

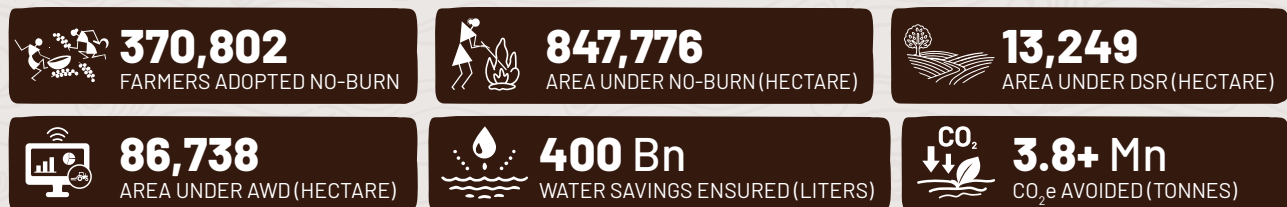
Seeds of Change

The Implementation Story of PRANA (2022-26)

Summary Report

PRANA At a Glance

Achievements



Reached out to farmers from 6200+ Villages across 18 Districts

Crop Residue Burning (Farmers)



Crop Residue Burning (Area)



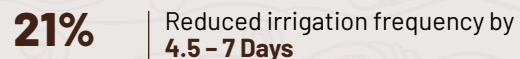
Super Seeder Usage



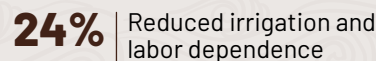
Long Duration Paddy Varieties



Water saving under Alternate Wetting & Drying (AWD)



Water saving under Direct Seeded Rice (DSR)



Over **USD 800,000** in business generated for Service Providers (SP) under **Pay for Results** interventions

Over **USD 100,000** in incentives disbursed for verified outcomes

Direct Seeded Rice
Total Area: **6,300 acres**

In-situ Crop Residue Management (CRM)
Total Area: **28,000 acres**



“ Through PRANA, I have gained knowledge that empowers me to make informed decisions and support other women to do the same. When women have access to the right information, we don't just grow crops – we grow communities.

–Jaswinder Kaur, Village Daun Kalan, District Patiala ”

Background and Context

Each year, during the short window between paddy harvesting and wheat sowing, north-west India experiences widespread crop residue burning. By 2020, the scale was both substantial and highly visible, Punjab alone saw over **55%** of its paddy area (1.66 million hectares) burnt, generating nearly **12.8 million tonnes¹** of straw and about **83,000²** fire incidents in one season.

By 2025, recorded fire incidents dropped sharply to **5,114** (over a **90% reduction**)³ signaling a gradual shift in on-ground practices. Farmers are increasingly moving away from complete burning, with **partial burning emerging as a key transitional pathway** where only a portion of residue is burned, and the rest is managed through alternative methods. This is often driven less by choice and more by operational necessity. Under tight sowing windows, high residue load, and limited confidence in full residue retention, partial burning offers farmers a quick, familiar way to reduce residue load before sowing.

By 2020–21, legal prohibitions, machinery subsidies, Super Straw Management System (SMS) mandates, Custom Hiring Centres (CHC), biological solutions, and regional governance mechanisms had created **strong policy momentum**. What farmers still

Despite strong policy support and available technologies, crop residue burning persisted because farmers lacked timely, reliable, and trusted access to alternatives during the critical harvest-to-sowing window—prompting the launch of PRANA to bridge this last-mile adoption gap and make no-burn practices truly workable on the ground.



needed was a dependable system that could make no-burn options timely, trusted, affordable, and operationally viable during the narrow window between paddy harvest and wheat sowing.

Evidence from north-west India shows that burning continued not because farmers were unaware of alternatives, but because they faced uncertainty over access, costs, operational performance and returns from residue-management technologies (Shyamsundar et al., 2019).

