Good Practices and Successful Cases of Conservation Agriculture and Conservation Agriculture Mechanization

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Central Institute of Agricultural Engineering (CIAE)
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Indian Agriculture

7th largest country in terms of area
29 states

- Net sown area - 140 million ha (42.6%)
- Agricultural workers - 263 million
- Employs about 52% of the workforce
- Provides livelihood to about 61% of the population
- Contributes 13% to the Gross Domestic Product (GDP)
- Yearly production
  - Produce – 283.5 million tonne
- No. of land holdings – 138 million
- 15% farms are semi-medium (2-4 ha), medium (4-10 ha) and large (more than 10 ha) size
India / South Asia: The Region With Challenges

- Most populous region *yet labour availability in farming is major challenge*
- Natural resources are stressed
- A hot-spot for multiple climatic risks

**MAJOR CHALLENGES**

Food requirement to meet growing population (1.3 billion) without environmental degradation.

**India**

- Occupies: 2.2% of world’s area
- Supports: 18% of world’s population
- Agricultural land: 61% of total land area
- Food Production growth: falling/stagnating

**Climate change:**

Temperature and rain variability affects productivity
Energy Scenario in Agriculture

Farm Mechanization level in India: 40-45%
90% of the total farm power by mechanical and electrical power sources.

Farm Power Availability:
0.3 kW/ha in 1971-72
2.02 kW/ha in 20014-15.
DIESEL CONSUMPTION IN AGRICULTURE SECTOR

- Tractors: 54.28%
- Agri. Pumpset: 23.57%
- Other Machineries: 22.14%

ELECTRICITY CONSUMPTION IN AGRICULTURE SECTOR

<table>
<thead>
<tr>
<th>Year</th>
<th>Consumption in Agril. Sector (GWh)</th>
<th>% Share of Total Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000-01</td>
<td>84729</td>
<td>26.76</td>
</tr>
<tr>
<td>2005-06</td>
<td>90292</td>
<td>21.92</td>
</tr>
<tr>
<td>2010-11</td>
<td>129051</td>
<td>18.16</td>
</tr>
<tr>
<td>2014-15</td>
<td>168913</td>
<td>17.81</td>
</tr>
</tbody>
</table>

Indian Scenario
Measures to Save Electricity and Diesel Consumption

**Electricity Saving**
- Design improvements in Pumps: 15-20%
- Efficient foot valves standard practices for installation of systems: 8-15%
- Solar Pumping system: 5-50%

**Diesel Saving**
- Matching machinery to prime mover: 20-30%
- Conservation agriculture: 20-40%
- Certified engines and pumps: 8-15%
Sustainable Agriculture

- Intensity of soil disturbance
- Crop rotation
- Surface crop residue retention

Conventional agriculture

- Minimum or no soil disturbance (Zero tillage, No-tillage)
- Permanent soil cover (residues or green manure cover crops (GMCCs))
- Crop rotation
- Integrated disease and pest management
- No burning

Conservation agriculture
Measures for reduction of energy use in agriculture

- Matching implements with power source
- CA machinery
- Equipment for precise application of fertilizers and chemicals
- Renewable energy operated machinery
- Reduce energy use in irrigation
- Real time soil moisture based irrigation system
- Drip irrigation system
- Residue management
Matching Implements with Power Source

➢ Low fuel consumption per hectare
➢ Higher operational efficiency
➢ Low operating cost

Higher Efficiency due to

- Selection of right size implements to ensure timely completion of each field operation.
- Size of tractor to be decided by the size and speeds of the implements and soil characteristics
- Types of implements to be used
Minimizing energy use by

- Minimal (reduced tillage) or
- Without tillage (no-till).

We know that these practices reduces soil carbon loss with minimum soil disturbances

- No-tillage systems also reduce energy use thus low CO₂ emissions.
- CA practices enhances soil carbon with retention of crop residue.
Laser land leveling is leveling the field within certain degree of desired slope using a guided laser beam through out the field.

Used for micro levelling of field and pulling loose soil from one place to other.

