Challenges in Sustainable Agricultural Mechanization in Nepal

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Sustainable Agricultural Mechanization (SAM)

- Activities involved in the value chain on utilization of tools, implements and machines to perform Agricultural Operation leading to
  - Increase labor productivity
  - Enhance land productivity
  - Reduce the cost of production
  - Reduce drudgery & farm work load

- With
  - No or little damage to environment
  - Safe to operator, consumer and environment
  - Appropriate in time, space and socioeconomic condition
Nepal

- Land Lock country sandwiched between India and China
- Land area 147,181 sq km & Population 2.7 M
- Three geographical region Terai, Hill & Mountain
- Elevation ranges from 70 m to 8,848 m
- Climate temperate to sub tropical
- Rugged terrain and diversity (in all senses) the typical feature of Nepal
Physiographic Regions

- **Terai**
- **Siwalik**
- **Middle Mountain**
- **Himalaya**
- **Alpine**
- **Sub Alpine**
- **Cool Temperate**
- **Warm Temperate**
- **Sub Tropical**

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
Agricultural Scenario

- Dominated by subsistence and small holder agriculture. Average land size <0.8 ha.
- Agriculture contributed 36% AGDP and employment to about 60 percent of population.
- Rice based and maize based cropping system are dominant in terai and hills respectively.
- Cattle, buffalo and goat and poultry are major livestock.
- Vegetable cultivation, cash crops viz. tea, coffee, cardamom, ginger etc.
## Area and Production of Cereal Crops, 2011/2012

<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>1531493</td>
<td>5072248</td>
<td>3312</td>
</tr>
<tr>
<td>Maize</td>
<td>871387</td>
<td>2179414</td>
<td>2501</td>
</tr>
<tr>
<td>Millet</td>
<td>278030</td>
<td>315067</td>
<td>1133</td>
</tr>
<tr>
<td>Wheat</td>
<td>765317</td>
<td>1846142</td>
<td>2412</td>
</tr>
<tr>
<td>Buckwheat</td>
<td>10339</td>
<td>10021</td>
<td>969</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3484532</strong></td>
<td><strong>9457722</strong></td>
<td><strong>2710</strong></td>
</tr>
</tbody>
</table>
Farm Power Availability

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

Human Power 36%
Animal Power 41%
Mechanical Power 23%
Tractor Population Trend

FIG. 3: CUMULATIVE NUMBER OF TRACTOR REGISTERED IN NEPAL
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
New Initiatives in tillage
Status of Agri. Mechanization (cont.)

Planting / Seeding
- Rice is manually Transplanted
- Wheat is broadcasted
- Maize & vegetable seeds is dabbled
- 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
- Hand tools- 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
- More than 30 Combine harvesters are in operation in Terai
- 4 wheel tractor operated reapers, power tiller & mini tiller operated reaper are also getting popular
Status of Agri. Mechanization (cont.)

Threshing

- Beating on stone/ drum
- Animal/ tractor treading
- It is estimated that more than 60% of threshing in terai is performed by thresher
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
Machinery supply chains

- Black smiths
- Small Agricultural Machinery Fabricators
- AM importers
- Dealers/ Sub dealers
- Service providers
  - Custom hiring
  - Repair and maintenance
- Farmers
Issues and Challenges on SAM in Nepal

Socioeconomic Issues

- Small and fragmented land holding
- Youth people are not interested in agriculture
- Poor Conditions of traditional Blacksmiths
- Gender Concerns
- Capital Constraints

Technological Issues

- Small holder agricultural mechanization
- Availability of spare parts:
- Poor condition of local agricultural machinery fabricators
- Lack of technical and safety standards
Issues

- **Policy Issues**
  - Lack of agricultural mechanization policy
  - Lack of Recognition of Farm Machinery Custom Hiring Enterprise
  - Fragmentation of land holding

- **Institutional Issues**
  - Weak Research and Extension System
  - Lack of institution for testing and Quality control
  - Capacity development of private sector and farmers
Opportunities and Intervention Needed Areas

- Development Adaptation & Promotion of Efficient Hand Tools through capacity development of local blacksmiths and commercialization of their skill
- Development Adaptation & Promotion of Efficient Animal Drawn Implements
Opportunities and Interventions needed (contd.)

- Development Adaptation & Promotion of Efficient processing machinery of high value commodities
- Agri. Mechanization with Conservation agriculture
Opportunities and Intervention needed ..(contd.)

- Cooperative farming/ command area development
- Assured and Efficient Irrigation for commercialization
- Promotion of renewable energy in agriculture
Opportunities & Interventions Needed.. (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 SAM**
Thank You!