought visible improvements in livelihoods through higher income and better resource use efficiency.



Farm pond in Devinoniguda village

**Table 1.** Cropping pattern, yields, and income before and after pond intervention

Cropping pattern and returns before pond							
Season	Crop	Area (acre)	Yield (q/acre)	COC/acre	Price (₹/q)	Gross returns (₹)	Net returns (₹)
Kharif	Maize	4	16	21,500	2,180	34,880	13,380
Kharif	Redgram	3	4	1,8500	7,300	29,200	11,000
Rabi	Maize	4	18	24,000	2,240	40,320	16,320
Cropping pattern and returns after farm pond							
Kharif	Redgram	4	5	19,800	8,400	42,000	22,200
Kharif	Cotton	3	7	23,600	6,900	48,300	24,700
Rabi	Bhendi	0.5	60	40,000	2,000	120,000	80,000
Rabi	Peas	0.5	30	37,000	3,000	90,000	53,000

**Table 2.** Economic returns on farm ponds

Adopted Villages	Number of Ponds	Storage Capacity (m <sup>3</sup> )	Area Benefited (acre)	Yield Increase (%)	Average Net Returns (₹/pond)	Benefit-Cost Ratio
Devinoniguda, Rakamcharla	2	38.52	1 per pond	25	25,000–30,000	2.38



Tomato cultivation with drip irrigation



Brinjal cultivation under drip + Mulching

**Table 3.** Economic returns from micro irrigation systems

Villages Covered	No. of Systems installed	Area Covered (acres)	Crops Covered	Avg. Water-use Efficiency (%)	Avg. Yield Increase (%)	Avg. Net Returns (₹)	Benefit-Cost Ratio
Gangupally, Devinoniguda, Rakamcharla, Medikonda	21 (Drip and Rain Guns)	21	Chilli, Tomato, Cabbage, Cauliflower	30	30–40	75,000	2.5:1

**Renovation of community check dam in adopted village:** In one of the adopted villages in Gangupally, the community check dam was renovated to restore its full capacity. The renovation included strengthening the sidewalls, desilting the water storage area, and repairing leakage points. These efforts helped the structure hold more water and improved its durability for long-term use.

After the renovation of the check dam, there was a noticeable increase in groundwater levels by about 1.5–2.5 m in nearby wells. The improved structure now holds enough water to irrigate nearly 30 acres of farmland, directly benefiting around 20 farming families in the village. The stored water seeps into the ground, recharging nearby open wells and borewells. This has ensured a steady water supply throughout the year for farming, livestock, and household needs. With

**Efficient utilization of water using drip irrigation and rain guns:** Under project, efficient irrigation practices were promoted through the installation of micro-irrigation systems such as drip irrigation and rain guns. These systems were aimed at improving water-use efficiency, ensuring uniform irrigation, and enhancing productivity in high-value crops like cabbage, chilli and tomato.

A total of 21 drip and rain gun systems were installed in Gangupally, Devinoniguda, Pudugurthy, Medikonda, and Rakamcharla villages, covering an area of about 21 acres. These interventions significantly improved water-use efficiency by nearly 30% along with reduced labour and resulted in an average yield increase of 30–40%. Farmers observed that they could easily manage irrigation during prolonged dry spells, leading to healthier crops, reduced stress, and improved fruit quality.

The economic analysis revealed a net return of ₹75,000/acre, with a benefit-cost ratio of 2.5:1, highlighting the profitability of adopting such technologies. Farmers also reported reduced labour and time in irrigation activities, ensuring timely water supply and sustainable resource utilization.

the assured water availability, farmers have started cultivating a second crop during the *rabi* season and shifted towards high-value crops like vegetables, which has improved their income and overall livelihood.



Renovated check dam in Gangupally village

**Table 4.** Impact of renovation of community check dam

Adopted Village	No. of Beneficiary Farmers	Area Irrigated (acres)	Avg. Increase in ground water levels (m)	Key Benefits	Impact on Cropping Pattern
Gangupally	20	30	1.5–2.5	Improved water storage, groundwater recharge, livestock and domestic use	Enabled second crop and vegetable cultivation

**In situ moisture conservation practices in adopted villages:** In the adopted villages of Vikarabad district, demonstrated the simple yet effective technique of conservation furrows as an *in situ* moisture conservation practice. After the usual field preparation and first weeding (around 30 days after sowing), made furrows between two crop rows at 3 m intervals using a traditional bullock-drawn plough. These furrows played a key role during low rainfall, they captured and stored rainwater, and during heavy rains, they drained out excess water. This helped maintain ideal soil moisture conditions and protected the crop during its crucial growth and grain-setting stages.

*In situ* moisture conservation practices were demonstrated across 315 acres by 250 farmers. The practice increased the average pigeon pea yield from 10 q/ha to 12.75 q/ha, a 27.5% improvement, even in years with below-normal rainfall. Farmers reported that their fields retained more moisture, crops looked healthier during dry periods, and overall productivity improved significantly. This low-cost and farmer-friendly practice has become a widely accepted method to enhance yield, conserve soil moisture, and reduce the risks associated with climate variability.



Conservation furrows in pigeonpea crop

**Table 5.** Overall benefits accrued to farmers with conservation furrows

District	No. of Farmers	Area Covered (acres)	Crop	Avg. Yield (q/ha)	Avg. Yield Increase (%)	Avg. Net Returns (₹)	Benefit–Cost Ratio
Vikarabad	250	315	Pigeon pea	12.75	27.5	45,175	1:0.85

### Overall outcomes

The combined interventions of farm ponds, drip irrigation and rain guns, check dam renovation, and conservation furrows brought significant positive changes for farmers. Farm ponds provided protective irrigation during dry periods, allowing the cultivation of winter and high-value vegetables, improving both yields and income. Drip irrigation and portable rain guns helped farmers use water efficiently, ensuring crops received adequate moisture during dry spells and improving crop quality. The renovation of community check dams restored water storage, enhanced groundwater recharge, and made water available not only for agriculture but also for livestock and domestic purposes. Conservation furrows helped retain rainwater in the fields, protecting crops from intermittent dry periods and maintaining soil moisture for better growth. Together, these interventions increased crop productivity, allowed off-season vegetable cultivation, improved water management, and strengthened community participation. Farmers reported more reliable irrigation, reduced dependence on unpredictable rainfall, healthier crops, and better livelihoods, showing that a combination of simple, cost-effective water harvesting practices can transform farming systems and build climate resilience in rainfed areas

### SUMMARY

The Farmer FIRST Programme successfully demonstrated that intervention-specific water management from farm ponds to drip irrigation, check dam renovation, and conservation furrows can transform rainfed drylands into productive, resilient farms. Each intervention complements the other, turning harvested water into a resource that sustains livelihoods, enhances crop production, and restores environmental balance.

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