Annexures

Custom Hiring Centres for Better Crop Residue Management

Insights from Punjab

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Annexure 1: Structure and operations of various custom hiring centre (CHC) types

Table A1: Entities eligible to set up CHCs under the *Crop Residue Management Scheme*

Key institutional characteristics	Cooperatives	Panchayats	Registered farmer societies	Farmer producer companies (FPCs)	Village-level entrepreneurs (VLEs)
Legal status	Registered under the State Cooperative Societies Act, 1961	Government constituted local bodies	Registered under Section 20 of the Societies Registration Act, 1860	Registered under Section 8 of the Companies Act, 2013	Individuals (no formal registration)
Ownership status	Collective ownership by cooperative members	Community ownership – assets owned by panchayat bodies	Collective ownership by society members	Collective ownership by shareholders (farmers)	Private ownership
Membership requirements	At least 10 members	Elected representatives (sarpanch and panchayat members)	At least 7 members	At least 10 members	-
Governing Body	Board of directors or managing committee	Elected representatives	Executive committee elected by the members	Board of directors elected by shareholders	Individual entrepreneur
Decision-making	Democratic – voting done by members	Bureaucratic – often linked to local government decisions	Democratic – voting done by members	Business-oriented; profit motive balanced with member welfare	Sole proprietor makes decisions
Funding sources	Member contributions, government support/ schemes, bank loans	Government funds/schemes, grants, revenue from local taxes	Member contributions, government schemes	Equity from shareholders, government schemes, and private investments	Own capital, bank loans, government subsidies/ schemes
Target beneficiaries	Member farmers	All farmers within the panchayat's jurisdiction	Member farmers	Shareholder farmers	Paying customers (any farmer)

Source: Authors' compilation based on Section 19A of the Companies Act, 2013; Section 5 of the Punjab Cooperative Societies Act, 1961, and Section 20 of the Societies Registration Act, 1860

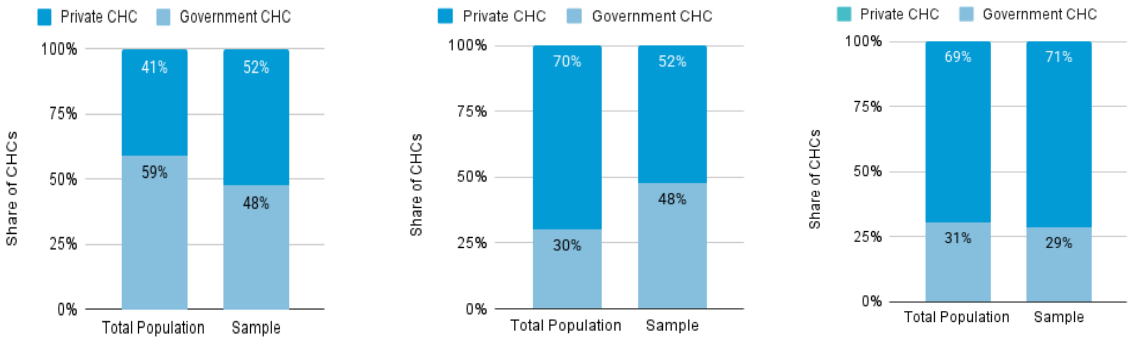
Annexure 2: Share of government and private CHCs in the study sample based on the total CHC population

Based on the population data and the distribution of government and privately-run CHCs in the three study districts (Ludhiana, Patiala, and Sangrur), we estimated the study sample.

Figure 1(a): Comparing the share of CHC in the population versus sample data in Ludhiana based on ownership type. The sample comprised 23 CHCs from Ludhiana, drawn from a population of 801 CHCs.

Figure 1(b): Comparing the share of CHC in the population versus sample data in Patiala based on ownership type. The sample comprised 21 CHCs from Patiala, drawn from a population of 835 CHCs.

Figure 1(c): Comparing the share of CHC in the population versus sample data in Sangrur based on ownership type. The sample comprised 21 CHCs from Sangrur, drawn from a population of 1247 CHCs.



