

Farmer FIRST

From Co-Creation to Community Transformation

Empowering Farmers to Innovate, Lead and Scale Change



ICAR - CENTRAL SOIL SALINITY RESEARCH INSTITUTE
KARNAL, HARYANA - 132001, INDIA

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1. BACKGROUND

The Farmer FIRST Programme (FFP) represents a fundamental shift from conventional technology transfer to farmer-centric innovation and co-creation. Farmers are not treated merely as recipients of scientific recommendations; they participate in problem identification, prioritization, on-farm experimentation, technology refinement and feedback, enabling scientific solutions to be adapted to real farm conditions. The programme therefore connects farmer knowledge, scientific evidence, local resources and institutional support to create solutions that are relevant, acceptable and economically viable.

2. THE FARMER FIRST FRAMEWORK

The proposed implementation strategy adopts a phased, systems-based and farmer-centric approach to address interconnected challenges of soil sodicity, water-quality constraints, declining productivity and socio-economic vulnerability. The framework integrates scientific diagnosis, participatory planning, farmer-scientist convergence, on-farm validation, adaptive refinement and institutional scaling into a continuous pathway from problem identification to sustained impact. GIS-based resource assessment and PRA-led prioritization establish the evidence base; participatory trials generate farmer-validated "best-bet" technologies; and iterative economic and farmer feedback ensure local fit, affordability and risk reduction. Cluster-based scaling, local resource persons, institutional convergence, market linkages and policy integration then translate successful field solutions into community- and landscape-level transformation.



This approach deliberately replaces the linear "Technology → Farmer" model with "Farmer ↔ Scientist → Innovation → Validation → Learning → Collective Action → Impact."

The implementation pathway follows a phased, evidence-driven pathway that moves from participatory diagnosis and field validation to technology refinement, scaling and institutionalization for sustained impact.

Strategic Phase	Key Interventions	Impact-Oriented Deliverables
Diagnosis & Participatory Planning	GIS-based soil and water-stress mapping; cropping and yield-gap assessment; input-use efficiency; livestock profiling; market and input-supply assessment; PRA-based problem prioritization	Stress-vulnerability profile; prioritized problem matrix; micro-location action plans; baseline indicators
Demonstration & Validation	Farmer-scientist joint planning; participatory on-farm trials; integrated soil reclamation, drainage, resilient varieties, DSR, INM, water-saving technologies, dairy health and fodder interventions; field days and exposure visits	Field-validated technology models; demonstrated yield and income gains; improved soil and water productivity; strengthened farmer groups
Refinement & Optimization	Fine-tuning of dose, timing and spacing; micro-location customization; cost-benefit and risk analysis; cluster platforms; development of local resource persons	Context-specific "best-bet" technologies; economic feasibility evidence; trained para-extension cadre
Scaling & Institutionalization	Cluster expansion; lead-farmer approach; farmer-to-farmer diffusion; peer learning; alignment with reclamation and irrigation schemes; policy briefs and institutional convergence	Large-scale adoption; stronger local institutions; improved resource productivity; enhanced landscape-level resilience

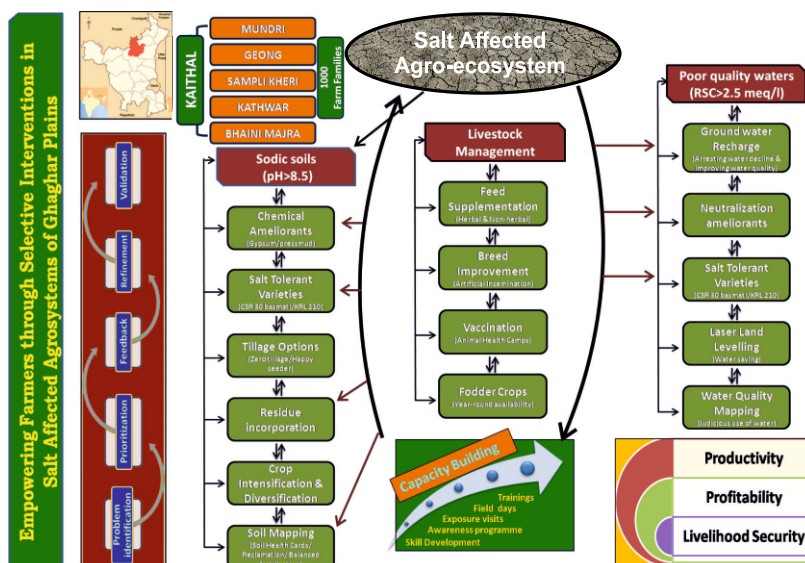
3. THE INNOVATION ARCHITECTURE

The framework establishes an end-to-end extension pathway linking scientific knowledge with farmer experience, institutional convergence, and local capacity. It transforms fragmented interventions into integrated, location-specific, and scalable solutions, strengthening farm productivity and livelihood resilience.