Aligned with The Nature Conservancy's 2030 ambition to advance integrated solutions across climate, water, land, and livelihoods, PRANA (Promoting Regenerative and No-burn Agriculture) was launched in 2021 as a Global Foodscape—one of TNC's priority landscapes where partners work across farms, markets, policy, and communities to transform food systems at scale—to reduce crop residue burning and accelerate regenerative agricultural practices. Designed to strengthen last mile delivery and adoption, PRANA applied a systems lens, recognizing that farmer decisions depend not only on awareness, but also on machinery access, service reliability, cost, timing, agronomic confidence, and local trust.

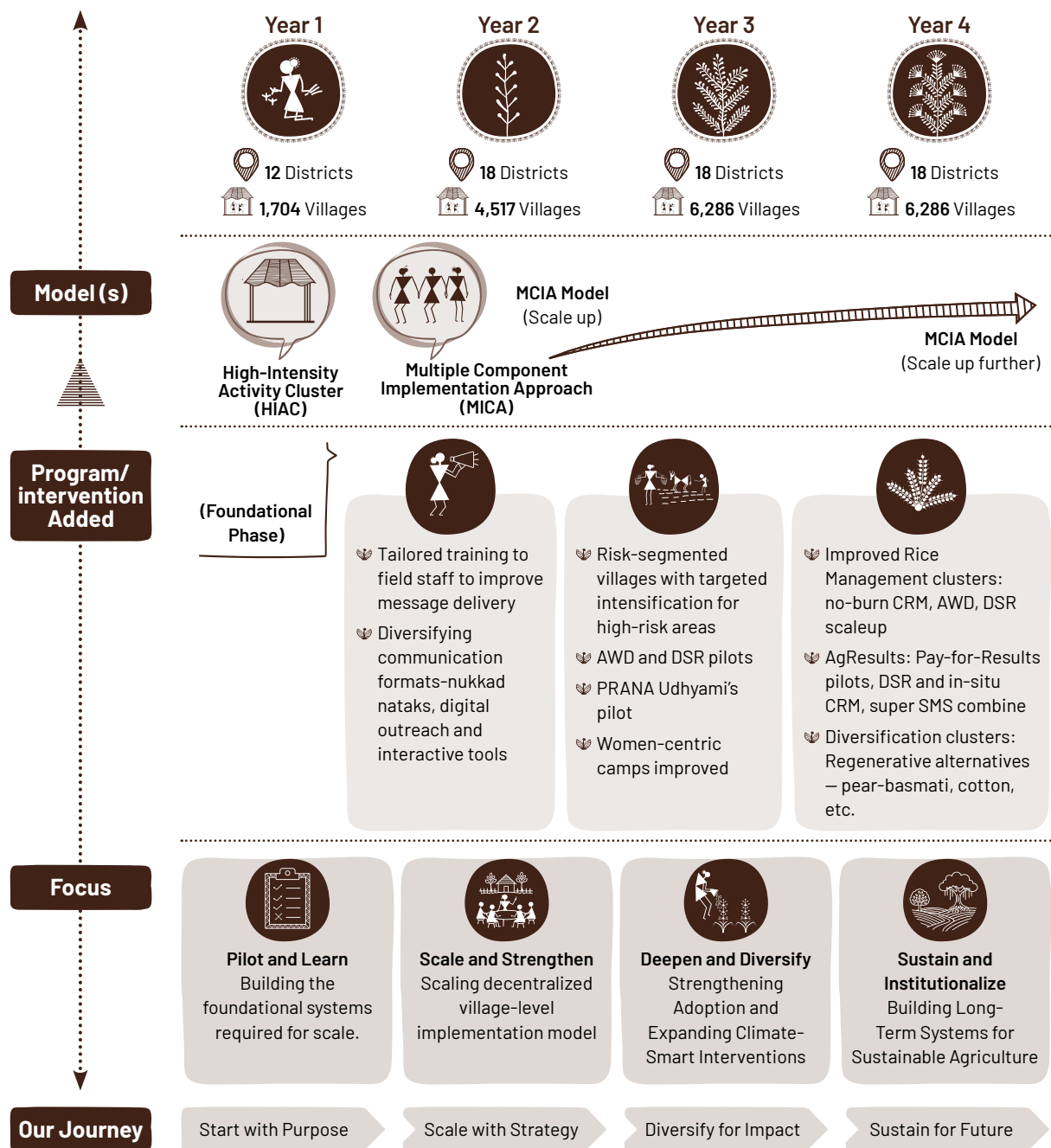
PRANA's Implementation Journey: From Pilot to Systems Transformation

PRANA evolved from a foundational implementation effort in 2022–23 into a **mature ecosystem platform** by 2025–26, progressively advancing from **diagnosing adoption barriers and piloting**



Participants at a farmer training in Ludhiana.