Source: Authors' compilation

Annexure 3: Optimising the operations for a CHC running a Super Seeder to break even

Table A2: CHCs need to cover ~105 acres through their Super Seeder in a harvest season to break even[1]

Parameter	Value	Source
Cost of Super Seeder (INR)	2,40,000	CRM guidelines 2025
Cost of Super Seeder @ 80% subsidy (INR) (F1)	48,000	
Machinery lifespan (in years) (F2)	~5	Consultation with CHC operators
Cost of Super Seeder/year (INR) (F1/F2)	9,600	Authors' analysis
Maintenance costs of Super Seeder per season (Lubrication + blade replacement) (INR)	12,000	Consultation with CHC operators
Other costs of running a CHC / harvest season (INR) (eg, salaries)	10,000	

[1]Calculating the break even value involves offsetting the capital and operational expenses of running a CRM machine against the revenue earned by renting the machine for a CHC

Total cost of providing CRM machines (INR) (L1)	31,600	
Rental rate /acre (INR) (L2)	300	
Total farm land to be covered for a Super Seeder owner to break even (L1/L2)	= ~105 acres	Authors' analysis

Source: Authors' analysis

Annexure 4: Total financial assistance required to provide one tractor each to all CHCs established under the CRM scheme at 80 per cent subsidy

Table A3: INR 3,896 crore is required to support all 40,481 CHCs with subsidised tractors @80% subsidy under the CRM Scheme

Parameter	Value
Cost of tractor (60 HP) under CRM scheme (INR)	12 lakh
Cost of tractor subsidy @ 80% per tractor (INR)	9.6 lakh
Total eligible CHCs established under the CRM scheme between 2018 and 2024 across Punjab, Haryana, and Uttar Pradesh	40,581
Total financial assistance required (INR)	3,896 crore

Source: Authors' analysis (CRM guidelines 2025; Rajya Sabha 2024)

Annexure 5: Cost comparison of purchasing versus renting equipment for conducting CRM operations

Instance 1: Cost associated with owning and running a CRM machine (Super Seeder) with a fuelled tractor and driver

Table A4: Assumptions used for calculating the cost of owning and running a CRM machine (Super Seeder) with a fuelled tractor and driver per acre

S. no.	Parameter		Source
Parameters associated with operating a tractor for CRM solutions			
1.	**Cost of tractor (INR)**	12 lakh	CRM Guidelines 2025
2.	**Life of a tractor in years (hours)**	~15 years (5,000 hours)	Consultation with tractor agencies (Mahindra, New Holland, and John Deere)
3.	**Annual usage of tractor per acre (in hours or minutes)**	**Kharif season** - 2 hours or 120 minutes	Consultation with CHC operators
		Rabi season- 1.5 hours or 90 minutes	
		Other - 1.5 hours or 90 minutes	
		Total - 5 hours or 300 minutes	

4.	**Annual maintenance cost of tractor (INR)** [2]	10,000	Consultation with tractor agencies
Parameters associated with operating a Super Seeder			
5.	**Cost of Super Seeder (INR)**	2,40,000	CRM guidelines 2025
6.	**Cost of Super Seeder @ 50% subsidy (INR)**	1,20,000	
7.	**Life of Super Seeder (in years)**	5	Consultation with CHC operators
8.	**Annual maintenance cost of Super Seeder (of 8 feet)**[3]	4,000	Consultation with Super Seeder manufacturers (Jagatjit and New-Vishavkarma)
9.	**Number of blades in Super Seeder (8 feet)**	60	
10.	**Cost per blade (INR)**	~250	
11.	**Time requirement for Super Seeder use per acre (in hours)**	~1.5 hours / 90 minutes	Consultation with CHC operators
12.	**Total landholding covered by Super Seeder (attached to tractor) in one work day of 8 hours (In acres)**	~5.3 acres	Authors' analysis
13.	**Annual maintenance cost of Super Seeder (INR) for lubrication and other factors**	4,000	Consultation with Super Seeder manufacturers (Jagatjit and New-Vishavkarma)
14.	**Life of blades used in Super Seeder**[4]	150 acres	
15.	**Blade replacement cost (INR)**	15,000	
Operational expenses associated with running CRM solutions			
16.	**Diesel required for tractor (litres/acre) (D1)**	10	Consultation with CHC operators
17.	**Cost of diesel per litre (INR) (D2)**	~90	
18.	**Cost of diesel per acre (INR) (D1*D2)**	900	Authors' analysis
19.	**Wages of skilled labour (driver)**[5]	800	Consultation with CHC operators

Source: Authors' analysis

[2] This cost would be incurred in 1 year for 25 acres of land, 2 years for 10 acres of land, and 4 years for 2.5 acres of land.