The ICAR-CSSRI initiative under FFP, "Empowering Farmers through Selective Interventions in Salt-affected Agroecosystems of Ghaghar Plains," provides an opportunity to prioritize smallholder agriculture and address the complex, diverse, and risk-prone realities of distressed farming communities in salt-affected agroecosystems. Streamlining, validating, and developing evidence-based best-bet technologies can support an ecosystem-based sustainable approach focused on optimal resource use, improved soil and crop resilience, and socio-economic development, ultimately contributing to Land Degradation Neutrality (LDN), food security, and environmental protection.

**CORE TRANSFORMATION
ENGINE**

Science + Farmer Knowledge + Co-Creation + Collective Action
↓
Sustainable Agricultural Transformation



Conceptual Framework of ICAR-CSSRI Led Farmer FIRST Project

Strategic Pillar	Core Intervention	Transformation Created
Participatory Diagnosis	PRA, scientific assessment, farmer prioritization	Problems become evidence-based action agendas
Farmer-Scientist Convergence	Joint planning, field interaction, feedback	Farmers become knowledge partners
Technology Co-Creation	On-farm trials and adaptive refinement	Technologies become location-specific
Integrated Technology Convergence	Crop, soil, water, livestock and livelihood technologies	Fragmented interventions become integrated solutions
Capacity & Skill Building	Trainings, field days, exposure visits, problem-based learning	Knowledge converts into capability
Local Institution Building	Farmer groups, seed clusters, local resource persons, departmental convergence	Individual capacity becomes community capacity
Farmer-Led Diffusion	Lead farmers, peer learning and farmer-to-farmer exchange	Adoption spreads horizontally
Digital & Knowledge Mobilization	ICT advisories, knowledge resources and communication platforms	Knowledge becomes accessible and continuous
Livelihood Diversification	Dairy, aquaculture, vegetables and integrated farming	Productivity gains become livelihood resilience

4. SCALE OF VALIDATION

The Farmer FIRST architecture operated at substantial institutional and field scale across five adopted villages (Mundri, Geong, Sampli Kheri, Kathwar and Bhaini Majra) in Kaithal covering 3,247 ha area. Interventions were validated through resource assessment, farmer-scientist interaction and participatory technology application, focusing on natural-resource management, crop diversification, residue management, horticulture, livestock, aquaculture and knowledge mobilization.

5 Villages | 3,247 ha | 2,862 Stakeholders Reached

4.1 Resource & Land Management

These interventions addressed soil sodicity, water stagnation, irrigation-water quality and soil-health constraints through location-specific resource-management solutions.

- Soil Health Cards | 3200 ha | 334 households
- Drainage-cum-Recharge Intervention | 300 ha | 94 households
- Gypsum Application | 38 ha | 94 households
- Pressmud Application | 50 ha | 125 households
- Gypsum + Pressmud | 74 ha | 185 households

4.2 Climate-Resilient Crop Technologies

The crop interventions focused on varietal diversification, improved crop establishment and management of productivity constraints in salt-affected environments.

- Salt-Tolerant Rice (CSR 30 Basmati) | 232 ha | 580 households
- Salt-Tolerant Wheat (KRL 210) | 123 ha | 308 households
- Boron Management in Rice | 40 ha | 99 households
- Herbicide-based Management of *Phalaris minor* | 62 ha | 156 households

4.3 Residue, Livestock & Livelihood Diversification

- Rice Residue Management through SSMS | 315 ha | 446 households
- Vegetable-Based Crop Diversification | 25 ha | 15 households
- Brackish-Water Aquaculture | 2 ha | 1 enterprise
- Livestock Reproductive-Performance Interventions | 1,038 animals | 735 households
- Dairy-Animal Conception & Health Interventions | 2,170 animals | 1,000+ households

4.4 Capacity Development

The intervention combined field demonstrations, farmer-scientist interaction, capacity building and knowledge mobilization to strengthen local capability and technology uptake.

