

RICE REGENERATIVE AGRICULTURE PILOT IN NIZAMABAD

Annual Report
2025-26

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Acronyms

Alternate Wetting and Drying: (AWD) 6
Bacterial Leaf Blight: (BLB) 16
Brown Plant Hopper: (BPH) 24
Centre for Agriculture and Bioscience International: (CABI) 14
Centre for Sustainable Agriculture: (CSA) 6
Chintha Venkat Reddy Method: (CVR) 18
Civil Society Organisations: (CSO) 12
Cool Farm Alliance: (CFA) 10
Cool Farm Tool: (CFT) 10
Crop cutting experiments: (CCE) 11
Custom Hiring Centres: (CHC) 9
Direct Seeded Rice: (DSR) 6
Farmer Field Schools: (FFS) 13
Farmer Producer Organizations: (FPOs) 12
Focused Group Discussions: (FGDs) 13
Good Agricultural Practices: (GAPs) 15
Intergovernmental Panel on Climate Change: (IPCC) 10
Kaleshwaram Lift Irrigation Project: (KLIP) 7
Krishi Vigyan Kendra: (KVK) 6
Mahatma Gandhi National Rural Employment Guarantee Scheme: (MGNREGS) 18
Mini Perculation Tanks: (MPT) 18
Minimum Support Price: (MSP) 13
National Bank for Agriculture and Rural Development: NABARD 7
Soil Organic Carbon: (SOC) 8
System of Rice Intensification: (SRI) 6
Village Development Committee: (VDC) 6
Women's Self-Help Groups: (SHGs) 12

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Photo Credits: CSA Field Team

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1. Executive Summary

Rice is the dominant crop across Nizamabad district, cultivated intensively in both Kharif and Rabi seasons. Its water-intensive cultivation, combined with widespread stubble burning, heavy agrochemical use, and continuous mono-cropping, poses serious ecological and economic challenges. Methane emissions from rice cultivation alone account for approximately one-fifth of all agricultural Green House Gas (GHG) emissions in India, while excessive groundwater extraction has placed several blocks in Nizamabad under critical over-exploitation.

Building on the successful 2024–25 pilot in Dichpally and Dharpally mandals, the Rice Regenerative Agriculture Project a collaborative initiative between the Centre for Sustainable Agriculture (CSA) and DIAGEO India expanded significantly in 2025–26 to cover four mandals: Dichpally, Dharpally, Bheemgal, and Velpur. The project enrolled 1,148 farmers across 36 villages, covering 5,205.85 acres under regenerative rice cultivation practices by the end of Rabi 2025–26.

Key interventions during the year included Alternate Wetting and Drying (AWD), System of Rice Intensification (SRI), Direct Seeded Rice (DSR), stubble burning prevention, green manuring, biodiversity enhancement through bund cropping and rice diversity blocks, seed systems diversification, soil fertility enhancement and community-led water management.

Key outcomes during 2025–26 include:

- 1,148 farmers across 36 villages and 4 mandals engaged in regenerative rice cultivation over 5,205.85 acres.
- Stubble burning prevented across approximately 5,000 acres by over 800 farmers in rabi 2025 and the post-Kharif period a community-led achievement supported by awareness campaigns, village meetings, and government dialogue.
- 159 farmers started adopting bund cropping systems in rice cultivation as an alternate income.
- 715 farmers adopted green manuring (Sesbania: 662; Navadhanya: 53) covering approximately 2,086 acres, improving soil organic carbon and nutrient cycling.
- Average yield under AWD reached 5,220 kg/hectare in Kharif 2025 and 6,372 kg/hec in Rabi 2025–26, compared to 4,736 kg/hec and 5,481 kg/hec respectively under conventional irrigation.
- Net profit per acre stood at Rs 39,810 in Kharif 2025 and Rs 41,742 in Rabi 2025–26 against a baseline of Rs 40,340, alongside a reduction in cost of cultivation from Rs 23,500 to Rs 21,784 in Kharif 2025 (−7%), reflecting improved agronomic efficiency under the programme even as Kharif yields were affected by Cyclone Montha at harvest.
- 89 awareness meetings, 35 training programmes conducted; 810 farmers received direct field advisory services.
- 74 farmers received quality seeds of improved varieties (WGL 44, DRR Dhan 74, KNM 733, KNM 7715) covering 213 acres, and a 16-variety rice biodiversity block established as a Farmer Field School.
- A district-level consultation on rice stubble burning prevention, attended by the Department of Agriculture, NABARD, KVK Rudrur, and Village Development Committee (VDC) members, resulted in a government decision to impose a fine of Rs 5,000 for stubble burning and explore procurement-linked incentives for farmers practicing residue incorporation.
- Agroforestry development initiated at Govindpally village common land (5 acres) in partnership with the VDC.

Several challenges were encountered while adoption of regenerative rice practices, including cyclone damage (Montha cyclone affected crop lodging in Velpur mandal), election code of conduct disrupting pre-season trainings, cold wave effects on seedling growth in Rabi 2025, overlapping interventions from other AWD projects offering financial incentives. The project continues to build community ownership, government convergence, and technical resilience across the expanding project area. The free electricity provided to farmers, as per state policy, encourages borewell use and continuous flooding, providing little incentive for farmers to change their irrigation practices.

2. Introduction

2.1 Background and State-Level Agricultural Context

Telangana's agricultural sector is at a critical inflection point. Agriculture employs approximately 47% of the state's workforce around 1.5 crore people and contributes 17% to the state's gross domestic product of Rs 14.64 lakh crore (2023-24). Despite this economic significance, farmers face mounting structural pressures: the state records India's highest rural household indebtedness at 92%, average monthly farm income stands at Rs 13,874 barely 38% of the lowest-grade government employee salary and 91.4% of operational holdings are classified as small and marginal, averaging just 0.89 hectares. (Source: CSA Status Brief on Agriculture in Telangana, March 2026; NABARD NAFIS 2.0; Telangana Socio Economic Outlook 2024)

Before the formation of Telangana in 2014, farming systems in the region were diverse and integrated combining millets, pulses, oilseeds, horticulture, and livestock rearing. These systems supported food security and ecological balance. However, policy changes, the introduction of free electricity for borewell irrigation, and government procurement incentives for rice gradually drove a wholesale shift toward input-intensive rice monoculture. Since 2014, rice production from 68 lakh tonnes to over 218 lakh tonnes in 2020-21. By 2023-24, rice occupied 46.9% of all Kharif-season (Vanakalam) sown area and a staggering 75.6% of all Rabi-season (Yasangi) sown area across the state. The area under rice cultivation has expanded by 240% in 10 years. (Source: Telangana Socio Economic Outlook 2025; Directorate of Economics and Statistics).

This expansion of rice has come at a severe ecological and nutritional cost. Telangana's Crop Diversity Index stands at a critically low 0.31-0.41. Pulses once covering 10.8% of gross cropped area now occupy only 3.9%. Horticulture and vegetable area has declined sharply, with vegetables covering only 0.56% of gross cropped area. The consequent nutritional impact is stark: child stunting stands at 28%, anaemia affects 61% of children, and on a business-as-usual trajectory, anaemia rates are projected to reach 107.8% by 2047. Nizamabad district the home of this project sits within this larger statewide crisis.

2.2 Groundwater Crisis and the Irrigation Dependency Trap

Groundwater depletion is Telangana's most critical agricultural challenge, and Nizamabad is among its most severely affected districts. Irrigated area across the state grew by more than 125% between 2014-15 and 2022-23. Tube well irrigation more than tripled from 5.88 lakh hectares to 19.01 lakh hectares in this period, with over 26.97 lakh agricultural borewell connections now pumping groundwater. By 2025, the state's groundwater extraction reached 46.7% of dynamic resources up from 38% in 2022-23 with 88% of extracted water used for irrigation. The area under extreme groundwater depletion (red zone, >20m depth) grew by 36% in just one year, expanding from 3,452 sq km in April 2024 to 4,714 sq km in April 2025. Over 500 villages are now classified

as overexploiting groundwater. (Source: CGWB National Compilation on Dynamic Ground Water Resources of India, 2025; The Hindu, May 2025)

The Kaleshwaram Lift Irrigation Project (KLIP), designed to irrigate over 40 lakh acres, has been non-operational since October 2023 due to structural concerns at the Medigadda barrage, forcing farmers back to groundwater dependency. In Nizamabad district, nearly one lakh borewells have been sunk. The state policy of 24x7 free power supply to all farmers Telangana is the only state in India to have implemented this costing the government Rs 10,000-15,470 crore annually has created a structural trap: farmers have no economic incentive to reduce groundwater pumping or adopt water-saving techniques such as AWD. This is the core systemic barrier that this project directly addresses.