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<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forward speed, km/h</td>
<td>4.0-6.0</td>
</tr>
<tr>
<td>Field capacity, ha/h</td>
<td>0.10-0.20</td>
</tr>
<tr>
<td>Standard deviation of reduced level after leveling, cm</td>
<td>0.55-0.90</td>
</tr>
<tr>
<td>Leveling index, cm</td>
<td>0.44-0.63</td>
</tr>
<tr>
<td>Volume of soil tilled, m³</td>
<td>50-90</td>
</tr>
<tr>
<td>Cost of leveling, $/ha</td>
<td>34-46</td>
</tr>
</tbody>
</table>

Tractor drawn laser land leveller
Movie of laser leveller

Source: M/s Dasmesh Mechanical work, India
www.landforce.in
Laser Assisted Precision Land Leveling: A Fully Validated CSAP with Impact at Scale

- Introduced in India during 2000-01 (RWC/CIMMYT and ICAR-NATP)
- Adoption: ~4 million ha in India
- Direct employment generation: 350 person days/unit/yr
- Yields gains in RW system (3.5 mha, 0.5 t ha-1 yr-1): ~1.75 million tons/yr
- Water saving in RW system (3.5 mha, 18 ha-cm ha-1 yr-1): 6.5 km³ yr-1
- Electricity saving for irrigation in RW systems of IGP (3.5 mha): ~US$ 70 million yr-1
- Indirect employment: manufacturing, transport, services
- Other possible benefits: GHG mitigation, savings in subsidy bill etc
- Case study
SEEDING AND PLANTING
Movie of Happy seeder

Source: M/s Dasmesh Mechanical work, India
www.landforce.in
Residue Management (CA) using Happy Seeder

- Improved soil health (SOC 0.5 t/ha/yr)
- Reduced weather risks (Low CV in crop yield)
- Reduce chemical load (20-25 kg N/ha, Less herbicide)
- More crop per drop (irrigation water ~40-50 ch/ha/yr)
- Lower costs and higher profits (Profit 12000-15000/ha/yr)
- Lower GHGs emission (~1 t CO2-eq/ha/yr)

Case study
Machinery which are able to work in residue conditions

**Turbo Happy Seeder** new light-weight machine named the “Turbo Happy Seeder” is now commercially available and manufacturers in India are already manufacturing this machine.

- Turbo Happy Seeder cuts and manages the standing stubble (under straw density > 5 tonnes per ha) and loose straw in front of the furrow openers,

- Retaining it as surface mulch and sows wheat in a single operational pass of the field.

- Operational costs for sowing wheat are 50-60% lower with HS than with conventional sowing.
Mini Happy Seeder

• A mini happy seeder of 0.9 m width for two wheel tractor for small and marginal farmers.

• This machine is capable of direct drilling wheat into ≤ 5 t/ha of rice residue.

• Provision has been made for the operator to ride on the MHS during its operation.

• It can be easily detachable from the two wheal tractor after seeding.
Direct zero-till drilling offers the apparent advantage of timely planting at:
Reduction in: time, fuel, labour and drastic reduction in tillage intensity
Saving in: cost, energy and carbon
Movie seed cum fertiliser drill
Roto Seeder: ROTO SEEEDER is a multi-purpose earth tilling machine used in the preparation of seedbed & sowing seed into stubbles fields.

Roto Seeder helps in proper distribution of seed & fertilizer with broadcasting process,

Also the seed feed-rate can be adjusted with the help of adjusting lever, which allows a great extent of liberty to farmers.

It is available with rotary tillers of 150, 18, 210 and 240 cm
Movie of Roto seeder

Source: M/s Dasmesh Mechanical work, India
www.landforce.in
Compared with zero till drill (TD) & farmer practice of relay cropping by manual dibbling

