10th Regional Forum on Sustainable Agricultural Mechanization in Asia and the Pacific

Gender Mainstreaming in Sustainable Agricultural Mechanization

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Designing Gender-Responsive Technologies and Empowering Women Engineers

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Indian Agriculture

- Net Sown area - 140 million ha (42.6%)
- Agricultural workers - 230 million
- Employs about 52% of the work force
- Provides livelihood to about 60% of the population

- Yearly production – Food grains - 315.6 million tonnes (2021-22)
  Fruits – 107.5 million tonnes (2021-22)
  Vegetables – 209.1 million tonnes (2021-22)

- No. of land holdings - 138 million

- Contributes 18% to the Gross Domestic Product (GDP)
Farm Mechanization Status

Need of farm power would be 4 kW/ha to meet the growing food demand by 2030

* Estimated values

Source: Tiwari PS; KK Singh; Sahni RK; Kumar V. 2019. Farm mechanization–trends and policy for its promotion in India. IJAS, 89 (10): 1555-1562.
Farm mechanization level in India is 40-47% and lower in comparison to US (95%), Brazil (75%) and China (59.5%).
Farm Machinery status of India

- 8 million **tractors** *(5.4 million tractors are being used in agricultural activities)*
- 0.59 million **combines and self-propelled machines**,*
- 2.62 million **levellers**
- 1.2 million **rotavators**
- 1.83 million **seed drill**
- 0.103 million **planters**
- 0.952 million **sprayers**
- 9.432 million **threshers**
- 10 million **other machines**
- **450 million hand tools**

*Source: Singh 2016, Data Book, Agriculture Mechanization in India*
Total 118 R & D centres in India are working directly or indirectly for agriculture

- 25 Centres under AICRP on FIM
- 12 Centres under AICRP on ESA
- 09 Centres under AICRP on UAE
- 13 Centres under AICRP on Energy in Agriculture and Agro-based Industries
- 30 Centres under AICRP on PHET
- 13 Centres under AICRP on Women in Agriculture
- 06 Centres under CRP on FMPF
- 05 Centres under CRP on MIS
- 05 Centres under CRP on EA
Advantage of Farm Mechanization

- Saving in seed: 15 to 20%
- Saving in fertilizer: 15 to 20%
- Saving in time: 20 to 30%
- Reduction in labour: 20 to 30%
- Increase in cropping intensity: 5 to 20%
- Reduction in drudgery of farm workers: 10 to 30%
## Population Dynamics of Indian Agricultural Workers (No. in million)

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Particulars</th>
<th>2011</th>
<th>2020</th>
<th>2050*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Country’s Population</td>
<td>1211</td>
<td>1323</td>
<td>1612</td>
</tr>
<tr>
<td>2.</td>
<td>Total No. of Workers</td>
<td>482</td>
<td>566</td>
<td>693</td>
</tr>
<tr>
<td>3.</td>
<td>Total Workers as % of population</td>
<td>40</td>
<td>43</td>
<td>43</td>
</tr>
<tr>
<td>4.</td>
<td>% of Agricultural Workers to total workers</td>
<td>55</td>
<td>41</td>
<td>26</td>
</tr>
<tr>
<td>5.</td>
<td>No. of Agricultural Workers</td>
<td>263</td>
<td>230</td>
<td>202</td>
</tr>
<tr>
<td>a)</td>
<td>Men</td>
<td>165</td>
<td>126</td>
<td>101</td>
</tr>
<tr>
<td>b)</td>
<td>Women</td>
<td>98</td>
<td>104</td>
<td>101</td>
</tr>
<tr>
<td>6.</td>
<td>% of women in agricultural work force</td>
<td>37</td>
<td>45</td>
<td>50</td>
</tr>
</tbody>
</table>

* Estimated values
Women Workers in Indian Agriculture

- Upland cultivation
- Wetland cultivation
- Horticulture
- Hill agriculture
- Worker as a source of power
- Worker as a machine operator
Multifaceted Role of Women

Field operations in crop production
Sowing, transplanting, weeding, interculture, harvesting and threshing

Agro-processing activities
Cleaning/grading, drying, parboiling, milling, grinding, decortication and storage

Operations in commercial agriculture
Tea plucking, tobacco leaf harvesting, Lac cultivation and processing

Animal upkeep and dairy activities
Cattle management, fodder collection, milking etc.

Domestic: Cooking, child rearing, water collection, household maintenance etc.

United Nations FAO estimated that if women had equal access to productive resources as men, they would increase yield by 20-30%.
The major constraints in taking the technologies to farm women include:

- Illiteracy among farm women
- Social customs and taboos
- Shortage of women extension workers
- Insufficient funds for extension programmes for women
- Lack of infrastructural facilities for women extension programmes
- Lack of coordinated and concentrated efforts.
Anthropometric & Strength Data of Indian Agricultural Workers

- Data on 79 body dimensions for 14618 (8970 male and 5648 female) agricultural workers and strength data on 16 parameters for 9515 (5570 male and 3945 female) workers.