- Capacity-Building Programmes | 31 Programmes | 2,862 Beneficiaries
- Digital Knowledge Platform Subscribers | 1,000+ users

The validation generated geo-referenced soil, water and nutrient maps, while field interventions translated these assessments into location-specific solutions for soil reclamation, water management, crop productivity, residue management, livestock health and livelihood diversification.

5. QUANTIFIABLE AGRICULTURAL & ECONOMIC IMPACT

The interventions generated measurable gains in productivity, profitability, resource efficiency and livestock performance, demonstrating the economic value of participatory extension beyond awareness and technology dissemination. Together, these results demonstrate a clear pathway from field-level innovation to quantifiable economic and livelihood outcomes.

Intervention	Measured Impact
Drainage-cum-recharge structure in low lying areas	2-3 me/l reduction in RSC_{iw} ; 22% higher net returns; 1.93 Benefit-cost ratio; 145% Internal Rate of Return; 2 years Pay Back period
Pressmud-based sodic soil management	12-19% higher rice yield; 11-17% higher wheat yield; ₹24233 -28,380/ha additional returns; 3.60-4.22 incremental input-output ratio
Gypsum + pressmud-based sodic soil management	16% higher rice-wheat system yield; ₹13,326/ha additional returns; 2.89 incremental input-output ratio
Salt tolerant wheat KRL 210	Threshold limits for varietal selection under sodic conditions (soil pH >8.7, RSC_{iw} >4.0 me/l); 11.2% higher net returns
Salt tolerant rice CSR 30 Basmati rice	Threshold limits for varietal selection under sodic conditions (soil pH >8.3, RSC_{iw} >3.5 me/l); 12.5% higher net returns
Foliar K-nutrition in wheat	125-210 kg/ha higher wheat yield; ₹1,521-3,217/ha higher net returns; 5.7 times incremental benefit for each unit invested towards K-use
Boron management in rice	3.7% higher yield; ₹4,147/ha monetary benefit; 6.91 incremental input-output ratio
Residue management and Happy Seeder sown wheat	Lower operational cost; 3.1% yield advantage; 5-10% water saving
Heat-stress management, mineral mixture supplementation in dairy animals during hot humid season	9.6% higher returns; reduced age of puberty (28 days); improved conception rate (>15%)



6. SOCIAL & INSTITUTIONAL TRANSFORMATION

The most significant impact of Farmer FIRST lies beyond yields and income-in the social infrastructure created around knowledge, participation and collective action.

Indicator	Pre-Intervention	Post-Intervention	Increase
Social participation	23.26	30.43	30.8%
Mass-media exposure	16.26	23.13	42.3%
Extension networking	26.42	34.54	30.7%

This represents a shift from individual technology uptake to stronger social participation, wider information access and expanded extension networks. Participation increased across institutions such as village panchayats, cooperative societies, farmer groups, religious committees, SHGs, FPOs and financial institutions.

7. INNOVATION-TO-IMPACT SCORECARD

Dimension	Impact Evidence
Problem Addressed	Ecological, climatic, technological, livelihood and institutional vulnerabilities
Innovation	Farmer-centric technology co-creation and adaptive refinement
Participatory Mechanism	PRA, on-farm trials, demonstrations, feedback and farmer-scientist interface
Agricultural Impact	Yield improvement, stabilized productivity and improved resource-use efficiency
Economic Impact	3.8-23.6% higher net returns across documented interventions
Social Impact	30.8% increase in social participation
Knowledge Impact	42.3% increase in mass-media exposure
Extension Impact	30.7% increase in extension networking
Institutional Impact	Farmer groups, seed clusters, local entrepreneurs and multi-stakeholder convergence
Environmental/Resilience Impact	Soil reclamation, water management, residue management and climate-resilient technologies
Sustainability	Farmer-to-farmer diffusion, local resource persons, decentralized seed systems and institutional convergence

8. FROM INNOVATION TO LASTING IMPACT

The ICAR-CSSRI-led Farmer FIRST Programme demonstrates that lasting agricultural transformation occurs when farmers become partners in innovation rather than recipients of technology. By combining scientific knowledge with farmer experience, participatory validation, experiential learning and institutional convergence, the programme transforms technology transfer into co-creation, individual adoption into collective learning, and extension delivery into community-led action, resulting in measurable gains in productivity, income, resource resilience and community capacity. Farmer FIRST

transforms the farmer from a recipient of technology into a partner in innovation-and transforms individual innovation into collective capacity, stronger institutions and sustainable community development.