STRATEGIC EVOLUTION OF PRANA



2022-23

Building the foundations for scale

Establishing field architecture, testing models and village-level systems for scale

Approach & Scale

- 1700+ villages in 12 Districts
- Phased implementation (learning before scaling)
- Focus on ground-truthing, testing implementation models, strengthening delivery systems

Highlights

- Decentralised Field Architecture:** Enabled strong last-mile delivery through local teams and repeated farmer engagement
- Behavior Change and Farmer Mobilisation:** Shifted mindsets through sustained awareness, community influence, and trusted communication channels
- Demonstrations and Peer Learning:** Built farmer confidence by showcasing real, locally relevant proof of no-burn practices
- CRM Ecosystem Mapping:** Enabled diagnostic understanding of access, distribution, and coordination challenge

HIAC (5,000+ farmers) High-Intensity Activity Cluster

Farmer-centric; Resource intensive
(1 field agent over 50-100 farmers)

Pilot and learning model
(what it takes to shift first time adopters)

5,000

farmer meetings and camps

230

Kharif demo plots

500+

Rabi demo plots

4,000

field days

16,800

CRM machines mapped

Dual Implementation Models

MCIA (75,000+ farmers) Multiple Component Implementation Approach

Village-centric; Scale-oriented
demo plot per 10-villages with 1 field officer per ~10 villages

Expansion and scaling platform
(how to operationalize at larger geography)

Reduction in crop burning highlights adoption gains, with MCIA emerging as the scalable pathway.

Scaling Decentralized Village-level Implementation model

Expanding the MCIA model and converting awareness into large-scale adoption.

Approach & Scale

- 4500+ villages in 18 Districts
- Scaling **decentralized village-level implementation model**.
- Transition to **practice-led adoption**.

Highlights

9300+

farmer meetings and camps

1000

Kharif demo plots

1500+

Rabi demo plots

1,700

field days

33,000+

CRM machines mapped

- Strengthened field delivery backbone:** Deployed 2,100+ frontline staff and village facilitators to deliver contextual, relatable, and actionable advisory
- Scaled Demonstration-Led Learning:** Leveraged repeated demonstrations to refine practices and sustain adoption beyond initial trials
- Shifted from Machinery Mapping to Access Enablement:** Focused on enabling timely access through improved coordination mechanisms
- Intensified behavior change communication:** Practice-specific and time-bound, emphasizing "what to do now" over "why it matters"
- Systematic Investment in field staff capacity building:** Enhanced communication and storytelling skills to make agronomy accessible and actionable

Despite continued decline in burning, high-burn areas lag significantly (~50% vs ~10% farmers), highlighting the need for focused interventions.

2023-24

Targeting High-Burn Areas & Piloting Beyond-CRM Approaches

2024-25

Strengthening last-mile execution in high burn areas and piloting improved rice management interventions

Approach & Scale

6200+ villages in 18 Districts

Targeted intensification in **high-burn geographies**

Pilot of climate smart agriculture techniques – **AWD, DSR and Improved Rice M clusters (IRM)**

Highlights

Continued decline in burning reinforces the effectiveness of differentiated CRM strategies, while pilots highlight scope for integrating AWD, DSR, and market-linked models.

