Agricultural Mechanization in Nepal

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Agricultural Mechanization

- Agricultural Mechanization often misunderstood as **Tractorization**
- **Utilization of tools, implements and machines** for agricultural land development, crop production, harvesting, preparation for storage, storage, and on-farm processing.
- With objective
  - To increase labor productivity
  - To increase land productivity
  - To reduce the cost of production
  - To reduce drudgery & farm work load
Physiographic regions

Terai (100-300)
Siwalik (150-800),
Middle mountain (300-1500)
High mountain (1500-5000)
High Himalaya (>2600 masl)
Physiographic Regions

- **TERAI**
- **SIWALIK**
- **MIDDLE MOUNTAIN**
- **HIGH MOUNTAIN**
- **HIMALAYA**
- **ALPINE**
- **SUB ALPINE**
- **COOL TEMPERATE**
- **WARM TEMPERATE**
- **SUB TROPICAL**
- **ARCTIC**

Upper Limit of Grazing
Upper Limit of Cereal Based Cropping
Upper Limit of Maize Based Cropping
Upper Limit of Rice Based Cropping
Upper Limit of Double Rice
<table>
<thead>
<tr>
<th>Region</th>
<th>No of Holding</th>
<th>Area of Holding</th>
<th>Av. holding Size, ha</th>
<th>Av. no of parcel/holding</th>
<th>Average size of parcel, ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mountain</td>
<td>298,223</td>
<td>218,707</td>
<td>0.73</td>
<td>4.03</td>
<td>0.18</td>
</tr>
<tr>
<td>Hill</td>
<td>1,586,406</td>
<td>1,038,615</td>
<td>0.65</td>
<td>3.18</td>
<td>0.21</td>
</tr>
<tr>
<td>Terai</td>
<td>1,479,510</td>
<td>1,396,716</td>
<td>0.94</td>
<td>3.20</td>
<td>0.29</td>
</tr>
<tr>
<td>Nepal</td>
<td>3,364,139</td>
<td>2,654,037</td>
<td>0.79</td>
<td>3.27</td>
<td>0.24</td>
</tr>
</tbody>
</table>
Land Holding Size Distribution

% of Holdings

Land area/holding

Mountain
Hill
Terai
Nepal

Land less
< 0.1
< 0.2
< 0.5
< 1
< 2
< 3
< 4
< 5
< 10
> +10
Agricultural Scenario

- Dominated by subsistence and small holder agriculture.
- Agriculture contributed 36% AGDP
- Rice based and maize based cropping system are dominant in terai and hills respectively.
- Cattle, buffalo and goat and poultry are major livestock
- Diversity in agriculture due to variation of agri-ecological diversity
- Vegetable cultivation, cash crops viz. tea, coffee, cardamom, ginger etc.
## Area and Production of Cereal Crops, 2010/2011

<table>
<thead>
<tr>
<th>Crops</th>
<th>Area (ha.)</th>
<th>Production (mt.)</th>
<th>Yield (kg/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paddy</td>
<td>1496476</td>
<td>4460278</td>
<td>2981</td>
</tr>
<tr>
<td>Maize</td>
<td>906253</td>
<td>2067722</td>
<td>2281</td>
</tr>
<tr>
<td>Millet</td>
<td>269820</td>
<td>302691</td>
<td>1122</td>
</tr>
<tr>
<td>Wheat</td>
<td>767499</td>
<td>1745811</td>
<td>2275</td>
</tr>
<tr>
<td>Barley</td>
<td>28461</td>
<td>30240</td>
<td>1063</td>
</tr>
<tr>
<td>Buckwheat</td>
<td>10304</td>
<td>8841</td>
<td>858</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3478813</strong></td>
<td><strong>8615383</strong></td>
<td><strong>2477</strong></td>
</tr>
</tbody>
</table>
Agricultural Work in Gender Perspective