- Data are being used in design of hand tools, farm machines, tractors etc.

- Indian data is included in ISO:7205

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height, cm</td>
<td>163.3</td>
<td>151.5</td>
</tr>
<tr>
<td>Weight, kg</td>
<td>54.7</td>
<td>46.3</td>
</tr>
<tr>
<td>Push strength (both hand)</td>
<td>224</td>
<td>143</td>
</tr>
<tr>
<td>standing, N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pull strength (both hands)</td>
<td>218</td>
<td>158</td>
</tr>
<tr>
<td>standing, N</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Anthropometric & Strength Data of Indian Agricultural Workers

- Height, cm
- Leg strength (Right) sitting, N

Percentile

Female
Male
Empowering women through mechanization

Naveen Dibbler
Output: 0.015 ha/h
Cost: Rs. 700/-

Rotary Dibbler
Output: 0.10 ha/h
Cost: Rs. 2300/-

3-Row Rice Transplanter
Capacity: 150 m²/h
Cost: Rs. 8,500/-

4-row Direct Paddy Seeder

8-Row Rice Transplanter

3-Row Rice Transplanter
Empowering women through mechanization

Cono Weeder
Cost: Rs. 1900/-
Field capacity: 0.028 ha/h

Twin Wheel Hoe
Cost : Rs. 800/-
Field capacity: 0.015 ha/h

Pedal Operated Thresher (OUAT)
Cost : Rs. 5,500/-
Output capacity: 35-40 kg/h
Tubular Maize Sheller
Cost: Rs. 60/-
Capacity: 27 kg/h

Rotary Maize Sheller
Cost: Rs. 8,000/-
Capacity: 77 kg/h

Areacanut dehusker
Cost: Rs. 3,000/-
Output: 5 kg/h
Paddy Winnower
Output: 170 kg/h
Cost: Rs. 6000/-

Groundnut Decorticator
Capacity: 26-30 kg/h (sitting)
35-40 kg/h (standing)
Cost: 2,400/-

Coconut tree climbing device
Cost – Rs. 3500/-
Output – 56 coconuts/h as against 28 coconuts/h in conventional system
Potato Peeler

Capacity: 50-60 kg/h
Cost: Rs. 17,000/-

Dal Mill

Capacity: 100 kg/h
Cost: Rs. 30,000/-

Portable briquetting machine

Capacity: 40 kg/h
Cost: Rs. 35,000/-
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**Platform Type Fruit Harvesting System**

- **Load carrying capacity**: 200 kg
- **Cost**: Rs. 6.75 lakh

**Ease in harvesting, pruning, spraying and canopy management operations in orchard**

**Manual fruit harvester**

- **Output** – 200-300 oranges/h
- **400-600 apples/h**

Harvesting apples with manual fruit harvester in NEH region
Multi-crop thresher

Capacity:
- Wheat: 90-100 kg/h
- Paddy: 100-110 kg/h
- Barnyard millet: 90-100 kg/h
- Finger millet: 90-100 kg/h
- Amaranth: 30-40 kg/h
- Mustard: 95-100 kg/h
- Radish: 80-90 kg/h
- Pea: 60-80 kg/h
- Masoor dal: 95-100 kg/h

Cost: Rs. 75,000/-
Recommendations and suggestions

- Design the tools/equipment keeping in view the anthropometric data of women workers
- Design of gender-friendly tools, equipment and self-propelled machines (like tractors, power tillers, transplanters, power weeders) suiting both men and women workers
- Testing the equipment with women workers
- Removing social taboos which makes women not to operate farm machines
- Organize demonstrations and trainings to rural women on various modern tools/equipment in proper and safe operation.
- Encourage manufacturers/entrepreneurs to fabricate improved tools and equipment – Policy intervention
- Make these tools and equipment available in rural areas for purchase by users
- Large scale demonstrations to create awareness about the improved tools/machines
Recommendations and suggestions

- Building up of linkages with central/ state departments, NGOs, banks, and other stakeholders to promote the improved tools and equipment.

- The state agricultural departments should take lead role because they have functionaries at village level.

- The supply of improved tools and equipment need to be ensured at village level so that assured availability is ensured to the farm women as per their requirement.

- The rural women are more comfortable with women trainers and are able to express their views better to them.

- All the departments which are involved in transfer of technology to rural women should have enough number of women trainers to make technology transfer more successful.

- Assist farm women, after being duly trained to get loans from banks/ other organizations to procure various tools/equipment
Our aim is to empower the women workers in agriculture through agricultural engineering technologies for

- reducing drudgery,
- higher work efficiency and output
- increasing earnings, and
- heightening their quality of life
Acknowledgement

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Thank you