12,400

farmer meetings and camps

1,200

Kharif demo plots

1,700+

Rabi demo plots

4,200

field days

27,000

AWD pipes installed

- ✓ **Intensified Targeted Field Engagement:** Focused deeper support in high-burn villages while reinforcing adoption in matured areas.
- ✓ **Sustained Behavioral Engagement:** Continued emphasis on demonstration-led learning and practice reinforcement
- ✓ **Introduced PRANA Udhyaami Model:** Incentivized local service providers to improve availability (super seeders and Combine SMS), reduce waiting time, and ensure last-mile support
- ✓ **Expanded Water-efficient Interventions:** Introduced AWD and DSR to promote water-efficient and sustainable farming practices
- ✓ **Piloted Improved Rice Management (IRM) Practices:** Tested a combined approach integrating CRM, AWD, and DSR across 100 villages

2025-26 Building Integrated Systems for Sustainable Agriculture

Transitioned to an integrated approach linking residue management, water use, cropping systems, and market/institutional support

Approach & Scale

6200+ villages in 18 Districts including 1,880 Intensive villages, 3,281 Extensive villages and 1000+ IRM villages

Align interventions to **local context and burn intensity**

Shift toward **outcome-linked and system-driven models**.

Highlights

- ✓ **Sustained Targeted Field Engagement:** Continued deeper support in high-burn villages with broad initiatives across mature villages
- ✓ **Scaled Improved Rice Management Systems:** Scaled the tested approach integrating CRM, AWD, and DSR across 1000+ villages
- ✓ **Advanced Outcome-Linked Incentives:** Expanded the Pay-for-Results model for verified acreage under DSR and CRM
- ✓ **Promoted Diversified & Resilient Farming Systems:** Enabled alternative cropping (Pear-Basmati, regenerative cotton) across ~220 clusters, supporting 1,494 farmers and scaling 3,000+ acres under regenerative practices

1,900

Kharif & Rabi Demos

1,800+

Farmer field school

1,600

field days

33,000+

CRM machines mapped

71,000

AWD Pipes

220

Agroforestry clusters

PRANA evolved from a residue management initiative into a comprehensive agricultural transition integrating improved rice management practices, crop diversification and market-linked approaches to drive long-term sustainability.

PRANA in Action: Stories of Transformation

01

NO-BURN CRM

Puranewala Village: A Zero-Burn Success Model



100% No-burn
400 acres Transformed

Once reliant on paddy straw burning as a quick post-harvest solution, Puranewala grappled with recurring air pollution, soil degradation, and health risks. Through PRANA's sustained engagement spanning — awareness campaigns, field demonstrations, and Farmer Field Schools, farmers began to see burning not as a necessity, but a choice, building confidence in viable alternatives. With timely access to machinery and consistent on-field support, the entire village transitioned to regenerative residue management, achieving **100% elimination of stubble burning across 400 acres** and securing its status as a **verified zero-burn village** within a single cycle.



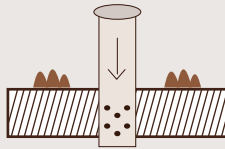
The entire village transitioned to eco-friendly residue management within a single cycle.



02

WATER-EFFICIENT PRACTICES

Learning to Farmer-Led AWD Innovation



3-4
Irrigation
Cycles saved

5 ac
Acres

Harwinder Singh, a paddy farmer from Salah Nagar, was introduced to AWD through a PRANA **field demonstration**, where a simple monitoring pipe helped him track soil moisture and irrigate only when needed. In his first season, he reduced **3-4 irrigation cycles**, **lowering electricity use** while **improving crop health and eliminating Brown Plant Hopper infestations** that previously required repeated chemical use. Demonstrating strong ownership, Harwinder later independently replicated the model by purchasing PVC pipes, preparing them as demonstrated, and installing one per acre across his 5-acre farm.



A clear shift from initial adoption to sustained, self-driven practice.

03

WOMEN'S AGENCY

23k+ Women Empowered as Forefront Regen Agents



747
Women-centric
Camps

~900
trained
in regen
agriculture

Women contribute significantly to Punjab's agricultural labour—yet account for less than **2%** of landholders—limiting their role in key farm decisions; PRANA addressed this gap by creating targeted platforms that built awareness, skills, and agency through **747 women-centric camps** (reaching **23,000+ women**), where they were introduced to **DSR, AWD, in-situ CRM, and organic nutrient use**, alongside training **~900 women in clean cotton picking**, fruit processing, etc., and supporting **9 women-led groups** to actively participate in regenerative, no-burn agriculture systems.