<table>
<thead>
<tr>
<th>Parameters</th>
<th>ZTSD (TD)</th>
<th>ZTSD (PT)</th>
<th>FP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effective working width, mm</td>
<td>1600</td>
<td>800</td>
<td></td>
</tr>
<tr>
<td>Working depth, mm</td>
<td>45-53</td>
<td>31-40</td>
<td></td>
</tr>
<tr>
<td>Soil moisture (%), db</td>
<td>18-22</td>
<td>18-22</td>
<td>23 &amp; higher</td>
</tr>
<tr>
<td>Seed rate, kg/ha</td>
<td>52</td>
<td>52</td>
<td>62</td>
</tr>
<tr>
<td>Field capacity, ha/h</td>
<td>0.346</td>
<td>0.18</td>
<td></td>
</tr>
<tr>
<td>Fuel consumption, l/h</td>
<td>4.2</td>
<td>1.41</td>
<td></td>
</tr>
<tr>
<td>Cost of operation, Rs/ha</td>
<td>1236.00</td>
<td>779.89</td>
<td>1600.00</td>
</tr>
<tr>
<td>Yield, kg/ha</td>
<td>591</td>
<td>562</td>
<td>625</td>
</tr>
</tbody>
</table>
Controlled traffic slit drill

- The controlled traffic slit drill was designed for zero till seeding in straw fields after grain combining.

Raised bed planter for residue condition

Planting crops on permanent raised beds have been useful for providing better drainage during heavy rainfall condition, controlled traffic, mobility in the shown field, higher yield, increased fertilizer and irrigation efficiencies, reduced herbicides dependence.
Inverted ‘T’ furrow opener for Zero till-drill

Energy & moisture conservation
Saving in time: 40-70%
Saving in fuel: 64%
Saving in water: 10-15%

Zero till-drill in operation
(5 million ha area)
<table>
<thead>
<tr>
<th>Equipment</th>
<th>Outputs</th>
</tr>
</thead>
</table>
| Seed-cum-ferti drill with differential fertilizer application system | • Fertilizers are efficiently utilised by plants at 15 cm depth of application and parallel results were observed for 10 cm depth also  
• Placement of fertilizer at depth 150 mm required 47% and 42% higher draft and power, respectively, as compared to 10 cm, resulting in higher cost of production at 150 mm depth placement without significant gain in yield  
• Fertiliser placement at 100 mm depth was found optimum |
Inclined Plate Planter with Broad/narrow Bed Former
Two different treatments of narrow bed planting of wheat
<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>L x W x H, mm</strong></td>
<td>1760x2600x1160</td>
</tr>
<tr>
<td><strong>No of furrow openers</strong></td>
<td>5 (up to 11)</td>
</tr>
<tr>
<td><strong>Type of furrow openers</strong></td>
<td>Shovel</td>
</tr>
<tr>
<td><strong>Metering mechanism</strong></td>
<td>Fluted roller</td>
</tr>
<tr>
<td><strong>Weight, kg</strong></td>
<td>550</td>
</tr>
<tr>
<td><strong>Rotavator (lxwxh, mm)</strong></td>
<td>600 x 1880 x 720</td>
</tr>
<tr>
<td><strong>No. of rotors</strong></td>
<td>8</td>
</tr>
<tr>
<td><strong>No. of blades in both end rotor</strong></td>
<td>3</td>
</tr>
<tr>
<td><strong>No. of blades in each rotor</strong></td>
<td>6</td>
</tr>
<tr>
<td><strong>Total number of blades</strong></td>
<td>45</td>
</tr>
<tr>
<td><strong>Speed reduction</strong></td>
<td>2.85</td>
</tr>
<tr>
<td><strong>Lower hitch height from ground</strong></td>
<td>470 mm</td>
</tr>
<tr>
<td><strong>Upper hitch height from ground</strong></td>
<td>1020 mm</td>
</tr>
<tr>
<td><strong>Distance between lower hitch</strong></td>
<td>700 mm</td>
</tr>
<tr>
<td><strong>Mast height</strong></td>
<td>550 mm</td>
</tr>
</tbody>
</table>