2.3 Soil Health Degradation and Agrochemical Burden

Intensive rice monoculture, stubble burning, and heavy synthetic fertiliser use are rapidly degrading Telangana's soils. According to the Soil Health Card Portal, 86% of soils in Telangana are deficient in nitrogen, 47% are deficient in soil organic carbon (SOC), 57% in iron, 47% in zinc, 50% in boron, and 39% in manganese. Telangana's soils are undergoing desertification and land degradation at a rate of 31.68%, primarily driven by water erosion and loss of vegetation cover. (Source: Soil Health Card Portal; Space Applications Centre Desertification Atlas 2021)

On fertilisers, Telangana is among the country's heaviest consumers: per-hectare use stood at 234 kg/ha in 2024-25 nearly double the national average of 135 kg. Total fertiliser consumption has grown 80% since 2015-16, reaching 18.79 lakh metric tonnes in 2023-24. Fertiliser application is severely imbalanced, skewed heavily toward urea (N:P:K ratio of 12.6:4.8:1 estimated for 2024-25 vs a recommended 4:2:1). Urea efficiency is only 30-45%, with the remainder leaching into soil and groundwater and emitting nitrous oxide. Telangana farmers are overusing urea by 50-100%, worsening nitrogen pollution. On pesticides, Telangana ranks 3rd nationally at 900 g/hectare a 118% increase since 2014, driven by rice monoculture and increasing pest resistance. (Source: Times of India, June 2024; Agriculture Statistics at a Glance 2024)

2.4 Climate Change Vulnerability

Climate change amplifies all existing agricultural vulnerabilities in Telangana. Summer temperatures regularly exceed 45°C in districts including Nizamabad, creating heat stress during critical crop growth phases. Rainfall has become increasingly erratic while 80% of annual precipitation falls during monsoon months, distribution within the season has grown unpredictable, disrupting traditional sowing calendars. Climate assessments indicate that vulnerable mandals will increase from 28% currently to 59% by mid-century. In 2025, this was not theoretical: the Montha cyclone caused widespread crop lodging in Nizamabad, while hailstorms in April 2025 damaged rice and maize fields in Kamareddy and Nizamabad districts. The project's pilot areas are directly in the path of these emerging climate risks. (Source: Kadiyala et al., Theor Appl Climatol 2021; CSA Status Brief March 2026)

2.5 Environmental and Ecological Challenges at Project Level

Within this state-level context, the Nizamabad project area faces the full intensity of each crisis. Stubble burning the practice of setting fire to post-harvest rice residue is near-universal in the district. (Each burning event releases approximately 1.4 tonnes of CO2, 60-70 kg of carbon monoxide, nitrogen and sulphur oxides, 2-4 kg of methane, and 15-20 kg of PM2.5/PM10 particulate matter per acre, (https://www.icar.gov.in/sites/default/files/2022-06/Ex-Situ-Crop-Residue-Management.pdf?utm_source=chatgpt.com. While also killing earthworms, crabs, microorganisms, and other soil beneficial organisms, and destroying the nitrogen, phosphorus,

potassium, and organic carbon held in the residue. Continuous monoculture with the same rice varieties has further eroded varietal diversity, increasing BLB disease pressure, which has become one of the most serious rice health challenges in Nizamabad.

2.6 Objectives of the Project

In response to this convergence of challenges groundwater depletion, soil health decline, GHG emissions, agrochemical dependency, nutritional deficit, and climate vulnerability CSA, with support from DIAGEO India, continued to expand the Rice Regenerative Agriculture Pilot during the 2025-26 crop year. The key objectives are:

- To reduce GHG emissions (methane, nitrous oxide, CO2) through regenerative practices such as AWD, DSR, SRI, and green manuring to enhance soil fertility.
- To prevent stubble burning and promote rice straw incorporation to reduce particulate & CO_2 emissions and improve soil health
- To reduce agrochemical dependency and improve soil organic carbon and soil biodiversity
- To enhance farmer capacity through awareness, training, advisory services, Custom Hiring Centres (CHC) and Farmer Field Schools
- To monitor, measure, and document the impact of rice regenerative agriculture across expanded geographies
- To engage government, policy-makers, and community institutions toward enabling policy change for regenerative agriculture

3. Village Profile and Community Engagement

Building on the foundation established in Dichpally and Dharpally mandals during 2024–25, the project expanded significantly in 2025–26 to include two additional mandals; Bheemgal and Velpur in Nizamabad district by bringing the total coverage to four mandals. These new mandals were selected due to their severe groundwater over-exploitation, near-complete dependence on rice monocropping in both seasons, and proximity to the original project area.

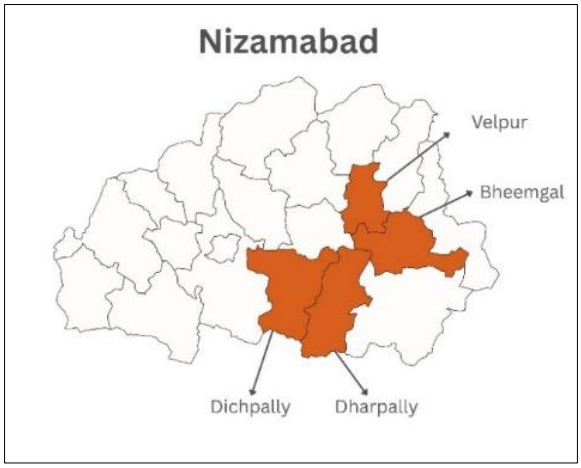

Figure 1: Project working mandals in Nizamabad district

In Kharif 2025, the project engaged 796 farmers across 35 villages in the four mandals, covering 3,470.25 acres. This included 398 new farmers and continued engagement of existing participants from Dichpally and Dharpally blocks (398 farmers covering 1,750.65 acres with no dropouts). During Rabi 2025–26, the project reached 352 farmers across 36 villages, covering 5,205.85 acres, incorporating both continuing and new participants.

These 36 villages collectively cultivate a substantial area under rice, and the project's reach of over 5,200 acres represents a meaningful proportion of the total cultivated area. The average landholding among participating farmers is approximately 2.27 acres, reflecting the predominantly small and marginal farming profile of the region.

Table 1: Season-wise Programme Reach: Number of Farmers and Acres Covered

Season	No. of Farmers	No. of Villages	No. of Mandals	Area Covered (Acres)
Kharif 2025 (existing + new)	796	35	4	3,470.25
Rabi 2025–26 (existing + new)	352	36	4	5,205.85
Total (2025–26)	**1,148**	**36**	**4**	**5,205.85**

4. Methodology

4.1 Criteria for Selecting Pilot Locations and Scaling up

The selection of scale-up locations in 2025–26 was guided by both technical criteria and community readiness. Priority was given to mandals with:

- High groundwater stress and over-exploitation - Bheemgal and Velpur were identified as critical, given their near-complete dependence on borewell irrigation and rice monoculture in both seasons in majority of the villages.
- Proximity to the existing project area in Dichpally and Dharpally, enabling continuity of community relationships, logistical support, and monitoring infrastructure.
- Active rice cultivation in both Kharif and Rabi seasons across at least 80% of agricultural land.
- Access to VDCs as community partners.

A stakeholder consultation process was conducted prior to the Kharif 2025 season, which validated the selection of the two new mandals and helped identify lead farmers and community resource persons in each mandal.

4.2 Baseline Data Collection

A structured baseline survey was conducted in 16 villages within the two new mandal blocks (Bheemgal and Velpur) to understand prevailing agronomic practices, challenges, knowledge gaps, and extension service coverage. The survey used a semi-structured interview model.

Methodology: Randomized Sampling Out of 222 initially enrolled farmers, 24 farmers were selected through randomized sampling using the RAND() formula (applied village-wise). An additional 25 farmers were selected based on their expression of interest and their active participation to be included in the project. The same questionnaire developed for Kharif 2024 was used to maintain consistency and enable cross-season comparisons.

Data was collected through ERPNext software on basic farmer profile and land size, cultivation practices and crop varieties, cost of cultivation, synthetic chemical usage, yield, and profitability. During the crop season through continuous field visits we have collected all necessary data on the same parameters in 3 stages (pre-mid-post season) across 90 baselines farmers covering all working villages

4.3 GHG Emissions

Impact on GHG emissions was assessed using the Cool Farm Tool (CFT), an online GHG calculator developed by the Cool Farm Alliance (CFA). The CFT integrates weather data and is based on empirical models and Intergovernmental Panel on Climate Change (IPCC) Tier 1 and Tier 2

methodologies. It enables estimation of emissions from on-farm activities including crop production, fertilizer use, soil management, energy consumption for irrigation, fuel, transport, and pesticide use.

GHG emission calculations were conducted for 90 baseline farmers for kharif and rabi seasons on emissions per acre and emissions per kg.

4.4 Water Use Monitoring

To monitor actual water consumption and validate the impact of AWD, the project deployed a combination of physical sensors and manual recording tools:

- 10 water meters were installed (5 at AWD fields, 5 at non-AWD fields) directly on borewell outlets. These meters record the total volume of water discharged, transmit data to a cloud dashboard via satellite signals, and operate entirely on solar power.
- 16 water level sensors were deployed across fields (12 in AWD fields, 4 in non-AWD fields) to continuously record water levels, dry spell durations, and re-flooding events. All data is transmitted in real time to a digital dashboard, with manual readings cross-validated periodically.
- Farmers enrolled in AWD were also provided with perforated pipes to enable manual monitoring of subsurface water levels, as used in the previous season.
- An Independent of ground-level instrumentation, Carbon Farm conducted a third-party evaluation using satellite-based remote sensing across all enrolled farmer fields.

4.5 Yield and productivity

Crop cutting experiments (CCE) were conducted during Kharif 2025 and Rabi 2025–26 to compare yields under AWD and conventional irrigation practices. The experiments were implemented across all project villages covering the four mandals - Dichpally, Dharpally, Bheemgal, and Velpur. Farmers were selected based on their willingness to participate and follow the experimental protocols. In Kharif 2025, 48 farmers were included (24 AWD and 24 non-AWD), while in Rabi 2025–26, 62 farmers participated (31 AWD and 31 non-AWD). Each AWD farmer was paired with a neighbouring farmer practicing conventional irrigation to ensure similar soil and agro-climatic conditions.