<table>
<thead>
<tr>
<th>Operation</th>
<th>Crop Intensive Pocket area</th>
<th>Vegetable Pocket area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Female</td>
<td>Male</td>
</tr>
<tr>
<td>Tillage</td>
<td>1%</td>
<td>97%</td>
</tr>
<tr>
<td>Planting</td>
<td>64%</td>
<td>35%</td>
</tr>
<tr>
<td>Weeding</td>
<td>58%</td>
<td>41%</td>
</tr>
<tr>
<td>Harvesting</td>
<td>57%</td>
<td>42%</td>
</tr>
<tr>
<td>Threshing</td>
<td>40%</td>
<td>58%</td>
</tr>
<tr>
<td>Drying</td>
<td>60%</td>
<td>39%</td>
</tr>
<tr>
<td>Processing</td>
<td>54%</td>
<td>45%</td>
</tr>
<tr>
<td>Transportation</td>
<td>42%</td>
<td>58%</td>
</tr>
<tr>
<td>Marketing</td>
<td>25%</td>
<td>73%</td>
</tr>
</tbody>
</table>
Farm Power Availability

- Animate power major source
- Stationary engine, two wheel power tiller and 4 wheel power tiller are considered
- The mechanical power is concentrated in terai 92%
Tractor Population Trend

FIG. 3: CUMULATIVE NUMBER OF TRACTOR REGISTERED IN NEPAL

Cumulative Number of Tractor Registered

Fiscal Year

- 1989/90
- 1990/91
- 1991/92
- 1992/93
- 1993/94
- 1994/95
- 1995/96
- 1996/97
- 1997/98
- 1998/99
- 1999/2000
- 2000/01
- 2001/02
- 2002/03
- 2003/04
- 2004/05
- 2005/06
- 2006/07
- 2007/08
- 2008/09
- 2009/10
- 2010/11

0
10000
20000
30000
40000
50000
60000
70000
Status of Agricultural Mechanization

Tillage

- Majority of tillage by animal power
- Only 26% of farmers use iron plough
- In Nepal 8% use tractor & in terai 18%
- Most of the tractor use cultivator
- Custom hiring of tractors is common
- Power tiller is getting popular
Transformation in tillage
Status of Agri. Mechanization (cont.)

**Planting / Seeding**

- Rice is manually Transplanted
- Wheat is broadcasted
- Maize & vegetable seeds is dibbled
- More than 64% is performed by women
- Zero till drill & minimum till drill is promoted by NARC & DOA
Status of Agri. Mechanization (cont.)

Inter-culture Operation

- Rice, Potato, maize and vegetables need major inter culture operations
- Khurpi and sickles, Kuto etc. are used
- Bullock drawn local plough is also used for maize inter culture
- More than 60% of inter-culture operation by women
Status of Agri. Mechanization (cont.)

Irrigation

- 42% of area irrigated and 18% year round
- only 242000 ha is irrigated by GW in which 208746 is through STW and 33732 ha by deep tube wells
- 14% in terai use CF pump mainly for shallow tube well
- More than 100000 treadle pumps in terai
- Simple low cost drip system and sprinkler irrigation is being used for vegetable cultivation
Status of Agri. Mechanization (cont.)

Harvesting

- Manually performed by using Locally made sickles
- Serrated sickles locally made is also popular
- 9 Combine harvesters are in operation in Kapilbastu, Nawalparashi, Rupandehi
- 4 wheel tractor operated reapers are also getting popular
Status of Agri. Mechanization (cont.)

**Threshing**

- Beating on stone/drum
- Animal/tractor treading
- Threshers 15 percent in terai use

Thresher (2001) at present it is estimated that more than 60%
Status of Agri. Mechanization (cont.)

Transportation

- Human, animal and mechanical power
- Tractor, animal, cycle, cart etc.
- One of the most drudgerous activity in hills
- 18% of farmers in terai use bullock cart
Status of Agri. Mechanization (cont.)

Processing

- Manual and mechanical
- Majority of cereal crop processing operation is mechanized
- Sheller, Huller, grinding mill, oil expeller, beaten rice mill is common
- Need of appropriate technology in processing of perishables / cash crops
Consequences of inappropriate equipment use

- In terai 9/11 tyne cultivator is used for land preparation which requires 6-7 pass for land preparation increasing the cost of tillage.
- Now a days 4 wheel tractor operated rotovator is used in terai (due to fine tilth and single pass for tillage) which destroy the soil structure and compact the soil below top soil.
- Frequent accidents occurs specially in the agro processing mills with exposed flat belt.
- Frequent accidents of tractor due to lack of safety feature (ROPS), lack of training to the operator etc.
- 4 wheel tractor is mainly used in other than agricultural works specially stone and gravel export in terai.
Tractor Use
Tractor Use
Machinery supply chains