**Rotary assisted bed maker-cum-seeder**
Raised bed planters for pulse

Treatments

3 makes

2 crops

Kharif

2 Season

Summer

Green gram

Black gram

Case Study

Dashmesh

National

Khedut

Multi location Trials
# Raised bed planters for pulse

## Results

<table>
<thead>
<tr>
<th>Case Study</th>
<th>Dasmesh</th>
<th>National</th>
<th>Khedut</th>
<th>Line sowing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bed width 700 mm</td>
<td>2000 mm</td>
<td>1500 mm</td>
<td>1500 mm</td>
<td>1500 mm</td>
</tr>
<tr>
<td>Bed Height 220 mm</td>
<td>200 mm</td>
<td>200 mm</td>
<td>150 mm</td>
<td>150 mm</td>
</tr>
<tr>
<td>Coverage 2000 mm</td>
<td>1500 mm</td>
<td>1500 mm</td>
<td>1500 mm</td>
<td>1500 mm</td>
</tr>
<tr>
<td>Bed width 600 mm</td>
<td>600 mm</td>
<td>600 mm</td>
<td>600 mm</td>
<td>600 mm</td>
</tr>
<tr>
<td>Bed Height 200 mm</td>
<td>200 mm</td>
<td>150 mm</td>
<td>150 mm</td>
<td>150 mm</td>
</tr>
<tr>
<td>Coverage 1500 mm</td>
<td>1500 mm</td>
<td>1500 mm</td>
<td>1500 mm</td>
<td>1500 mm</td>
</tr>
<tr>
<td>Bed width 600 mm</td>
<td>600 mm</td>
<td>600 mm</td>
<td>600 mm</td>
<td>600 mm</td>
</tr>
<tr>
<td>Bed Height 150 mm</td>
<td>150 mm</td>
<td>150 mm</td>
<td>150 mm</td>
<td>150 mm</td>
</tr>
<tr>
<td>Coverage 1500 mm</td>
<td>1500 mm</td>
<td>1500 mm</td>
<td>1500 mm</td>
<td>1500 mm</td>
</tr>
</tbody>
</table>

## Working width, mm

<table>
<thead>
<tr>
<th></th>
<th>Dashmesh</th>
<th>National</th>
<th>Khedut</th>
<th>Line sowing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working width, mm</td>
<td>2000</td>
<td>1500</td>
<td>1500</td>
<td>1500</td>
</tr>
</tbody>
</table>

## Metering

<table>
<thead>
<tr>
<th></th>
<th>Dashmesh</th>
<th>National</th>
<th>Khedut</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metering</td>
<td>Fluted roller</td>
<td>Fluted roller</td>
<td>Cup feed</td>
</tr>
</tbody>
</table>

## Field capacity, ha/h

<table>
<thead>
<tr>
<th></th>
<th>Dashmesh</th>
<th>National</th>
<th>Khedut</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field capacity, ha/h</td>
<td>0.378</td>
<td>0.392</td>
<td>0.372</td>
</tr>
</tbody>
</table>

## Fuel consumption, l/ha

<table>
<thead>
<tr>
<th></th>
<th>Dashmesh</th>
<th>National</th>
<th>Khedut</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel consumption, l/ha</td>
<td>1.48</td>
<td>1.435</td>
<td>1.384</td>
</tr>
</tbody>
</table>

## Cost of operation, Rs/ha

<table>
<thead>
<tr>
<th></th>
<th>Dashmesh</th>
<th>National</th>
<th>Khedut</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of operation, Rs/ha</td>
<td>1418</td>
<td>1405</td>
<td>1014</td>
</tr>
</tbody>
</table>

## Comments

All the PRD planters tested in field trials.
### Developed CAM in India

<table>
<thead>
<tr>
<th>Machine parameters</th>
<th>Zero till drill</th>
<th>Strip till drill</th>
<th>Roto till drill</th>
<th>Slit till drill</th>
<th>Convention al (3 Tillage + Sowing)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working width, mm</td>
<td>1600-2000</td>
<td>1800</td>
<td>2000</td>
<td>1800</td>
<td>1850</td>
</tr>
<tr>
<td>Weight, kg</td>
<td>210</td>
<td>350</td>
<td>350</td>
<td>300</td>
<td>-</td>
</tr>
<tr>
<td>Unit price, $</td>
<td>465</td>
<td>925</td>
<td>1075</td>
<td>850</td>
<td>310+ 390</td>
</tr>
<tr>
<td>Time, h/ha</td>
<td>3.23 (70.1)</td>
<td>4.17 (61.2)</td>
<td>3.45 (68.1)</td>
<td>2.50 (76.8)</td>
<td>10.80</td>
</tr>
<tr>
<td>Fuel used, l/ha</td>
<td>11.50 (66.8)</td>
<td>17.50 (49.4)</td>
<td>14.80 (57.2)</td>
<td>10.00 (71.1)</td>
<td>34.60</td>
</tr>
<tr>
<td>Operational energy, MJ/ha</td>
<td>650 (67.2)</td>
<td>1002 (49.3)</td>
<td>784 (60.3)</td>
<td>565 (71.4)</td>
<td>1976</td>
</tr>
</tbody>
</table>
Nitrogen fertilizers are not always used efficiently by crops. Increased N use efficiency would reduce N₂O emissions