9. POLICY IMPERATIVES

Invest not merely in technologies, but in the extension architecture that enables farmers to test, adapt, own, diffuse and sustain them. This is the pathway from innovation to adoption-and from adoption to lasting community impact. This may include:

- Policy interventions for strengthening the participatory Strategic Research and Extension Plans (SREPs) with private and public agencies in the existing/new modules of transferring sustainable technology packages with more emphasis on demand driven technology linkage to new market access; skill enhancement among farmers; and local-level accountability of extension workers to farmers.
- Establishing impact-oriented agricultural services (governmental, private sector, NGOs etc.) for upscaling the tested technological interventions, improving access to relevant agricultural services and sustainably increasing the agricultural productivity.
- Decentralize decision-making through "bottom-up" planning procedures that would directly involve farmers in planning and implementing extension programs at the village, block and district-levels.
- Specific policy implications for sustainable rehabilitation of degraded lands, improving soil health and reconciling environmental protection addressing location-specific optimal resource use with socio-economic development of distressed farming community and eventually achieving the UN-SDGs of land degradation neutrality, food security and environmental protection.
- Groundwater Policy and Regulatory Mechanism for optimal groundwater management, rainwater harvesting and water recharge for future groundwater development.
- Formulating agricultural policies prioritizing the agricultural use of sugarcane 'pressmud' in sustainably managing the irrigation induced sodicity stress with enhanced ecological resilience, addressing the competing issues of shrinking gypsum availability and quality concerns, pressmud disposal problems and associated environmental hazards.

10. RECOGNITIONS

The outcomes of field-oriented technologies and models have been duly certified by ICAR, New Delhi, recognising their scientific validity, field applicability and potential for wider replication. The certified portfolio covers low-cost sodicity management, mobile-based decision support, sustainable wheat production, GIS/index-based management of salt-affected soils and community-led Farmer FIRST implementation. Collectively, these innovations demonstrate how scientific research can be translated into location-specific technologies, farmer-centric decision support and community-level development outcomes, providing a strong foundation for scaling sustainable and resilient agricultural practices.

RECOGNITIONS FOR FARM LEVEL IMPACT

Technology ID	Title	Developer(s) Proof
ICAR-AEXT-NAARM-Model-2024-083	Impactful model for farmer FIRST programme implementation	Lead Developer: Ashok Kumar Singh Associate Developer: Udharn Singh Gautam, Ved Parkash Chahal, Rajarshi Roy Burman, P. Venkatesan, N. Sivaramane, Ch. Srinivasa Rao, Rajbir Singh, S.K. Singh, S.S. Singh, Y.G. Prasad, M.J. Chandre Gowda, Lakhan Singh, Anupam Mishra, A.K. Tripathi, B.C. Deka, Venkatasubramanian Anjani Kumar, J.P. Mishra, Shantanu Kumar Dubey, S.R.K. Singh, S.K. Roy, Saik N. Meera, K. Govindaswamy, Parvender Sheoran, Amulya Kumar Mohanty, Pradip Kumar Dey, Shiv Kumar, Mukesh Kumar, Mitali Ghosh Ray, Bommu Kalyani, Arvind Kumar, P.P. Rohilla, A.R. Reddy, K.S. Das, Arun Kumar Singha, Pragya Bhadauria, D.V. Kolekar, Rajesh T., Harish M.N., Bagish Kumar
ICAR-NRM-CSSRI-Techno-logy-2024-023	Conjunctive use of gypsum and press-mud: Low cost eco-resilient strategy for mitigating irrigation induced sodicity hazards and sustaining farm productivity	Lead Developer: Parvender Sheoran Associate Developer: R.K. Yadav, N. Basak, Satyendra K. Thimmappa, Ranjay K. Singh, Ashwani Kumar, Arvind Kumar, Arijit Barman, Kailsah Parjapat, P.C. Sharma
ICAR-NRM-CSSRI-Techno-logy-2023-058	Sodicity tolerance limit based management for sustainable wheat production	Lead Developer: Parvender Sheoran Associate Developer: Arvind Kumar, R.K. Yadav, Satyendra Kumar, R.Raju, Arijit Barman, R.K. Singh, S.K. Sanwal, Kailash Prajapat, Ashwani Kumar, Y. J. Dar, P.C. Sharma
ICAR-NRM-CSSRI-Metho-dology-2024-024	Index-based zoning for location specific management of salt-affected soils	Lead Developer: Arijit Barman Associate Developer: Parvender Sheoran, R.K. Yadav, R.K. Singh, Satyendra Kumar, Kailash Prajapat, Arvind Kumar, Ashwani Kumar, S.K. Sanwal, R.Raju, Yousuf Jaffer Dar



