Agricultural Mechanization in Nepal

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Physiographic regions

Physiographic Regions of Nepal

- High Himalaya (23%)
- Siwalik (14%)
- Terai (14%)
- Middle Mountain (19%)
- High Mountain (30%)

Terai (100-300)
Siwalik (150-800)
Middle mountain (300-1500)
High mountain (1500-5000)
High Himalaya (>2600 masl)
## Land Holding

<table>
<thead>
<tr>
<th></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>
Agricultural Scenario

- Dominated by subsistence and small holder agriculture.
- Agriculture contributed 35% 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.
Other Related Scenario

- Poor infrastructure (road, electricity, market, communication etc.)
- Agriculture provides employment to 73.9% of population
- Irrigated area 43% of cultivated and only 18% is year round irrigated.
- Lack of agricultural labor in Peak agricultural season
- Migration of rural youth to abroad and nearby cities in search of jobs.
- Poor investment capacity of farmers
Share of loan by ADBN 2009/10

- Poultry: 29%
- Agri business and Fishery: 19.5%
- Agriculture related: 4.3%
- Food crops: 5%
- Cash Crops: 23%
- Special crops: 3%
- Fruit Crops: 1%
- Agri tools/mechanical: 15.8%
Historical Perspective

- 1924- First tractor single cylinder (K B Thapa Biratnagar)
- Mid 60s - Tractor (64) and pumpsets (30) introduced
- 1964- Establishment of ATF (USSR)
- 1970s- Tractor import by National Trading Limited
- 1970s- Agriculture credit projects finance availability
- 1980-85- ADBN discouraged financing tractor/ machine
- 1991- Establishment of NARC - AED
- 1995- Removal of subsidy in pump sets
- 1996- Privatization of ATF
- 2004- Establishment of Agricultural Engineering Directorate
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%
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
Distribution of holdings using tractor

![Graph showing distribution of holdings using tractor](image-url)
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
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 80000 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
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
## Tools & Implements Used in Hills

<table>
<thead>
<tr>
<th>Agricultural Operations</th>
<th>Manual Tools/ device</th>
<th>Animal drawn implements</th>
<th>Power drawn implements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tillage</td>
<td>Spade</td>
<td>Wooden plough, iron MB plough plank</td>
<td>Cultivator, disc harrow Rototiller</td>
</tr>
<tr>
<td>Planting</td>
<td>Hoe</td>
<td>Traditional wooden plough</td>
<td>Minimum / zero till seed drill</td>
</tr>
<tr>
<td>Intercultural</td>
<td>Hoe</td>
<td>Traditional wooden plough</td>
<td></td>
</tr>
<tr>
<td>Plant protections</td>
<td>Compression type Sprayer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irrigation</td>
<td>Low cost drip, micro sprinkler and sprinkler</td>
<td>Petrol/diesel engine &amp; electricity operated Pump set</td>
<td></td>
</tr>
<tr>
<td>Harvesting</td>
<td>Sickle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Threshing &amp; Winnowing</td>
<td>Drum/maize pedal thresher, flail</td>
<td>Treading on threshing floor</td>
<td></td>
</tr>
<tr>
<td>Milling &amp; grain processing</td>
<td>Dhiki, Okhal, Janto, Kol</td>
<td>Kol</td>
<td>Huller, sheller, oil expeller watermill</td>
</tr>
<tr>
<td>Transportation</td>
<td>Doko</td>
<td>Mule, chyangra, Nak Backpack</td>
<td>Tractor/ power tiller trailer</td>
</tr>
</tbody>
</table>
## Tools & Implements Used in Terai

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<td>Spade</td>
<td>Wooden plough, MB plough, disc harrow, culti, wooden plank</td>
<td>Tractor cultivator, disc harrow, leveller, power tiller cultivator</td>
</tr>
<tr>
<td>Planting</td>
<td>Hoe</td>
<td>Wooden plough</td>
<td>Zero till and minimum till seed drill</td>
</tr>
<tr>
<td>Intercultural</td>
<td>Hoe</td>
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<td>Compression type Sprayer</td>
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<td></td>
</tr>
<tr>
<td>Irrigation</td>
<td>Hand Pump, Rower Pump, Treadle pump, drip system</td>
<td>Diesel engine &amp; electricity operated Pump set</td>
<td></td>
</tr>
<tr>
<td>Harvesting</td>
<td>Sickle</td>
<td>Reaper and combine harvester</td>
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<tr>
<td>Threshing &amp; Winnowing</td>
<td>Drum/ stone, maize sheller, winnower</td>
<td>Treading on threshing floor</td>
<td>Wheat and multi crop thresher</td>
</tr>
<tr>
<td>Milling/ grain processing</td>
<td>Dhiki, janto</td>
<td>Huller, sheller mills, chakki mill, modern rice mills and flour mills</td>
<td></td>
</tr>
<tr>
<td>Transport</td>
<td>Cycle, basket</td>
<td>Bullock cart</td>
<td>Tractor/ PT trailer</td>
</tr>
</tbody>
</table>
Stake Holders in Ag. Mech.

- Government Ministries (agriculture / finance/ land reform / labor/ trade & commerce)
- Department of Agriculture & Agricultural Engineering Directorate,
- Nepal Agriculture Research Council and Agricultural Engineering Division (AED & Agriculture Implement Research Center (AIRC), Ranighat
- Institute of Engineering Purbanchal Campus
- Agricultural Development Bank and other financial intermediaries.
- Private Sector (importers/ distributors/ fabricators of agri machineries)
- NGOS/ Projects
- Blacksmiths
Contribution of Agricultural Engineering in AM

- Hand Hoes (Local Blacksmiths and artisans)
- Iron Plough (ATF, Dealers)
- Tractors (ADBN, Dealers)
- Power Tillers (NARC, Dealers)
- Conservation Tillage (NARC, MOAC)
- Sprayers (Importers, Dealers & DOA)
- Shallow tube wells (ADBN, Dealers, DOI)
- Sprinkler irrigation (ADBN, Suppliers, DOI)
- Drip Irrigation & Treadle Pump (IDE, SIMI, DOI, NGOs)
- Reapers (NARC, Dealers)
- Combine Harvester (Entrepreneur/Service Provider)
- Threshers (DOA, ATF, Suppliers, Fabricators)
- Processing Machinery (Importers, Dealers, ADBN, NARC, Fabricators)
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
Issues & Constraints

- Needs specific Policy & program for agro ecological, small holders and medium holders
- Since, women farmer has got dominant role in crop production activities their drudgery problem is need to be addressed.
- Major technological constraints with farmer’s perspective spare parts, training on O & M, lack of skilled mechanic and workshop
- Indigenous skill and technology of blacksmiths is at the verge of extinction from the community, due to lack of commercialization and modernization.
- Custom hiring of farm machinery is taking place in an informal way
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 AM 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
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 Appropriate Agricultural Mechanization

- Government’s role: favorable policy & facilitator, coordinating, testing quality control, demonstration and research
- Private sector: manufacturing, import, distribution, marketing, service providing
- Financial intermediaries: easy access to credit
- PPP joint collaborative effort for promotion of AAM
Opportunities of AM in Nepal (contd.)

- Agricultural mechanization for **national food security**
- Agricultural mechanization for **commercialization in agriculture**
- Agricultural mechanization for **reducing cost of cultivation & income generation**
- Agriculture mechanization for **reducing the drudgery**
- Agricultural mechanization for **attraction of youth farmers** in Nepalese agriculture for **New Nepal**
Thank You