[3] This cost would be incurred in 1 year for 25 acres of land, 2 years for 10 acres of land, and 3 years for 2.5 acres of land.

[4] Refers to the area that can be covered by a Super Seeder machine before blade replacement required

[5] Assuming an 8-hour workday.

Table A5: Formulas used for calculating the cost of owning and running a CRM machine (Super Seeder) with a fuelled tractor and driver per acre

Cost Parameter	Overheads	Formula
Capital costs	Cost of owning a tractor for CRM operations per acre (C1)	$= \left(\frac{Cost\ of\ tractor\ (INR)}{Landholding\ size\ (in\ acres) \times Annual\ usage\ of\ tractor\ per\ acre\ (in\ hours) \times Life\ of\ tractor\ (in\ years)}\right) \times Time\ reqt.\ for\ Super\ Seeder\ use\ per\ acre\ (in\ hours)$
	Cost of owning a Super Seeder per acre (C2)	$= \frac{Cost\ of\ Super\ Seeder\ (INR)}{Landholding\ size\ (in\ acres) \times Life\ of\ Super\ Seeder\ (in\ years)}$
Operational costs	Diesel cost associated with running a tractor per acre (C3)	$= Diesel\ required\ for\ tractor\ (litres/acre) \times Cost\ of\ diesel\ per\ litre\ (INR)$
	Labour cost associated with running a tractor per acre (C4)	$= \frac{Wages\ of\ skilled\ labour\ (driver)}{Landholding\ covered\ by\ tractor\ (CRM\ machine\ attached)\ \ in\ 8\ hours\ (In\ acres)}$
Maintenance costs	Annual maintenance cost of tractor per acre (C5)	$= \frac{Annual\ maintenance\ cost\ of\ tractor\ (INR)}{Landholding\ size\ (in\ acres)}$
	Annual maintenance cost of Super Seeder per acre (C6)	$= \left(\frac{Annual\ maintenance\ cost\ of\ Super\ Seeder\ (INR)}{Landholding\ size\ (in\ acres)}\right) + \left(\frac{Blade\ replacement\ cost\ (INR) \times \left(\frac{Life\ of\ Super\ Seeder\ (in\ years)}{\frac{Blade\ life\ (in\ acres)}{Landholding\ size\ (in\ acres)}}\right)}{Landholding\ size\ (in\ acres) \times Life\ of\ Super\ Seeder\ (in\ years)}\right)$

Source: Authors' analysis

Table A6: Total cost incurred by farmers in owning and running a CRM machine with a tractor reduces with an increase in landholding of farmers (an extension of Table 9 of the Report)

Cost Parameter	Capital costs		Operational costs		Maintenance costs		Total Costs
Total landholding (In acres)	Cost of owning a tractor for CRM operations per acre (C1)	Cost of owning a Super Seeder per acre (C1)	Diesel cost associated with running a tractor per acre (C3)	Labour cost associated with running a tractor per acre (C4)	Annual maintenance cost of Super Seeder per acre (C5)	Annual maintenance cost of tractor per acre (C6)	Cost of owning and running a CRM machine with a tractor per acre (C1 + C2 +C3 + C4 + C5 + C6)
1	24000	24000	900	150	4000	10000	63050
2.5	9600	9600	900	150	1600	4000	25850
5	4800	4800	900	150	800	2000	13450
7.5	3200	3200	900	150	533	1333	9317
10	2400	2400	900	150	400	1000	7250
12.5	1920	1920	900	150	320	800	6010
15	1600	1600	900	150	267	667	5183
17.5	1371	1371	900	150	229	571	4593
20	1200	1200	900	150	200	500	4150
22.5	1067	1067	900	150	178	444	3806
25	960	960	900	150	160	400	3530
27.5	873	873	900	150	145	364	3305
30	800	800	900	150	133	333	3117
32.5	738	738	900	150	223	308	3058
35	686	686	900	150	214	286	2921
37.5	640	640	900	150	207	267	2803
40	600	600	900	150	200	250	2700
42.5	565	565	900	150	194	235	2609
45	533	533	900	150	189	222	2528
47.5	505	505	900	150	184	211	2455
50	480	480	900	150	180	200	2390

