Challenges of Agricultural Machinery Development in Nepal

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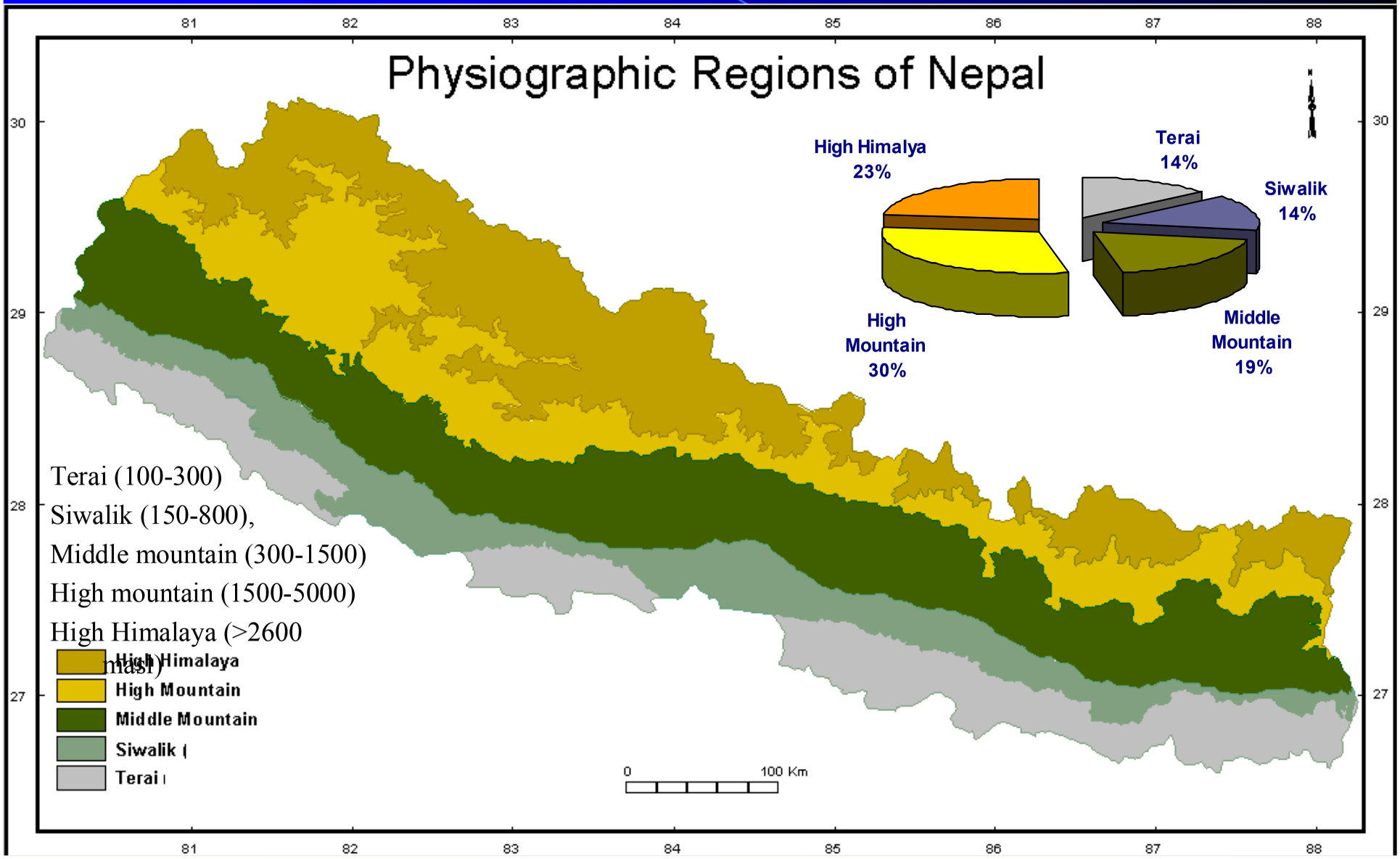
Background
Agricultural Scenario

- Dominated by subsistence and small holder agriculture.
- Agriculture contributed 32% of GDP
- 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 71.3% of population in which wage 6.8 and self 64.3% in 2003/04
- 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

Physiographic Regions



Major Feature of Agricultural Mechanization

- Subsistence agriculture, small land holding , cultivation in narrow terrace and sloppy land.
- Draft animal power (bullock) is the major source of power in the hills for land preparation
- Only 1.5 % of the farmers in the hills & mountain use power tiller for land preparation (CBS 2001)
- Only about 3% farmers in the hills &mountain use mechanical thresher (CBS 2001)
- In terai, use of 4 wheel and 2 wheel tractor, use of diesel pump sets, threshers etc. increasing trend

Why to mechanize?