To maintain comparability, both farmers in each pair used the same variety and followed similar practices with respect to nursery sowing time, age of seedlings, and transplantation schedule. Other agronomic practices such as land preparation, fertilizer application, and pest management were also kept similar, with irrigation method being the primary variable.

Crop cutting was carried out using standard 5 × 5 m plots (25 sq. m), and data on yield and related parameters i.e. No of tillers, No of productive tillers per hill, No of grains per panicle, Grain weight, Straw weight, Harvest Index, panicle length, etc were recorded. This paired approach enabled a reliable comparison, ensuring that differences in yield could be largely attributed to irrigation practices.

4.6 Crop Residue Management - Prevention of Stubble Burning

The project adopted a structured, community-driven approach to address stubble burning, focusing on behaviour change, demonstration of alternatives, and collective action. The methodology followed a sequential process of *awareness → demonstration → input support → community mobilisation → institutional convergence.*

The intervention began with village-level awareness campaigns conducted before and after the harvest season in locations where farmers naturally gather, such as rice drying yards, procurement

centres, and panchayat offices. These meetings were designed to build awareness on the adverse environmental and soil health impacts of stubble burning and to introduce feasible alternatives.

This was followed by demonstration of residue management practices under field conditions. Farmers were shown practical steps such as post-harvest irrigation to soften residues, incorporation through cage wheeling or rotovator, and the application of waste decomposer cultures to accelerate decomposition within the limited inter-season window.

To support adoption, the project provided waste decomposer cultures to interested farmers, enabling them to independently practice residue incorporation. This helped bridge the gap between awareness and field-level practice. A key component of the methodology was community mobilisation through VDCs. Villages were facilitated to adopt collective resolutions to eliminate stubble burning, ensuring that the risk of fire spreading from neighbouring fields was minimized.

The intervention was further strengthened through information and communication materials in the local language and institutional convergence with government stakeholders, including district-level consultations to support scaling and policy alignment.

5. Implementation

5.1 Stakeholders Involved

The project maintained strong multi-stakeholder convergence as a core implementation strategy during 2025–26, bringing together government institutions, community organisations, and farmer collectives to support the farmers transition to regenerative rice cultivation. The Department of Agriculture, Telangana played an active role in awareness meetings, Farmer Field Schools, and district-level consultations, while also committing support for farm machinery access in project villages. NABARD continued to provide convergence support for initiatives such as tree plantation and vermicomposting. KVK-Rudrur contributed through soil testing services, technical guidance, pest management tools, and participation in training programmes.

Farmer Producer Organizations (FPOs), particularly Dichpally, Bheemgal and Govindpally FPCs, served as key implementation partners by facilitating the distribution of seeds, bio-inputs, and equipment through Custom Hiring Centres, while also enabling collective action such as stubble burning prevention. VDCs emerged as critical community institutions, leading village-level mobilisation, coordinating awareness campaigns, and driving collective decisions, especially around residue management and common land development. Women's Self-Help Groups (SHGs) were actively engaged in promoting kitchen gardens and improving household nutrition, while local Civil Society Organisations (CSO), including SWRDS, supported fruit tree plantation and community outreach. Additionally, media platforms such as ETV Annadatha helped amplify project learnings and policy dialogue, extending the impact beyond the immediate project geography and Print media started updating our works very regularly in the local languages.

5.2 Capacity Building and Training

5.2.1 Awareness and Training Programmes

The project adopted a participatory and multi-channel approach to farmer capacity building. During 2025–26, 89 awareness meetings and 35 training programmes were conducted across project villages. These covered majorly:

- **Regenerative Agronomic Practices:** Farmers were trained on improved crop management practices such as early transplantation, maintaining proper line-to-line and row-to-row

spacing, creating gap rows at regular intervals (every 10 feet) for better aeration and light penetration, and tip cutting of seedlings to reduce pest incidence and improve crop health.

- **AWD-Based Water Management:** Capacity building focused on efficient irrigation practices under AWD, including the use of perforated pipes for monitoring water levels, understanding the recommended 15 cm threshold for re-irrigation, and recording irrigation events to optimise water use and use of power drawn implements to reduce the usage of agro chemicals.
- **Pest and Disease Management:** Training sessions enabled farmers to identify major pests and diseases and promoted the use of biological control measures and bio-inputs as safer and sustainable alternatives to chemical pesticides
- **Soil Health and Green Manuring:** Farmers were sensitized to the importance of soil health improvement through practices such as cultivation of green manure crops (Sesbania, Navadhanya – a mix of 16 different type of crops), composting, Biochar and vermicomposting to enhance soil fertility and organic matter content.
- **Stubble Burning Prevention:** Awareness programmes highlighted the adverse environmental and soil impacts of stubble burning and introduced practical alternatives, including residue incorporation through cage wheeling, rotovator use, and application of waste-decomposers and use of mechanized shredders for easy decompositions.
- **Variety Selection and Seed Systems:** Farmers were educated on the importance of varietal diversification, the performance of improved and climate-resilient varieties, and proper seed treatment practices to improve crop resilience and productivity.
- **Weather Advisory and Water Budgeting:** Special emphasis was laid on linking rainfall patterns with irrigation decisions and improving understanding of groundwater depletion. Crop water budgeting workshops were conducted, particularly in Dharpally and Bheemgal mandals, to support informed decision-making.

5.2.2 Farmer Field Schools and Focused Group Discussions

As part of the capacity-building and knowledge-sharing approach, the project conducted Farmer Field Schools (FFS) and Focused Group Discussions (FGDs) to promote experiential learning, participatory analysis, and farmer-led decision-making.

- **Rice Diversity Block FFS:** A 8 variety rice diversity block was established, including 5 traditional varieties cultivated under SRI 3 improved varieties under organic farming practices. Farmers from neighbouring villages participated in field visits to observe and compare varietal performance, pest resistance, and agronomic traits. The platform also facilitated participatory seed selection. Officials from the Agriculture Department, horticulture officers, and VDC members actively participated. Despite the impact of the Montha cyclone causing crop lodging, the variety DRR Dhan 75 demonstrated better resilience and performance.
- **Drum DSR FFS:** A Farmer Field School on DSR using drum seeders was conducted to demonstrate the methodology and benefits of direct seeding. Farmers were able to observe labour-saving potential, crop establishment, and field performance of DSR under real-time field conditions, which helped in improving their understanding and confidence in adopting the practice.
- **Focused Group Discussion - Rice Cultivation Systems (24 May 2025):** A focused group discussion was conducted at Govindpally village with 20 rice-growing farmers to understand the continued dominance of rice cultivation. Key reasons identified included assured procurement, availability of Minimum Support Price (MSP), government bonus systems, and

significant challenges in marketing alternative crops. Farmers also highlighted risks such as crop damage caused by wildlife (wild boars, peacocks, and birds), which discourages diversification.

- **Focused Group Discussion - Soil Health and Policy Gaps (26 February 2026):** Another FGD was conducted to understand the disconnect between farmers and policies related to soil health management. The discussion helped identify key issues such as declining soil fertility, dependency on chemical inputs, and limited awareness of sustainable alternatives. It also provided insights into feasible pathways for transitioning towards regenerative practices and informed the project's local-level interventions.

5.2.3 Tools, Inputs, and Infrastructure Support

All enrolled AWD farmers were provided with perforated pipes for field-level water monitoring and farmer diaries for recording inputs, water events, and costs by promoting a culture of self-assessment and record-keeping.

Two CHCs were established - one at Bada Bheemgal FPO and one at Govindpally FPO providing access to drum seeders, brush cutters, shredders, tarpaulins, rice weeders, moisture meters, weighing machines, bio-inputs, seeds, and training materials. These shared resources reduced the financial burden on individual farmers and supported early adopters in implementing efficient and labour-saving practices.

Brush cutters were promoted as an alternative to chemical herbicides for weed management on field bunds. More than 80 farmers adopted brush cutters, with the additional benefit that the cut grass serves as fodder for cattle - creating a dual-use, sustainable practice.

5.2.4 Advisory Services

A season-long advisory service was provided to farmers covering key aspects such as crop production, seed selection, soil health, pest and disease management, weather-based advisories, and water management. The advisory support was designed to ensure continuous engagement with farmers and facilitate timely decision-making throughout the crop cycle. Advisory services were delivered through multiple channels to maximize outreach and effectiveness. The extension team conducted regular field visits, through which 847 farmers received direct, hands-on advisory support, enabling personalized guidance based on field conditions. In addition, WhatsApp advisory groups were created, through which 465 farmers received continuous updates on crop practices, pest alerts, and weather-based recommendations.

To expand accessibility, the project also leveraged the Kisan Mitra toll-free helpline, CSA's farmer support system, which connected farmers to information on government schemes, agricultural advisories, and crop management practices. Furthermore, farmers were oriented towards the use of digital advisory tools such as CABI and Pestoscope, which helped them in identifying pests and diseases and accessing appropriate management solutions. Together, these integrated advisory approaches ensured timely, reliable, and accessible support to farmers across the project villages.

5.3 Key Intervention Practices and Technologies adopted

5.3.1 Alternate Wetting and Drying (AWD)

AWD is a water-saving irrigation technique for rice cultivation where fields are not kept continuously flooded. Instead, water is allowed to drain and the soil is allowed to dry for a period. A perforated pipe inserted into the field serves as a water-level indicator. This cycle of wetting and drying allows for multiple aeration events, suppresses anaerobic respiration in the soil, and reduces methane emissions. AWD conserves water, lowers methane GHG emissions, improves plant health (stronger root systems, more tillers), reduces incidence of BLB disease and BPH pest, and maintains or improves yield compared to continuous flooding.