Women groups actively shaping regenerative, no burn agriculture systems.



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localized models to building **decentralized service systems** and enabling **integrated, climate-smart rice management solutions**.

What's Next: Learnings and Way Ahead

The PRANA project's delivery model has successfully moved a large share of farmers away from business-as-usual residue burning. This progress is evidenced by a sharp decline in complete burning, a significant increase in no-burn adoption, the mainstreaming of CRM machinery, and the emergence of ex situ management as a critical transition pathway. However, the transition has been neither uniform nor complete. Evidence suggests that Punjab is now entering a transition phase where the central challenge is no longer only awareness or initial adoption, but whether farmers can implement no-burn practices reliably, confidently, affordably, and within narrow operational windows.

In this evolving context, the distinction between adoption and practice fidelity becomes critical. While many farmers have adopted CRM-related technologies or services, implementation often remained partial, improvised, or operationally adapted to local risk conditions. This explains why complete burning reduced sharply while partial burning continued to persist across many areas. Farmers increasingly appear to be shifting toward hybrid residue-management pathways that balance operational feasibility, agronomic confidence, machinery access, and sowing timelines rather than transitioning directly from complete burning to mulching or incorporation. The modest rise in incorporation, the rapid expansion of ex situ, and changing usage patterns of Super Seeders all

01

Managing Farmer Transition Risk

Partial burning continues as a risk-minimization strategy, requiring a transition toward full no-burn practices through integrated agronomic support, residue-load solutions, and sustained behavior change efforts



1. HEAVY PADDY STRAW LOAD



As combine harvesters leave heavy loose straw, farmers often resort to partial residue burning before sowing with a Super Seeder—this being the most observed machinery combination among partial burners. (PRANA survey)



Long-duration variety (Pusa 44⁴) produces higher straw load and compresses sowing timelines.

Seed shortages and quality concerns around PR126 also affect confidence in varietal transition.



High Super Seeder use reflects technology acceptance, but not necessarily full adherence to the intended no-burn pathway.



CRM Adoption Increased Significantly

- Sharp decline in complete burning
- High Super Seeder adoption
- Increasing no-burn awareness



2. PERCEIVED AGRONOMIC ISSUES/LOAD



Weed pressure under high residue conditions



Pest incidence and rodent attacks



Poor crop Establishment and delayed germination



Perceived yield losses and higher cultivation costs



Reduced profitability under no-burn systems

These concerns reinforce partial burning as a safer and more familiar transition pathway, particularly among farmers with limited exposure to well-managed no-burn demonstrations and technical handholding.



PARTIAL BURNING EMERGED AS A RISK-MANAGEMENT STRATEGY

Farmers balance machinery feasibility, agronomic confidence, and sowing timelines through hybrid residue-management pathways.



Key Takeaway

Partial burning persists not due to unwillingness, but due to operational constraints (heavy straw load) and agronomic risk perceptions. Addressing both through integrated solutions is critical for sustained transition to full no-burn systems.

reflect this evolving behavioral transition.

The findings point to two interlinked transition priorities for enabling reliable no-burn agriculture in Punjab: **managing farmer transition risk and strengthening service-delivery systems.**

Policy Direction

Reducing operational pressure from heavy residue load

Scale Super SMS adoption during harvesting operations to improve straw spreading and reduce operational difficulty during wheat sowing. Existing provisions under the Punjab CRM Action Plan 2026–27, including undertakings and Agricultural Development Officer verification for combines operating without Super SMS, provide an important policy foundation for strengthening compliance.

Complement enforcement with outcome-linked incentives for service providers, as demonstrated through PRANA's Super SMS pilot or through a verified incentive of around INR 300–400 per acre to offset additional Super SMS costs during the transition period. Over time, these models can gradually shift toward market-based adoption through targeted and tapered incentives, bundled harvesting–sowing service models, and improved financing support for service-provider capacity expansion.