52.5	457	457	900	150	176	190	2331
55	436	436	900	150	173	182	2277
57.5	417	417	900	150	170	174	2228
60	400	400	900	150	167	167	2183
62.5	384	384	900	150	164	160	2142
65	369	369	900	150	162	154	2104
67.5	356	356	900	150	159	148	2069
70	343	343	900	150	157	143	2036
72.5	331	331	900	150	155	138	2005

Source: Authors' analysis

Note: All values are in INR per acre; values based on formulas discussed in Annexure 5.

Instance 2: Cost associated with renting a CRM machine (Super Seeder) with a fuelled tractor and driver

Table A7: Total cost incurred by farmers in renting a CRM machine (Super Seeder) with a fuelled tractor and driver is INR 2000 per acre

Overheads	Rental rates (INR /acre)
Cost of renting a tractor (R1)	650
Cost of renting a CRM machine (R2)	300
Cost of diesel expenses incurred (R3)	900
Cost of labour associated with running a tractor (R4)	150
Total cost of renting CRM as a packaged solution (R1 +R2 +R3 +R4)	2,000

Source: Authors' compilation based on consultations with CHC operators

Annexure 6: Rental income generated through the renting of CRM services

We have compared the rental income earned from exclusive renting of a Super Seeder and renting a Super Seeder with a tractor and driver

Table A8: Renting CRM machinery can generate revenue of 31,500 while renting the packaged service can generate ~2 lakh for machinery owners

Rental service	Rental rate (INR/acre)	Area covered for optimal use (acres)	Potential revenue earned (INR)
Renting CRM machines	**300**	**105**	**31,500**
Renting the CRM solution as a package (CRM machine + tractor + fuel + driver)	**2,000**	**105**	**2,10,000**

Source: Authors' analysis

Annexure 7: Comprehensive list of CRM machines included in the CRM guidelines and their usage characteristics

Table A9: CRM machines available at 80% subsidy under the CRM scheme for CHCs

S. no.	Machine name	Usage description
Machines used for in-situ CRM		
1.	**Super Straw Management System (Super SMS)**	Attaches to a combine harvester to cut straw into small pieces and spread it evenly during harvesting, facilitating mixing in the soil.
2.	**Happy Seeder/Smart Seeder**	Sows seeds and applies fertiliser directly into the soil with existing stubble, enabling sowing without removing residue.
3.	**Paddy Straw Chopper/Shredder/Mulcher**	Cuts and chops paddy straw into smaller pieces, facilitating decomposition in the field and creating mulch over the field.
4.	**Shrub Master/Rotary Slasher**	Cuts and shreds standing straw and stubble left after harvesting.
5.	**Hydraulic Reversible M B Plough**	Incorporates straw into the soil by ploughing.
6.	**Zero Till Seed cum Fertilizer Drill**	Plants seeds and applies fertiliser simultaneously without removing crop residue.
7.	**Super Seeder**	Combines straw management and seeding in one pass, along with fertiliser application.
8.	**Surface Seeder**	Spreads seeds over the field surface with existing residue.
Machines used for ex-situ CRM		
9.	**Crop Reaper/Reaper cum Binder**	Harvests standing crop residue for easier baling or removal.
10.	**Rake**	Gather loose straw into rows for baling.

11.	**Tedder Machine**	Fluffs and spreads straw to dry before baling.
12.	**Baling Machine**	Compresses straw into bales for easy collection and transport.
13.	**Telehandler/Tractor-mounted Loader**	Lifts and stacks bales for storage and transport.
14.	**Trolley/Automatic Bale Loading Trolley**	Transports bales from the field to storage or industry.
15.	**Moisture Meter**	Check moisture levels in straw before and after baling to ensure quality.
16.	**Bale Bundler**	Ties multiple bales together for bulk handling.
17.	**Bale Accumulator**	Collects and groups bales for easier handling.

Source: Authors' compilation (Package of Practices Kharif 2025; CRM guidelines 2025)