Methodology of promotion: AWD was introduced through a combination of village-level awareness meetings, night meetings, village level trainings and live field demonstrations in actual rice plots. Progressive farmers and Community Resource Persons (CRPs) were trained first and then served as peer demonstrators. The project team conducted regular field visits during the critical AWD monitoring periods (especially at 30 and 60 days after transplanting) to troubleshoot and build farmer confidence. Perforated pipes were distributed to all enrolled farmers as a practical tool to reduce the CH_4 emissions through water management.

Non-Negotiable Practices alongside AWD: Farmers adopting AWD were also oriented on 11 Good Agricultural Practices (GAPs) or 'non-negotiables' — line-to-line and row-to-row transplantation, gap rows every 10 feet for aeration, early transplantation (within 30 days of nursery raising), tip cutting of seedlings to prevent stem borer, seed/seedling treatment, reduced fertilizer use, reduced pesticide use, bund plantation, and growing vegetables organically for household consumption.

Reach: A total of 1,148 farmers across 36 villages and 4 mandals adopted AWD, covering 5,205.85 acres. Approximately 800 farmers adopted line-to-line transplantation and gap spacing, and 426 farmers adopted seed or seedling treatment during Kharif 2025.

5.3.2 Crop Residue Management – Prevention of Stubble burning

The stubble burning prevention campaign was implemented across all project villages through a combination of awareness, demonstration, and collective engagement activities.

A series of 146 awareness meetings were conducted before and after harvest seasons, using public address systems and local announcements to ensure participation. These meetings were often led by progressive farmers to build trust and peer influence. Key messages included the environmental damage caused by burning, soil fertility loss, and the benefits of alternative practices.

Field-level demonstrations of residue incorporation were conducted, where farmers were guided through the process of applying irrigation after harvest, incorporating residues using machinery such as rotovators or cage wheels, and applying decomposer cultures for faster breakdown.

To facilitate adoption, waste decomposer cultures were distributed to 200+ farmers, enabling them to replicate the process independently on their fields. Posters and pamphlets in Telugu were also distributed and displayed in common places within villages to reinforce messaging.

VDCs played a crucial role in mobilizing farmers and enabling collective action, including passing resolutions to stop stubble burning across entire villages. This helped address the issue of fire spread from neighbouring fields.

At the institutional level, the project organised a district-level consultation workshop in May 2026, engaging the Department of Agriculture, NABARD, KVK Rudrur, and local stakeholders. This led to

commitments for improved machinery access (rotary shlashers) and enforcement measures, including the introduction of a fine for stubble burning.

5.3.3 System of Rice Intensification and Direct Seeded Rice

SRI: SRI involves transplanting younger seedlings (12–15 days old) at wider spacing (one or two seedlings per hill), with minimal water and aerobic soil conditions. This method improves root development, tiller count, and overall plant health while significantly reducing seed quantity requirements. The major challenge remains labour unwillingness — labourers are accustomed to faster conventional transplanting methods that allow per-acre completion, and resist the slower, more delicate SRI approach, particularly for 12–15-day seedlings. Cold wave conditions in Rabi 2025 further suppressed early seedling growth and caused delayed transplantation beyond 40 days in many fields.

DSR: Direct Seeded Rice eliminates the nursery stage by sowing seeds directly into the main field using a drum seeder. This addresses labour shortages and costs, reduces crop duration, and can yield results equal to or better than transplanted rice. In 2025–26, 10 farmers adopted DSR across 20 acres (less than 1% of project area). The Wet DSR, FFS was conducted to build familiarity and encourage wider adoption.

Challenges: Both SRI and DSR require significant departures from traditional transplanting practices. Unpredicted rainfall during the rainy season (as experienced with the Montha cyclone in Kharif 2025) poses a major climate risk to these alternate cultivation methods. Labour group resistance to SRI continues to be a structural barrier.

5.3.4 Green Manuring and Soil Health Enhancement

Awareness meetings were organized on soil health management, focusing on the long-term consequences of continuous rice monoculture, stubble burning, and heavy synthetic fertilizer use leads to declining soil organic carbon, loss of soil biodiversity, and reduced soil fertility. Farmers were introduced to the practice of cultivating green manuring crops in the 8–10-week inter-season window between Rabi harvest and Kharif sowing.

Sesbania and Sunn hemp (for nitrogen fixation); Navadhanya (a 16-variety mix providing 3-4 tonnes of green biomass from the same seed rate as Sesbania or Sunn hemp alone); and Gliricidia (fast-growing nitrogen-fixing tree for bund planting).

Reach: 715 farmers adopted green manuring crops and 662 cultivating Sesbania and 53 growing Navadhanya covering approximately 2,086 acres. Farmers who adopted stubble incorporation reported early signs of soil health improvement even as the additional cost of incorporation (approximately Rs 2,000/acre) remained a consideration.

Additional demonstrations: Azolla (freshwater fern) was promoted as an alternative to herbicides - azolla covers the field rapidly, blocking sunlight and preventing weed germination, while also fixing atmospheric nitrogen. Azolla units were established with one farmer per village as a multiplication and distribution hub. Two vermicompost units were also established at Dichpally village as demonstration units for sustainable soil enrichment.

5.3.5 Seed Systems and Varietal Diversification

Only a few varieties were used over decades under rice cultivation have eroded varietal diversity in Nizamabad. The repeated use of the same seed has increased vulnerability to Bacterial Leaf Blight (BLB), a seed-borne disease that spreads rapidly through seeds, water, and air, and has been causing increasing crop damage in the district.

Awareness meetings were conducted on the importance of varietal diversification. A 8-variety rice diversity block was established as a live demonstration. Several farmers expressed interest in cultivating DRR Dhan 75 and selected traditional varieties following their observation at the diversity block. During the Montha cyclone, DRR Dhan 75 stood out as the best-performing variety in terms of resistance to lodging, validating the importance of variety diversification for climate resilience.

Quality seed facilitation: 74 farmers received quality seeds of improved varieties sourced from universities and KVKs (WGL 44, DRR Dhan 75, KNM 733, and KNM 7715) - along with some traditional varieties for home consumption, covering 213 acres.

5.3.6 Biodiversity Enhancement through Bund Cropping

Bund cropping was promoted as a low-risk, low-investment approach for biodiversity enhancement and supplementary income. The initiative addressed the ecological challenge of mono-cropping in rice while also reducing dependence on chemical herbicides on bunds (which pose health and soil health risks).

The following crops were promoted on field bunds:

- *Celosia cristata* (Setha Jada puvvu): A floral crop with high cultural and market value during the Bathukamma festival. It attracts pollinators, suppresses weeds, acts as a trap crop to reduce pest pressure, and provides seasonal income.
- Okra, vegetables, and red gram: For household nutrition and soil fertility improvement.
- Drumstick, mango, guava, and Gliricidia: For long-term income, soil health, and biodiversity.

Reach: Bund cropping materials (Celosia, okra, vegetable seeds, red gram, drumstick seeds) were distributed to 159 farmers. Brush cutters were also promoted as an alternative weed management tool on bunds, replacing chemical herbicides, with more than 80 farmers adopting them in few villages.

5.3.7 Women Farmers Engagement

Four awareness meetings were conducted with SHG women farmers in Pochampally and Kuknoor on the importance of cultivating traditional vegetables for household consumption. These meetings addressed the triple burden of reducing women's participation in agriculture (due to mechanization and migrant labour), declining nutritional diversity, and dependence on chemically grown vegetables.

Reach and impact: 80 kitchen garden kits containing 16 traditional vegetable seed varieties were distributed to SHG women and general farmers, encouraging use of household spaces for safe, nutritious, and chemical-free vegetable cultivation. The programme promoted traditional food habits, improved family nutrition, and enhanced women's involvement in sustainable farming.

5.3.8 Agroforestry Development - Govindpally Village Common Land

With the support from CSA, the Govindpally VDC in Dharpally mandal initiated to develop 5 acres of village common land, out of a total of 32 acres, which was previously used for animal grazing. The land did not generate any formal income for the village, and there were limited financial resources available for its development. In response, the project supporting a community-led initiative to convert this land into a fruit-based agroforestry system.

The intervention followed a participatory and community-driven planning process. The VDC first organized a village-level meeting, where a formal resolution was passed to convert the common land into an agroforestry system. To strengthen planning and learn from existing models, CSA

team members and VDC representatives visited Sadhana Forest to understand water conservation practices and explore their applicability to the site.

At the village level, initial efforts included land preparation through the removal of unwanted plants, shrubs, and trees. The VDC facilitated critical infrastructure support by arranging electricity connections and borewell access, and also applied for MGNREGS support to undertake bunding and trench formation activities. The CSA team provided technical support throughout the process, including identification of suitable species, design of bunding and trenching layouts, and improvement of water retention structures such as farm ponds and mini percolation tanks (MPTs). Additional support included the establishment of a vermicompost unit, facilitation of bio-inputs such as *Trichoderma* and *Pseudomonas*, bio-fencing design, and guidance on soil conservation and post-plantation management practices.

To further enhance ecological restoration, a seed ball campaign was conducted, involving school students, teachers, VDC members, and the broader village community. Seed balls containing wild forest species were distributed across the land to promote natural regeneration and biodiversity. In addition, mango plantation activities were undertaken as part of the agroforestry initiative to establish a long-term income-generating system for the village. Such initiatives has built social capital among farmers!