➢ Adjusting N application based on crop needs (e.g., precision farming) and least susceptible to loss (improved timing)

➢ Use of slow- or controlled-release fertilizer or nitrification inhibitors (which retards the microbial processes of N₂O formation)

➢ N placement more precisely into the soil to make it more accessible to crops roots

➢ Avoiding N applications in excess of immediate plant requirements.
Adoption of Precision Machinery for Fertilizer and Chemical applicators

- Variable rate fertilizers applicator with real time sensors could save 10-15% fertilizer.
- Band width applicator for placing the fertilizer for higher input use efficiency
- Fertigation system for N application with higher input use efficiency
Pre-emergence herbicide strip applicator
Plant Protection Equipment

Power tiller operated sprayer

Self-propelled sprayer
Intra Canopy Sprayer for pigeon pea and cotton crops
Residue Management

### Surplus of crop residues in India (million tonne year⁻¹)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>501.76</td>
<td>140.84</td>
<td>92.81</td>
</tr>
</tbody>
</table>

- Emissions due to Burning of crop residue in India: 6.606 million tonnes equivalent CO₂ emission/year (INCCA-2010).

### In-situ management of paddy straw

- Incorporation of paddy residue into the soil using
  - Conventional tillage methods
  - Straw chopping and mixing using tillage tools
- Retention of paddy straw as mulch on soil
  - Sowing of wheat using happy seeder
  - Straw chopping and sowing of wheat using spatially modified no-till drill
Removal/collection of paddy straw

➢ Farm residue collector
➢ Baling of paddy straw
➢ Collection of whole straw using head feed combine
Straw incorporated tillage seeding

STRAW CHOPPER
Movie of Straw Chopper

Source: M/s Dasmesh Mechanical work, India
www.landforce.in
Movie of Straw mulcher

Source: M/s Dasmesh Mechanical work, India
www.landforce.in
Tractor operated straw reaper (combine)
Tractor operated straw reaper with trailer

Field capacity: 0.4 ha/h
Cost: $5000
Movie of Straw reper

Source: M/s Dasmesh Mechanical work, India
www.landforce.in
Hay rake in operation to collect paddy straw

Straw baler being used to make bales of paddy straw
New Innovation: Super straw management system

Movie of super straw management system

Source: M/s Dasmesh Mechanical work, India
www.landforce.in
Future challenge!!
Management of Standing Crop Residues

Reformation of bed following harvest of maize with full maize prior to wheat planting

Partial removal of wheat straw for fodder if economically feasible prior to bed reformation

Rolling Down Maize Straw

Chopping maize straw after harvest
Roller for Managing Standing Crop Residues Instead of Chopping
CA for Sustainable Intensification of Rice-Wheat System: Relay planting of Green gram (Pulses) in wheat

- System sustainability through inclusion of legume in cereal rotations
- Increase profits
- Nutritional security
- Improve soil health
- Buffer canopy temperature-adaptation
- Eliminate wheat stubble burning
CA in Cotton-Wheat Systems

- Cotton-wheat, 2nd largest wheat systems in South Asia (>4.5 mha)

CA in Maize Systems

CA in Sugarcane Systems
Energy Flow in Wheat Production in Punjab

### Operational Energy (MJ/ha)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Energy (MJ/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seedbed Pre.</td>
<td>1454</td>
</tr>
<tr>
<td>Irrigation</td>
<td>3516</td>
</tr>
<tr>
<td>Har. &amp; Thr.</td>
<td>3166</td>
</tr>
<tr>
<td>Weeding</td>
<td>129</td>
</tr>
<tr>
<td>Others</td>
<td>947</td>
</tr>
</tbody>
</table>