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Recharge structures improve water table of affected Kaithal villages

PARVEND SHARMA
KARNAL, NOVEMBER 8

The water recharge structures, designed, developed and installed by the Central Soil Salinity Research Institute (CSSRI), Karnal, in villages of Kaithal district which had higher sodic water effect on soil, has helped in improving the water quality and groundwater table.

As per farmers and scientists, the groundwater table rose upto 2.3 metres beneath the structure during the period of intense rain. Besides, these structures also improved the water quality by reducing the residual sodium carbonate (RSC) in the underground aquifers from 4.5-5.5 to 3.5-4.0 milliequivalent/litre. The improvement in groundwater quality has also been observed in the surrounding areas, the scientists claimed. These structures were installed in 2018 under the CSSRI-led Farmer-Farm, Innovation, Resources, Science, and Technology (Farmer FIRST) project.

The groundwater data indicates that the indiscriminate use of groundwater resources led to fast depletion of water table at an alarming rate of almost 1.3 metres per year during the last 15 years in the Kaithal block. Dr PC Sharma, Director CSSRI, said the scientists of the institute — Dr Parvender Sheoran, Principal Scientist and project incharge, Dr Satyendra Kumar, Principal Scientist, along with their team of scientists — installed these six recharge structures in low lying areas of adopted vil-



These water recharge structures were installed in 2018 under the CSSRI-led Farmer-Farm, Innovation, Resources, Science, and Technology (Farmer FIRST) project. (IANS PHOTO)

1,000 STRUCTURES TO BE INSTALLED IN STATE

Seeing the benefits of recharge structures, the nearby village panchayats have also taken initiative to install a few structures at different locations.

Under the 'Mera Pasi Meri Vansat' scheme of the Haryana government, over 1,000 structures will also be installed across the state to save crops in low-lying areas, he added. Dr Satyendra Kumar said the total cost of the structure remains Rs 1,000-1,200 (depending on the quality of material used and the lithology of the area). "We are thankful to the scientists of the CSSRI who chose our village under this initiative. We had to re-transplant the crops due to heavy rainfall that led to water stagnation, but now, the structure has helped us in eradication of the water stagnation problem," said Chandi Ram, a farmer.

SODIC SOILS ONE OF THE LIMITING FACTORS

The low infiltration capacity of sodic soils and poor quality groundwater are the main limiting factors for sustaining crop production in these areas, so the CSSRI took this initiative and installed water recharging systems. In PC Sharma, Karnal, said

ages, including Mundli, Kathwar, Sampli, Kheri and Geong in Kaithal district, infiltration capacity of sodic soils and poor quality groundwater are the main limiting factors for sustaining crop production in these areas, so the CSSRI took this initiative and installed water recharging systems. In PC Sharma, Karnal, said