5.3.9 Demonstration on Broadcasting Broken Rice for Weed Suppression (CVR Method)

A demonstration was initiated based on the method pioneered by Padmashree Natural Farming practitioner Chintha Venkat Reddy (CVR), who advocates broadcasting broken rice in rice fields on the day of transplantation. The broken rice is claimed to suppress 80% weed populations for up to 25 days after transplanting, and again when applied at 45 days, while also improving soil health. Given the significant cost and chemical load of herbicide use in rice cultivation, a demonstration plot was established at the farmer level to observe and document results.

5.3.10 Crop Water Budgeting Workshops

Dedicated crop water budgeting workshops were organized in Dharpally and Bheemgal mandals, two blocks identified for severe groundwater depletion with the farmers. The workshops presented a comprehensive analysis covering seasonal rainfall received versus total irrigation water applied for rice cultivation, long-term groundwater depletion trends and their consequences, and the economic and agronomic case for crop diversification and shorter-duration varieties.

Farmers expressed surprise at the volume of water they apply for rice and acknowledged the long-term risks involved. However, they also shared significant barriers to transitioning away from rice cultivation, including wildlife damage to alternative crops from wild boars, peacocks, and birds from nearby forests, the lack of assured procurement at MSP for non-rice crops, and the ease and predictability of the existing government rice procurement system.

6. Results and Impact

6.1. GHG Emissions (Co_2eq) per Acre per Season

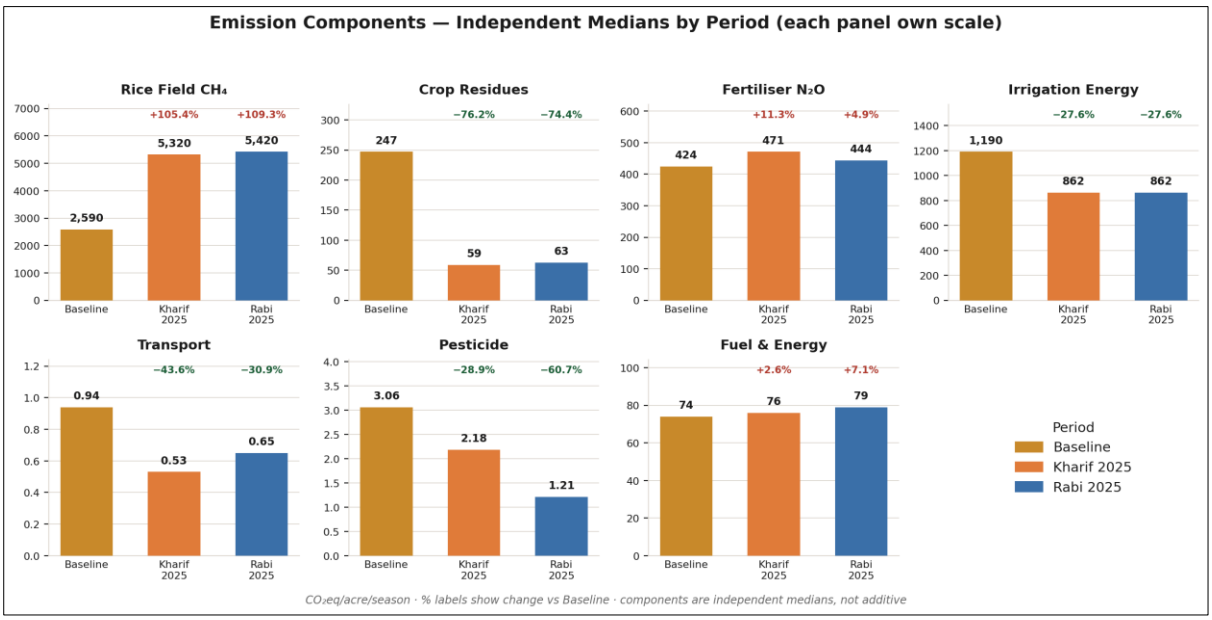

Figure 2: GHG Emission Impact - Component wise - Co2eq / Acre/ Season

The Cool Farm Tool (CFT) was applied to 90 farmers across Bheemgal, Velpur, Dharpally and Dichpally mandals across three periods; Baseline (pre-programme), Kharif 2025 and Rabi 2025. Emissions are measured in kg CO_2-equivalent per acre per season across seven sources: rice field methane (CH_4), crop residue management, fertiliser N_2O, irrigation pumping energy, transport, pesticide production, and farm fuel and energy use.

AWD adoption produced a clear restructuring of the farm-level GHG emissions. Irrigation energy emissions fell by 28% in both Kharif and Rabi (1,190 → 862 CO_2eq/acre in each season), directly reflecting fewer pump-hours and reduced water lifts under the AWD protocol. Crop residue emissions fell by 76% in Kharif and 74% in Rabi (247 → 59 and 63 CO_2eq/acre), confirming a near-complete shift away from post-harvest stubble burning - a behaviour change through CSA extension and CRP outreach. Together, these two reductions saved approximately 516 CO_2eq/acre in Kharif and 512 CO_2eq/acre in Rabi compared to the baseline.

Table 2: Emission component per Acre Per Season (Co2eq)

Emission Source	Baseline	Kharif 2025	Rabi 2025
Paddy Field CH_4	2,590	5,320	5,420
Crop Residues	247	59	63
Fertiliser N_2O	424	471	444
Irrigation Energy	1,190	862	862
Transport	0.94	0.53	0.65
Pesticide	3.06	2.18	1.21
Fuel & Energy	74	76	79

Emission Source	Baseline	Kharif 2025	Rabi 2025
Reported TOTAL (median)	**5,895**	**6,710**	**6,755**

Note: *Component figures are independent medians — each emission source's median is calculated separately across the same 90 farmers. They will not sum to the Reported Total (median), because no single farmer holds the median value across all seven sources simultaneously; the Reported Total is the median of each farmer's own full-basket sum. The "SUM of components (raw)" row is shown only to make this gap visible — it is not a valid emissions figure in its own right.*

Total per-acre emissions (median) increased moderately from baseline (5,895 CO_2eq/acre) to Kharif 2025 (6,710, +13.8%) and Rabi 2025 (6,755, +14.6%), driven primarily by a rise in rice field methane from 2,590 CO_2eq/acre at baseline to 5,320 in Kharif (+105%) and 5,420 in Rabi (+109%). This increase is primarily explained by two positive agronomic practices promoted under the programme: the incorporation of rice stubble into the soil rather than burning it, and the cultivation and soil incorporation of green manure crops like Navdhanya, Sunnhemp, and Sesbania before rice transplanting. Both practices add organic biomass that decomposes under flooded anaerobic conditions and generates methane, captured by the CFT as higher rice CH_4. These are deliberate soil-health investments that improve long-term soil carbon, nitrogen availability, and fertility not indicators of declining environmental performance.

6.2 Impact on Yield and Productivity

To assess the impact of irrigation practices on rice productivity, CSA implemented paired Crop Cutting Experiments across the working villages in both Kharif 2025 (24 AWD- 24 Non-AWD in 24 villages) and Rabi 2025-26 (31 AWD- 31 Non-AWD in 31 villages) under the project. Each pair consisted of one AWD farmer and one neighbouring conventional-irrigation farmer growing the same or closely matched rice variety under comparable agronomic conditions. Data collected included grain yield, active tillers per hill, seeds per panicle, grain weight, straw weight, and harvest index. All yield is standardised to 14% grain moisture content.

Across both Kharif 2025 and Rabi 2025-26, AWD-practising farmers consistently produced higher grain yields than non-AWD. The AWD advantage is observed in 88% of Kharif paired villages (21 out of 24) and 87% of Rabi paired villages (27 out of 31).

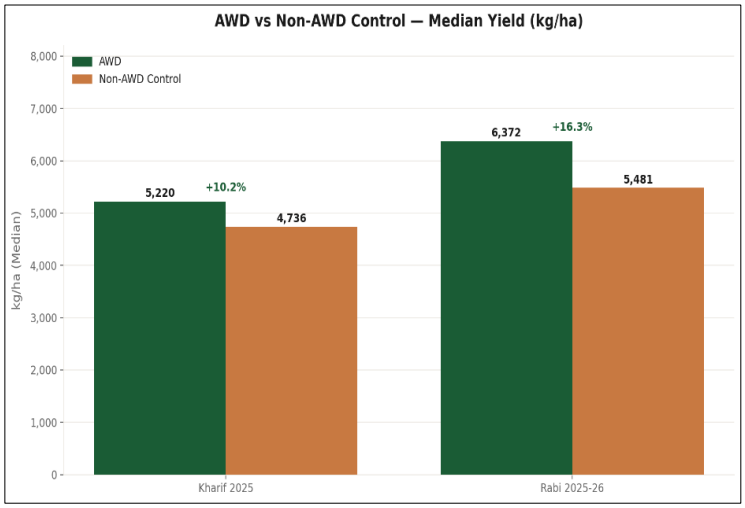

Figure 3: Impact on Yield - AWD vs Non AWD (kg/hec)

The cross-season comparison confirms that AWD's yield advantage over conventional irrigation is not season-specific but a consistent, reproducible programme outcome.

At the median level, the Rabi yield advantage (+16.3%, 891 kg/ha) is stronger than in Kharif (+10.2%, 484 kg/ha). This is consistent with the known agrophysiology of AWD: periodic soil drying strengthens root architecture and improves nutrient uptake over time. By Rabi, the second major season of AWD practice for most farmers - the root development benefit is more fully expressed, and Rabi's cooler temperatures and more stable growing conditions allow this improved root system to more reliably convert nutrient uptake into grain yield.