Accelerate transition toward short-duration paddy systems through reliable seed availability (like PR126), comparative demonstrations, and dissemination of agronomic evidence by PAU, KVKs, and Agriculture Departments. Diversification-linked incentives (like Minimum Selling Price linked to Kharif Maize⁵), may further support varietal transition while reducing residue pressure.

Strengthening farmer confidence in full no-burn systems

What Prana Learned About Effective Outreach



Participatory and culturally familiar formats—nukkad nataks, village demonstrations, peer outreach, Gurudwara announcements — improved participation and recall



Stakeholder mapping played a crucial role in building an ecosystem of change, thus effectively reducing farmers' risk-aversion



Capacity building of staff, in culturally relevant storytelling ensured greater uptake of scientific knowledge



Physical outreach most effective when local, convenient, visible and aligned with farmers' work calendars.



WhatsApp advisories enabled quick dissemination but worked better when two-way communication channels allowed farmers to raise queries and receive timely support



Behavior change requires repeated observation, timely handholding, accessible troubleshooting and culturally resonant communication



Expand repeated agronomic handholding and advisory support on weed management, pest control, irrigation scheduling, residue decomposition, and crop establishment under high-residue conditions through demonstrations, advisory camps, and blended digital-physical extension systems. Evidence from PRANA's choice experiment⁶ suggests positive farmer preference for combination of digital and physical advisory.

Build confidence through credible local evidence and peer learning using Farmer Field Days/ Schools, progressive farmer visits, peer-led learning, and demonstration plots that allow farmers to observe successful no-burn outcomes under nearby field conditions. Trusted peer networks should be systematically integrated into CRM extension systems.



Ex-Situ Systems Are Becoming Time-Sensitive Service Markets

Ex-situ residue management expanded rapidly because it reduced residue load, enabled cleaner seedbeds, lowered perceived pest and weed risks and reduced operational complexity.

However, PRANA's survey findings indicate that adoption increasingly depended on the reliability of systems operating beyond the farm gate. **Timely evacuation emerged as the key operational constraint.** Delayed bale pickup and weak logistics frequently pushed farmers toward fallback burning to avoid sowing delays. A growing segment of farmers reported willingness to pay **INR 400–700 per acre** for assured residue evacuation, indicating that service reliability, rather than residue price alone, is increasingly becoming the binding constraint.

*Strengthening ex-situ systems will require moving beyond **volume-centric biomass incentives** toward more **reliable service-assurance mechanisms**, including time-bound residue pickup systems and differentiated compensation linked to rapid evacuation during peak demand periods.*



Although machinery access has improved, timely and reliable service delivery remains a constraint, requiring a shift from asset availability to service-oriented CRM delivery systems

CRM Machinery Availability Improved



CRM machinery stock expanded



Increased machinery penetration



Wider village-level presence



Operational Reliability Gaps



Machine downtime



Weak repair readiness



Poor maintenance

THE MACHINERY CONSTRAINT HAS SHIFTED



FROM
Machine
Availability



TO
Reliable, Timely
& Functional
Access



Farmers prioritized access to a working machine with a reliable operator within the narrow 21-day paddy harvest-wheat sowing window.



Cooperative Service Delivery Constraints



High waiting periods (4–5 days on average)



Inconsistent service quality



Poor machine condition



Lower preference vs. farmer service providers



Affordability and Subsidy Distortions



Subsidy-linked price escalation



Complex application and documentation



Approval delays



Perceived preferential access for large farmers



Decentralized Farmer SP Performed Better



Lower waiting times



Better operational responsiveness



Stronger farmer preference



Improved last-mile access

PfR pilots demonstrated: Decentralized service ecosystems can improve timely machinery access during critical agricultural windows.



Key Takeaway

CRM transition depends less on the number of machines available and more on reliable, affordable, and timely access through decentralized service ecosystems.