Department of Agriculture and Farmers Welfare
District Kaithal, Haryana

Ref: 7488
Date: 22-11-2021

To Whom It May Concern

This is certified that in a participatory research work under Farmer FIRST Project, a team of scientists namely: **Drs. Parvender Sheoran, Ranjay K. Singh, Satyendra Kumar, Arjit Barman, Kalash Prajapati, Arvind Kumar, Ashwani Kumar and PC Sharma** from ICAR-Central Soil Salinity Research Institute, Karnal, Haryana has mobilized the farming community (2017 to 2020) and installed 6 ground water recharge structures in five adopted villages (Sampli Kheri, Mundli, Kathwar, Geong and Bhaini Majra) in Kaithal District. This initiative has shaped in establishing **Climate-Cum-Ecologically Smart Villages**. The intervention could enhance Climate-Cum-Ecologically Smart irrigation water in these villages in terms of mitigating the water induced sodicity stress and climate variability. The increased resilience led to rise in groundwater table beneath the structure to the extent of 2-3 metres wherever the accumulated rain water recharged the aquifers during intense rains. In addition, the reduction in residual sodium carbonate from 4.5-5.5 to 3.5-4.0 milliequivalent/litre. In absence of recharge structure, the rice crop was totally damaged in nearly 5 ha area (normally partial transplantation is done upto 12-15 ha) with 10-20% potential yield penalty under delayed transplanting. The tangible benefit through direct saving remains approximately Rs. 30,000-35,000/- in loss of transplanting (enhanced nursery + labour cost). This participatory initiative on Climate-Cum-Ecologically Smart Village has motivated other farmers to contact State Department and installing ground water recharge structures in nearby villages also.

(Signature)
Deputy District Agriculture Officer
KAITHAL

Hindustan Times

<https://www.hindustantimes.com> | Chandigarh News |

Haryana: Over 1100 farmers apply for construction of water ...

14 Jul 2020 — In Haryana, 1177 farmers have so far applied for the construction of recharge shafts under the 'Mera Pasi Meri Vansat' scheme aimed at protecting the depleting groundwater table.

The Tribune
Sun, 07 November 2021
<https://epaper.tribuneindia.com/c/64195156>

Sugar industry waste helps revive productivity of sodic soil: Experts

TRIBUNE NEWS SERVICE

KARNAL, DECEMBER 22

In a major achievement in reviving the productivity of degraded soils with the help of sugar industry waste — press-mud — scientists of the Central Soil Salinity Research Institute (CSSRI), have been successful in the trial on sodic soil in the fields of villages in Kaithal district. The scientists used press-mud, which is considered an environmental hazard, not only revived the productivity of sodic soils, but also reduced soil sodification, claimed the scientists. As per the scientists, gypsum is generally used by farmers for reclaiming their sodic land, but the organic waste material from sugar industries has the potential to improve the sodic land and also increase crop yield in degraded environment.

Under the Farmer FIRST project, the CSSRI scientists led by Dr Parvender Sheoran, Principal Scientist, had started trial of press-mud on sodic soil of five affected villages —



The trial being conducted at a village in Kaithal district. (IANS PHOTO)

Mundli, Kathwar, Sampli Kheri, Geong and Bhaini Majra in 2016, where around 40 per cent of total land was sodic and 90 per cent underground water had residual alkalinity problems. After a four-year experimentation, they have now received good results and the productivity of the sodic land has been revived, said Dr PC Sharma, Director CSSRI. Dr Parvender Sheoran said the field assessments of more than 125 locations in rice-wheat system revealed positive influence of press-mud in alleviating the sodicity stress with appreciable reduction in sulphur and exchangeable sodium percentage, with better plant salt tolerance and enhanced grain yields. The economic analysis indicates that press-mud seems to be an affordable solution to lessening pressure on limited gypsum reserves. Dr Sheoran added. He claimed that the technology had potential agricultural benefits and paybacks with effective reclamation of degraded lands. The farmers are also slated with this technology as it has reduced sodicity in soil significantly. The press-mud application gives more greenness to crop and requires less urea application and also improves soil health," said Raj Kumar, a farmer.

आस्ट्रेलिया के कृषि वैज्ञानिकों ने किया खेतों का दौरा

अब एक राउंड के माध्यम से खेती जाड़नी खेतों पर नजर
गणराज्य, 18 जनवरी (प्रेसमन):
गणराज्य में किसान विकास कोषी के खेतों में कृषि वैज्ञानिकों को दौरा ने दौरा किया।
यह वैज्ञानिक कोषी गुरु जय प्रकाश वैश्व कृषि केंद्र में पत्र सही कृषि कार्य और खेती को सही तरीके से करने में मदद करने के लिए आस्ट्रेलिया के किसानों के साथ बैठक कर रहे हैं।
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यसायनिक खाद का न करे अंधाधुंध प्रयोग

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सैनिटरी एक्सपर्ट

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