In summary, the CCE data across both seasons establishes clearly that AWD is a yield-enhancing technology for rice cultivation in this geography. The typical AWD farmer at median produced 484 kg/ha more rice than conventional in Kharif and 891 kg/ha more in Rabi gains that are economically significant.

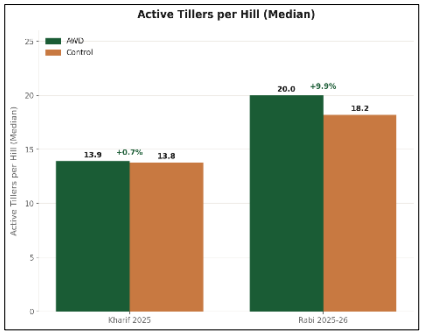

Figure 7: Comparative Analysis of Productive Tillers - AWD vs Non-AWD

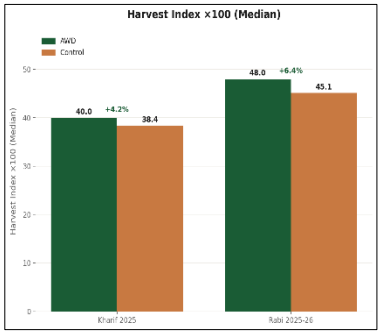

Figure 6: Harvest Index — AWD vs Non-AWD, Season-wise Comparison

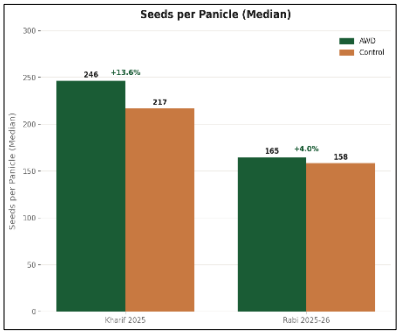

Figure 5: Seeds per Panicle — AWD vs Non-AWD Comparison

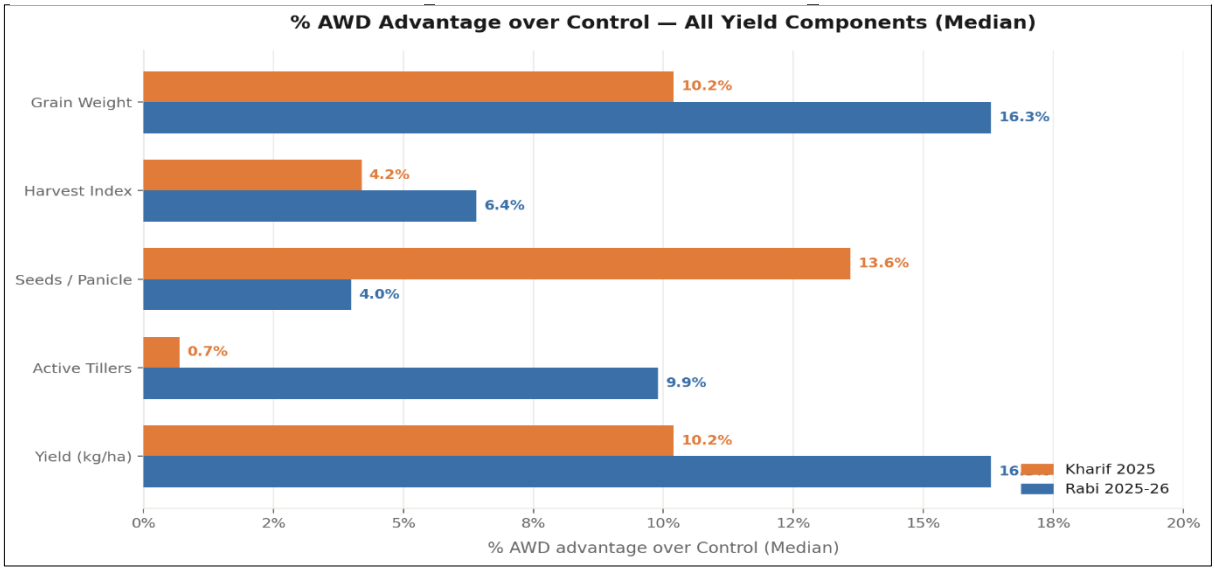

Figure 4 Season-wise % Advantage of AWD over Control — All Yield Components

The component analysis reveals a clear seasonal pattern in how AWD delivers its yield advantage. In Kharif 2025, the dominant is seeds per panicle (+13.6%) - AWD plants produced substantially more filled grains per panicle at median (246 vs 217), while active tiller count was almost identical between the two arms (+0.7%). This means AWD's Kharif advantage is primarily a grain-filling quality effect: each existing panicle produces more grain, driven by AWD's root-health benefit improving nutrient access during the reproductive stage. Harvest index (+4.2%) and grain weight (+10.2%) follow from this improved grain filling.

In Rabi 2025-26, the pattern shifts. Seeds per panicle are still higher in AWD (+4.0%) but the gap narrows. The dominant one here is active tillers per hill (+9.9%) and harvest index (+6.4%). AWD Rabi plots produce more productive tillers (20.0 vs 18.2 per hill) and convert a higher proportion of those tillers' biomass into grain (HI 0.48 vs 0.45). Grain weight (+16.3%) directly defines the yield gain.

The straw weight also increases modestly in both seasons (Kharif +8.6%; Rabi +7.8%), indicating that AWD plants are growing more total biomass overall - but here the harvest index data confirms

that a greater fraction of this larger total biomass ends up as grain rather than as straw. This is the hallmark of a physiologically superior crop stand.

6.3 Crop Residue Management - Prevention of Stubble Burning

The intervention resulted in significant reduction of stubble burning across the project area through community-led action and increased adoption of alternative practices.

- **Kharif 2025:** 549 farmers prevented stubble burning across 2,300 acres, adopting residue incorporation practices supported by decomposer application and field-level demonstrations.
- **Post- Rabi 2025:** More than 900 farmers across 35 villages collectively prevented stubble burning on approximately 3,000 acres, representing around 50% of farming communities in the project area.

This scale was achieved through sustained community mobilisation, VDC-led resolutions, peer learning, involving the dept of agriculture and access to inputs and knowledge. Farmers increasingly adopted residue management practices such as incorporation using rotovators and cage wheels.

However, challenges persist, an incident in Kesaram village, where fire spread from a neighbouring field, highlights the continued risk in the absence of universal adoption, reinforcing the importance of full community participation.

6.4 Water Use and Irrigation Efficiency

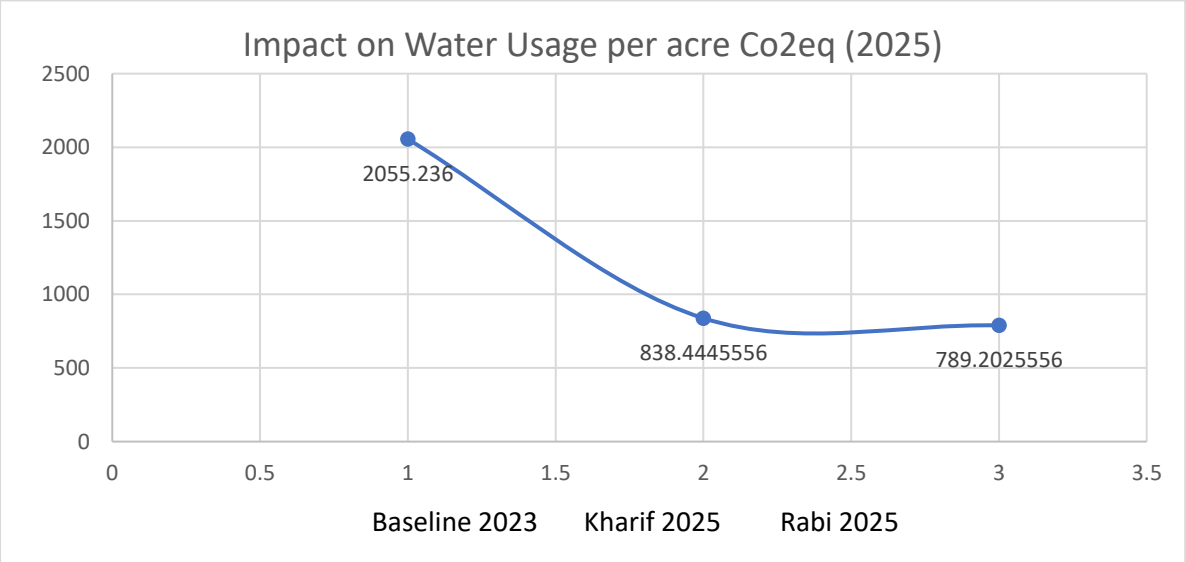

Figure 8 Season wise Water Usage per Acre - Co2eq

The analysis of farmers' irrigation practices across the baseline, kharif and rabi seasons reveals a notable change in water management following the adoption of AWD. Initially, the most farmers irrigated daily or every 2to 4 days representing excessive water usage. During the kharif and rabi seasons, daily irrigation was entirely phased out. This has marked a positive behavioural shift towards structured water saving practices.

This shift is also reflected clearly in the emissions data. Irrigation energy - the GHG component directly linked to water pumping for rice cultivation showed the sharpest decline of any emissions source measured in the programme, falling from a baseline mean of 2,055 kg CO_2eq/acre/season to 838 kg CO_2eq/acre in Kharif 2025 (−59%) and 789 kg CO_2eq/acre in Rabi 2025 (−62%). This offers direct quantitative evidence of AWD's core water-saving mechanism: by cycling fields between

wet and dry conditions instead of maintaining continuous flooding, farmers are pumping water far less frequently per season.