### Material Input Energy (MJ/ha)

- Seedbed Pre.: 1454
- Irrigation: 3516
- Har. & Thr.: 3166
- Weeding: 129
- Others: 947

Total Energy Input (Operational + Material): 19364 MJ/ha

### Output Energy

- Grain: 61490 MJ/ha
- Biomass: 87320 MJ/ha

Output Energy: 148810 MJ/ha

Indian Scenario

Case study

### Indicators

- Output-Input ratio: 7.6
- Specific Energy (MJ/Kg): 4.63
Energy Flow in Paddy Production at Punjab

Operational Energy (MJ/ha)
- Seedbed Pre. (1865)
- Irrigation (17993)
- Har. & Thr. (922)
- Weeding (96)
- Others (515)

Material Input Energy (MJ/ha)
- (11101)

Total Energy Input (Operational + Material) 32892 MJ/ha

Output Energy 147811 MJ/ha
- Grain 83731
- Biomass 64080

Output-Input ratio: 4.4
Specific Energy (MJ/Kg) : 5.77
Crop Residue Burning is a BIG Challenge.
Rice Residue Burning during 2016

Estimates on Adoption of Zero Till Wheat in Haryana and Punjab Using Remote Sensing (Winter 2016-17)
CA based Innovations for Managing Crop Residues

Field Crops Research 184 (2015) 201–212

Contents lists available at ScienceDirect

Field Crops Research

journal homepage: www.elsevier.com/locate/fcr

Development and evaluation of the Turbo Happy Seeder for sowing wheat into heavy rice residues in NW India

H.S. Sidhu a, Manpreet Singh b, Yadvinder Singh b, c, J. Blackwell c, Shiv Kumar Lohan b, E. Humphreys d, M.L. Jat e, Vicky Singh f, Sarbjeet Singh f
Govt of India in the recent budget allocated Rs 1000 crores (153 lakh USD) to reduce stubble burning.

Flat 50% subsidy will be given to the individual farmers who are willing to buy the equipment for straw management.

Government support & policy decision very important.
<table>
<thead>
<tr>
<th>S No</th>
<th>Product Name and Model</th>
<th>Product Image</th>
<th>Ex-Factory (Rupees)</th>
<th>Ex-Factory (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Laser Land Leveler (Std. Model) (LLN2A)</td>
<td></td>
<td>3,20,000</td>
<td>4923</td>
</tr>
<tr>
<td>2</td>
<td>Laser Landleveler (Sport Model) (LLS2A)</td>
<td></td>
<td>3,25,000</td>
<td>5000</td>
</tr>
<tr>
<td>3</td>
<td>Happy seeder (10 Tine) (HSS10)</td>
<td></td>
<td>1,45,000</td>
<td>2230</td>
</tr>
<tr>
<td>4</td>
<td>Roto seeder heavy duty (7 Feet) (RH7MG48)</td>
<td></td>
<td>1,25,000</td>
<td>1923</td>
</tr>
</tbody>
</table>

Only indicative
## Brief of cost of the equipment

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Rs</th>
<th>USD</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Seed cum fertilizer drill (11 tine) (SDD11)</td>
<td>49,000</td>
<td>754</td>
</tr>
<tr>
<td>6</td>
<td>Zero seed drill (11 Tine) (ZDD11)</td>
<td>49,000</td>
<td>754</td>
</tr>
<tr>
<td>7</td>
<td>Combine harvester with SMS</td>
<td>22,00,000</td>
<td>33846</td>
</tr>
<tr>
<td>8</td>
<td>Straw Mulcher (2 meter) (CSB)</td>
<td>1,45,000</td>
<td>2231</td>
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<td>9</td>
<td>Straw reaper (SR56)</td>
<td>2,25,000</td>
<td>3461</td>
</tr>
</tbody>
</table>

*Only indicative*
To conclude

- Future farm mechanization is through mechanical sources of power
- CA will demand to work in close partnership with farmers, stakeholders, Government to strengthen knowledge
- CA offers an opportunity for arresting resource degradation and make agriculture more resource use efficient, competitive and sustainable
- Machines suitable for custom hiring – high capacity, high labour productivity
- Quality manufacturing and after sales support for reliability of farm machinery.
THANK YOU