- Black smiths
- Small Agricultural Machinery Fabricators
- AM importers
- Dealers/ Sub dealers
- Service providers
  - Custom hiring
  - Repair and maintenance
Policies related to AM

- Majority of policy neutral to AM
- Agricultural policy -Commercialization
- Energy Policy
- (Civil Code) 2020- Causes Land Fragmentation
- Land Reform Policy- yet to be implemented
- Low Duty on Imported agricultural Machinery (not all )/ high on raw materials
- No policy to establish agril machinery industry
- No focus on research and developemnt of agril machinery (weak institutions related to AM)
- Lack of policy on testing of AM
Proposed Agricultural Mechanization Policy 2070

- Through appropriate agricultural mechanization, the Nepalese agriculture will be made more competitive, sustainable and commercialized by enhancing productivity and profitability.

- Through the collaborative effort of government, private and cooperative sector, agricultural mechanization service and enterprise will be enhanced and accessibility of appropriate agricultural machine will be enhanced.

- Women and environment friendly agricultural mechanization will be enhanced.

- Institutional development for agricultural mechanization and quality of agricultural machinery used in Nepal will be regulated.
Challenges of AM in Nepal

- Small and fragmented land holding
- Subsistence nature of agriculture
- Poor infrastructure is major constraints for mechanization and commercialization of agriculture in Nepal.
- Need of easy access to credit & awareness of financial intermediaries
- Need of easy access to appropriate AM technology
- Weak Research and development system on AM
- Lack of clear-cut policy and strategy on AM
Opportunities of AM in Nepal

Development Adaptation & Promotion of Efficient Hand Tools

- Upgrade the skill level & facility of Blacksmiths & support for BDS of hand tools
- Continuous R & D on efficient hand tools
- Corn sheller, efficient hand hoes, fruit harvester, weeder, metal bins, stoves, improved plough etc.
Opportunities of AM in Nepal (contd.)

Development Adaptation & Promotion of Efficient Animal Drawn Implements

- Continuous R & D on efficient animal drawn implements & promotion
- Single yoke harvesting
- Shifting to buffalo for draft power in terai
- Train local blacksmiths in fabrication of efficient animal drawn implements
Opportunities of AM in Nepal (contd.)

Development Adaptation & Promotion of Efficient processing machinery

- Continuous R & D on appropriate processing value addition equipments
- Locally fabricate and bring in to supply chain
- Create favorable condition for small fabricators/ manufacturers
Opportunities of SAM in Nepal (contd.)

Agri. Mechanization with Conservation tillage

- Land preparation and sowing cost is 1/3 that of traditional practice. (Rs. 988 vs Rs. 2891/ha)
- Saves up to 100 lit of diesel/ha in land preparation.
- Saves at least 20% of irrigation water
- Better nutrient use efficiency
- Better yield (10-20%) than the traditional practice
RCT in wheat
Opportunities of AM in Nepal (contd.)

Cooperative farming / command area development

- Address the problem of small holders
- Improve land/ labor productivity
- Create favorable condition for agril mechanization & commercialization
- Easy for development of infrastructure/ facility at farm level
Opportunities of AM in Nepal (contd.)

Efficient Irrigation for commercialization

- Promotion of STW in terai
- Electricity facility at farm level
- Promotion of drip and sprinkler
- Adaptation of laser leveling for better water management & land productivity
Opportunities of AM in Nepal (contd.)

Mechanization through custom hiring

- BDS of custom hiring as enterprise
- Support custom hiring of AM (training, tax reduction on spare parts, operation & maintenance)
- Exposure to improved agricultural machinery
Opportunities of AM in Nepal (contd.)

Public & Private Partnership for promotion of Sustainable Agricultural Mechanization

- **Government’s role:** favorable policy & facilitator, coordinating, testing quality control, demonstration, training and research

- **Private sector:** manufacturing, import, distribution, marketing, service providing

- **Financial intermediaries:** easy access to credit

- **PPP joint collaborative effort for promotion of AAM**
Thank You