Timely access
– 21-day sowing window



Functional machines & responsive repair



Localized SPs & Reliable operators



Strengthen localized behavior change communication (BCC) through interactive and operation-specific outreach rather than broad awareness campaigns alone. Existing provisions under the Punjab CRM Action Plan 2026–27—including village camps, demonstrations, IEC campaigns, and school outreach, can be further strengthened through participatory and community-driven engagement formats that improve recall, participation and long-term practice fidelity.

Policy Direction

Expanding decentralized service networks

Scale PfR-type delivery models that improve timely machinery access during critical window. PRANA's PfR pilot showed that locally embedded service providers reduced waiting times and improved operational responsiveness through incentives linked to verified acreage served and timely field operations. Stronger convergence with Agriculture Department extension systems can further improve long-term sustainability, field-level coordination.

Institutionalize Service Providers cross-learning platforms through periodic meetings, workshops, exposure visits, and virtual forums that enable SPs to exchange best practices, operational learnings, implementation strategies, and field-level innovations while collectively addressing common operational challenges.



Improving reliability, accountability, and equitable access

Strengthen accountability and service standards across cooperatives/CHCs through pre-season machine fitness checks, repair certification, operator availability, transparent booking, and public rental schedules and grievance-redressal mechanisms. Cooperatives should be monitored on uptime, waiting time, and complaints, while CHCs should be repositioned from subsidized machinery repositories into rural service institutions with trained operators and service protocols.

Integrated agricultural transition systems can help move beyond standalone CRM interventions and support long-term climate-resilient agricultural transformation

Reform CRM subsidy systems to improve affordability, transparency, and reliable access by simpler application process, transparent beneficiary selection, and stronger monitoring of subsidy-linked procurement. Support should increasingly prioritize decentralized rental networks, and targeted hiring support for small-marginal farmers, while linking incentives where feasible to verified service delivery and no-burn outcomes.

Way Forward

The experiences from PRANA's Pay for Results, Super SMS, and IRM pilots suggest that sustainable agricultural transitions may require approaches that go beyond standalone machinery promotion, subsidy-led distribution, or enforcement-driven implementation. Importantly, PRANA's field experience indicated that delivery systems initially designed around crop residue management may also support broader IRM transitions. The expansion of practices such as AWD and DSR, suggests that farmers may be willing to adopt wider resource-efficient agricultural practices when implementation systems are reliable, locally accessible, and operationally responsive.

Future policy may therefore consider moving toward **integrated agricultural transition frameworks** that connect crop residue management with broader objectives related to cleaner air, lower emissions, soil health, water conservation, crop diversification, and climate-resilient agriculture. The PRANA experience suggests that aligning operational delivery, incentives, agronomic support, and



farmer engagement within a coordinated ecosystem may support larger-scale behavioral and system-level transitions over time.

Abbreviations

AWD	Alternate Wetting and Drying
BCC	Behavior Change Communication
Bn	Billion
CAQM	Commission for Air Quality Management
CHCs	Custom Hiring Centres
CRM	Crop Residue Management
CO₂e	Carbon Dioxide Equivalent
DSR	Direct Seeded Rice
HIAC	High-Intensity Activity Cluster
IEC	Information, Education, and Communication
IRM	Improved Rice Management
KVKs	Krishi Vigyan Kendras
MCIA	Multiple Component Implementation Approach
Mn	Million
MSP	Minimum Support Price
PAU	Punjab Agricultural University
PfR	Pay-for-Results
PRANA	Promoting Regenerative and No-burn Agriculture
PVC	Polyvinyl Chloride
SP/SPs	Service Provider(s)
Super SMS	Super Straw Management System



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Most importantly, we acknowledge the thousands of farmers, service providers, community leaders, and local stakeholders across Punjab who participated in and supported the project. Their willingness to test new approaches, share their experiences, and champion sustainable agricultural practices has been at the heart of PRANA's achievements.

This report reflects the collective efforts of all those who have contributed to advancing regenerative, no-burn agriculture and building more resilient agricultural systems in Punjab.



About The Nature Conservancy

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