6.5 Economic Benefits to the Farmers Through Input Saving and Income

A major change observed was the shift in cost of cultivation following the project intervention. Farmers' expenses fell from INR 23,500 per acre at baseline to INR 21,784 during Kharif (−7%), before rising to INR25,150 in Rabi (+7%). The Kharif decline likely stems from improved agronomic techniques and better input management facilitated by the project.

Gross income followed a similar pattern, dipping to INR61,594 in Kharif (−4%) before rising to INR66,892 in Rabi (+5%). The reduction in Kharif yield is largely attributable to the impact of Cyclone Montha, which caused crop damage at the time of crop harvesting and affected productivity across the project area, rather than reflecting a shortfall in AWD performance itself.

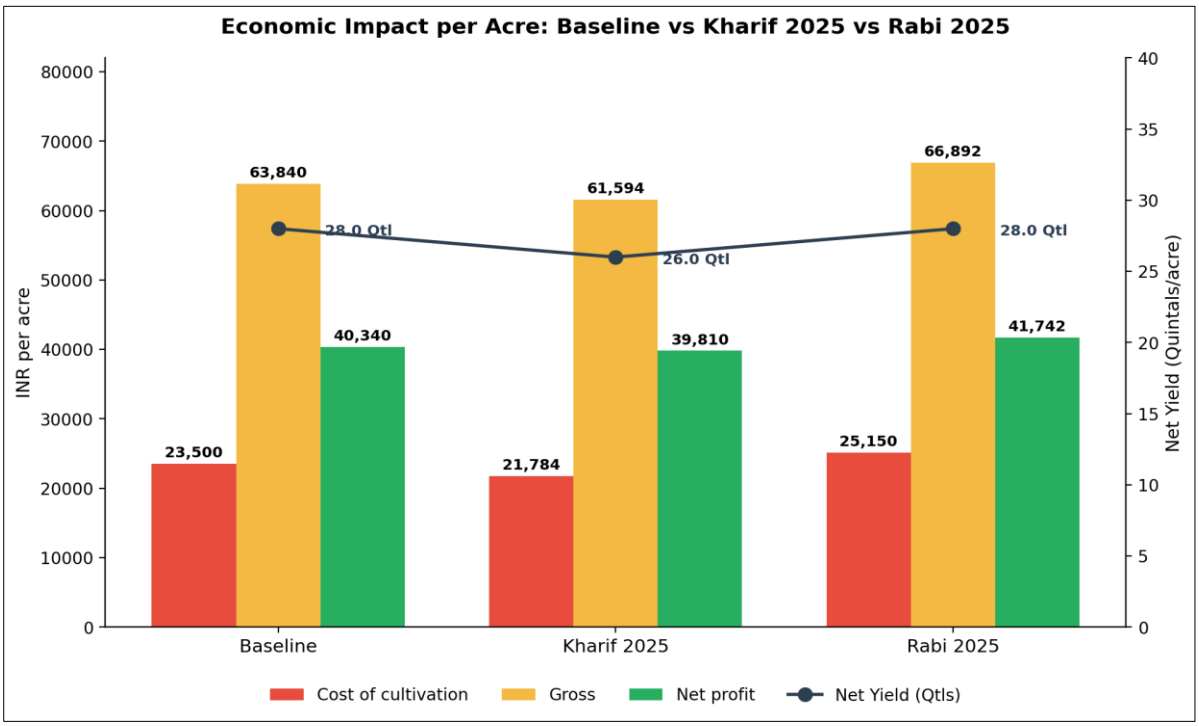

Figure 9 Cost of cultivation, gross income, net profit (bars, INR/acre) and net yield (line, quintals/acre) across Baseline, Kharif 2025, and Rabi 2025.

Table 3 Seasonal wise Economics per Acre

Season	Cost of cultivation	Gross	Net profit	Net Yield (Qtls)
Baseline	23,500	63,840	40,340	28.0
Kharif 2025	21,784	61,594	39,810	26.0
Rabi 2025	25,150	66,892	41,742	28.0

6.6. Biodiversity and Bund Cropping

The bund cropping programme was expanded in 2025–26, with *Celosia cristata*, okra, vegetables, red gram, and drumstick seeds distributed to 159 farmers. Bund plantation provides multiple

benefits supplementary income (particularly Setha Jada during Bathukamma), attraction of beneficial insects and pollinators, weed suppression, soil fertility improvement, and reduced chemical herbicide use on bunds.

The replacement of herbicides with brush cutters was also adopted by over 80 farmers, reducing chemical loads while providing grass for cattle fodder an additional economic and ecological benefit.

6.7 Social Inclusion Outcomes

The project maintained a strong focus on social inclusion. A majority of participating farmers are small (up to 2.5 acres) and marginal (2.5–5 acres) farmers groups that typically face greater barriers to accessing agricultural resources, technologies, and advisory services.

Women's engagement was strengthened through the SHG kitchen garden programme, reaching 80 households with traditional vegetable seed. SHG awareness meetings in Pochampally and Kuknoor villages directly addressed the declining role of women in agriculture and connected this with nutrition security.

CRPs and progressive farmers continued to serve as peer educators and demonstration leaders, building social capital at the village level and enabling farmer-to-farmer knowledge transfer. The VDC-level resolutions on stubble burning prevention represent a new form of collective governance emerging from this social capital foundation.

6.8 Pest Incidence and Farmer Perceptions

Farmers adopting AWD and non-negotiable practices continued to report lower incidence of Brown Plant Hopper (BPH) and BLB (Bacterial Leaf Blight) compared to conventional farmers in the same villages. CCE data showed higher grains per panicle and effective tillers in AWD plots, suggesting improved crop health under AWD management. Further research is required to establish a statistically robust relationship between AWD and disease/pest incidence.

7. Farmer Testimonials

- Before joining in 2023, I practised conventional paddy cultivation, heavy chemicals, flood irrigation, and stubble burning. After CSA's awareness session, everything changed. I now practice AWD, apply fertilisers and pesticides only when needed, and prepare bio-inputs like Jeevamrutham and Agniastra myself. My cost of cultivation has reduced and yield has improved. On one acre, I grow paddy, sesame, and vegetables entirely organically for my family's healthy consumption- ***Shri T. Narsaiah, A Farmer from Dichpally Village***
- I established a biodiversity plot 5 traditional varieties and 3 improved varieties under organic farming, with seed and bio-input support from CSA. During the Montha Cyclone, all varieties suffered lodging damage except DRR Dhan 75, which stood firm and performed remarkably well. I continued its cultivation in Rabi 2025 ***- Shri Praveen Kumar, A Farmer Velpur Village***
- Practicing AWD and other regenerative practices for two years has given me significant water savings and reduced my cost of cultivation. On CSA's recommendation, I cultivated the fine grain variety WGL 44 with seed support from KVK Rudrur. When the Montha cyclone hit, WGL 44 farmers recorded comparatively better yields than others, strengthening our confidence in this variety ***- Shri P. Sathish Reddy- A Farmer Burdipur Village***

- Learning that CSA planned to establish a Custom Hiring Centre (CHC) in Bheemgal block, our FPO BOD partnered with CSA. The organization has provided brush cutters, drum seeders, paddy weeders, and stubble burning awareness materials. Farmers now access these implements at minimal maintenance charges and the CHC has also helped our FPO attract new members - ***Shri O. Naresh (CEO)*** of Bheemgal Farmer Producer Company Ltd.
- I used to cultivate paddy traditionally, struggling with labour shortage and high costs. After CSA's awareness session, I adopted Direct Seeded Rice (DSR), sprouted seeds sown directly using a drum seeder, with no nursery needed. The crop surprised me with excellent performance, reducing the crop duration by 15 days and delivering better yields. I strongly encourage every farmer to shift to DSR **- *Shri Shebarish, A Farmer from Padgal Village***

8. Key Challenges in Programme Implementation

The 2025–26 season brought a range of operational, climatic, and systemic challenges:

- **Climate variability:** The Montha cyclone severely affected many farmers' fields in Kharif 2025. In Velpur village, nearly 60% of rice fields experienced crop lodging. The biodiversity block's 7 varieties were all affected by lodging, though DRR Dhan 75 showed the best resilience.
- **Cold wave in Rabi 2025:** Cold wave conditions suppressed seedling growth during nursery raising, delaying transplantation beyond 40 days (vs the recommended 30 days) in most fields. This affected SRI adoption, which requires younger seedlings.
- **Labour reluctance for SRI:** Labourers continue to resist transplanting younger (12–15 day) seedlings, as the process is slower and more delicate. Since labourers are paid per acre rather than by time, SRI is less economically attractive to them, limiting farmer adoption even when farmers themselves are interested.
- **AWD competition from other programmes:** Several other organizations are operating AWD projects in Nizamabad district and offering per-acre financial incentives to farmers. This creates confusion among farmers and pressure on the CSA project to offer similar incentives, affecting smooth implementation and farmer engagement.
- **Sensor theft and damage:** Theft-related issues were reported from rice sensor fields during the harvesting period. Some farmers removed sensors, while others were damaged or stolen, disrupting data collection.
- **Election code of conduct:** During the Rabi 2025 season, pre-season training programmes were restricted due to the enforcement of the election code of conduct, resulting in delays and reduced participation in critical early-season activities.
- **Rice procurement delays:** Farmers faced difficulties at rice procurement centres due to labour shortages, extreme monsoon heat, and lorry delays. At mills, deductions of approximately 6 kg of grain per quintal were reported, causing weight and income losses. Endline data collection was also delayed as farmers could not provide accurate yield estimates until procurement was completed.
- **Irrigation and water availability in Rabi:** Irregular rainfall distribution and severe groundwater scarcity during Rabi 2025 affected crops in some villages. Some farmers were unable to adopt bund plantation due to water unavailability.
- **Stubble burning fire from neighbouring farmers:** One incident in Kesaram village, where a fire set at night by a neighbouring farmer spread and burnt a field maintained for stubble incorporation, underscores the vulnerability of individual adopters to external fire events - a challenge that can only be resolved through village level community adoption.

- **Free Electricity Subsidy:** A major concern is the state policy of providing free electricity to farmers, which encourages excessive groundwater extraction and inefficient water use. As a result, many farmers rely on continuous flood irrigation, leading to significant water wastage, soil degradation, and declining groundwater levels. This leads to the less acceptance of AWD with few farmers.

9. Key Learnings

- **Varietal diversification is a climate resilience strategy:** During the Montha cyclone, farmers who had adopted improved varieties (WGL 44, DRR Dhan 75) experienced significantly lower crop damage than those cultivating older or less resilient varieties. This provides a powerful, lived demonstration of the value of the seed system and diversity work.
- **Mechanization as a multi-purpose solution:** The brush cutter, promoted through CHCs as an alternative to herbicides on bunds, has found enthusiastic adoption among more than 80 farmers — with the additional discovery that cut grass can serve as cattle fodder. This dual utility (reducing chemicals and providing fodder) makes the practice more economically attractive and self-sustaining.
- **Community governance for stubble burning:** The VDC-level collective resolution model for preventing stubble burning is proving to be the most effective mechanism, as it removes the external fire spread challenge that discourages individual adopters. Villages with formal collective agreements show higher and more sustained prevention rates.
- **Government convergence multiplies impact:** Engaging the Department of Agriculture, KVK, NABARD, and media in the district-level stubble burning workshop demonstrated that project-level learnings can trigger policy decisions (the Rs 5,000 fine for stubble burning) that benefit the entire district far beyond the project's direct reach.
- **Farmer economic logic is paramount:** Barriers to practice adoption are rarely technical - they are economic. Labour reluctance for SRI, resistance to crop diversification, and continuation of stubble burning all trace back to economic incentives and systemic policies (free electricity, MSP only for rice, per-acre labour pricing). Addressing these requires policy advocacy alongside technical support.

10. Mitigation Strategies

10.1 Strengthen AWD Adoption Through Landscape-Level Planning

AWD adoption can be significantly enhanced by implementing a landscape-level approach where contiguous farms coordinate irrigation schedules. FPOs and VDCs can facilitate this coordination, ensuring synchronized water management. When entire landscapes adopt AWD together, the risk of uneven water tables affecting individual fields is minimized and water savings are maximized.

10.2 Address Competition from Incentive-Based AWD Programmes

Given that other organizations are offering financial incentives for AWD adoption in Nizamabad, the project should develop a clear communication strategy for farmers explaining the differentiated and holistic value of CSA's approach - which builds soil health, community governance, and long-term sustainability beyond just AWD. Explore options for documenting and communicating premium market access or government incentive eligibility for farmers adopting the full regenerative package.

10.3 Enhance Farmer Capacity and Confidence - SRI and DSR

Building farmer confidence in SRI requires continuous, season-long capacity building. Involving labourers in training on the benefits of SRI (rather than only farmers) may help address labour resistance. Exploring time-based payment models for SRI transplanting, in collaboration with FPOs / Labour agents could make it more attractive to labourers.

10.4 Prevent Stubble Burning Through Universal Community Action

The remaining risk of fire spread from non-participating neighbours requires an expansion strategy - moving towards near village level adoption of stubble incorporation within project villages. Continued VDC engagement, combined with the new state government fine of Rs 5,000, creates a stronger enforcement environment. Expanding decomposer distribution and maintaining the CHC supply of incorporation machinery will support adoption at scale.

10.5 Address Groundwater Challenges During Rabi Season

Promoting shorter-duration rice varieties and facilitating crop diversification during Rabi can reduce water stress. Crop water budgeting workshops should be expanded, and the data from installed water meters used to create village-level water accounts that are shared with farmers and government water boards to build evidence for groundwater governance.

11. Key Policy Recommendations

11.1 Create Strong Policy on Rice Stubble Burning Prevention

Building on the state government's decision to fine farmers Rs 5,000 for stubble burning, the policy framework should be strengthened with:

- Procurement-linked incentives: Farmers who demonstrate prevention of stubble burning (through community certification, PGS-like systems, or satellite monitoring) should receive a direct per-acre incentive (suggested: Rs 2,000, covering incorporation cost) credited to their bank accounts during rice procurement.
- Machinery support: Rotary slashers and other residue management implements at the district level should be prioritized for project villages through CHC allocation.

11.2 Promote AWD at a Landscape Level

To enable large-scale AWD adoption in canal-irrigated and borewell-dependent areas, a landscape-level approach should be institutionalized. This requires coordinated water management across contiguous farms, facilitated by FPOs or Water User Associations, with state-level facilitation for pilot command areas to demonstrate water savings, yield retention, and emission reductions at scale.

11.3 Reform Power Subsidies and Strengthen Water Governance

The current policy of free electricity for agriculture is the single largest structural barrier to water conservation in rice cultivation. Power subsidy reforms linked to water-saving outcomes - for example, providing electricity credits to farmers who adopt AWD - could create the right incentive without removing support from farmers. Participatory groundwater budgeting at the mandal level, supported by the data from project water meters, would strengthen water governance.

11.4 Diversify Cropping Systems Through Market and Policy Support

Rice monoculture will continue as long as rice is the only crop with assured procurement, MSP, bonuses, and government marketing infrastructure. Extending MSP, procurement centres, and market linkage support to alternative crops - pulses, millets, vegetables, oilseeds - would create the economic conditions for farmers to diversify away from rice in appropriate seasons and agroecological zones.

11.5 Support Transition Through Capacity Building and Infrastructure

Government agencies, KVKs, and agricultural universities should invest in intensive capacity building for regenerative practices, including: field demonstrations of AWD, SRI, DSR, and green manuring; hands-on training on soil health management; integration of AWD and crop diversification into regular KVK advisory programs; and a state-level helpline for advisory on crop, weather, and soil management.

11.6 Foster Behaviour Change Through Collective Action and Social Mobilization

Adoption of sustainable practices requires behavioural change alongside technical support. Regular awareness campaigns, participatory workshops, and experience-sharing platforms should be institutionalized to shift farmer mindsets. Village-level champions and progressive farmers should be formally recognized and supported to serve as peer educators and demonstration leaders.

12. Annexures

12.1 Narsaiah's AWD Farming Success Story — Featured by The Better India:

https://www.linkedin.com/posts/regenagri-transforming-the-lives-of-5000-ugcPost-7442110554917294081-jFit/?utm_source=share&utm_medium=member_desktop&rcm=ACoAADR_udwBFSWtwSMGxbdoOaK00KQZRHPm_1A

12.2 Seed Ball campaign to create a awareness on afforestation

https://youtu.be/2IVh4VGoDnc?si=gRRIC7U5vVCzvV7-

12.3 Community lead action towards prevention of paddy stubble burning workshop

https://youtu.be/UVCVO8guJeE?si=itQrk46GQxz0bEma

13. Photographs



Figure 12 AWD pipe dried up to 15 cm recorded in carbon farm Field companion tool



Figure 11 AWD perforated pipe installing for monitoring and assessing the water level in the field



Figure 10 Water level sensor that records the irrigation interval.



Figure 14 Water meter installed to the outlet of bare well to record water utilization.

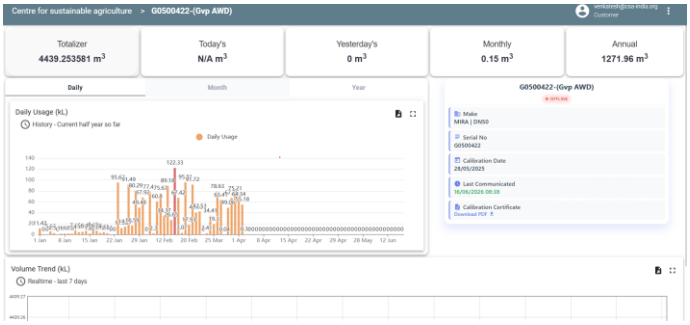

Figure 13Dashboard interface, records the amount of water used



Figure 16 Bund plantation with red gram to increase diversification



Figure 15 Cyclone Montha Causes Widespread Paddy Lodging; DRR Dhan 75 Stands Resilient



Figure 24 District level workshops for the prevention of stubble burning by involving all stake holders.



Figure 23 Green manuring crops, Navadhanya 16 varieties of green manure seeds



Figure 22 Conducted crop water budgeting addressing ground water stress in 2 blocks



Figure 21 To create awareness on prevention of stubble burning used local village level broadcasting channels



Figure 20 Awareness annoucements of stubble burning prevention through village speakers



Figure 19 Village level trainings on AWD and Regenerative Agricultural Practices



Figure 18 Visited Sadhana Forest for learning on Soil-water conservation



Figure 17 Awareness meeting with SHGs on sustainable practices in paddy and traditional Vegetables production