- Nepal, the member of WTO
- Reducing cost of cultivation
- Commercial farming
- Timely farm operations
- Efficient use of land, labor and equipment
- Saving in time for other activities (Income generating activities, child health care, education, recreation etc.)
- Reducing human drudgery

Status of Agricultural Mechanization in Nepal

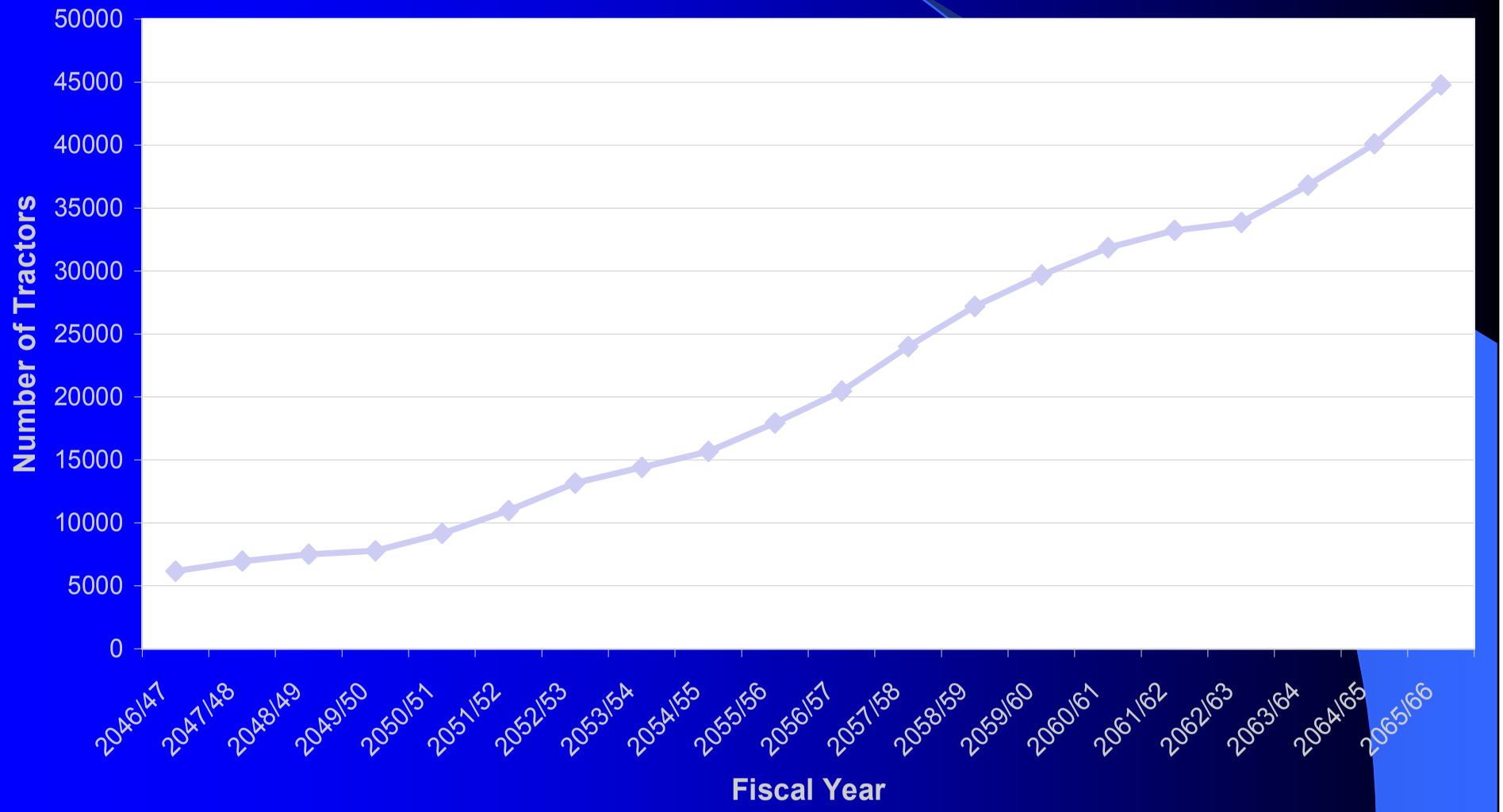
- Agricultural Mechanization is in infancy stage
- Single cylinder Fordson diesel tractor was introduced by Krishna Bahadur Thapa of Biratnagar in 1924 AD
- Hills & Mountains-Human labor, primary source of power
- Terai-Mechanical power is increasing replacing animal power
- **Agricultural mechanization misunderstood for tractorization**
- Power availability (kilowatts)
  Nepal : 0.22 kw/ha (0.29hp/ha)
  India: 1.35 kw/ha
  Himanchal Pradesh =0.6 kw/ha
  Punjab= 3.03 kw/ha

Share of Different Sources of Agricultural Power in Nepal & India

Type of Power	Nepal	India
Animate	65	18
Mechanical	35	55
Electrical	-	27
Total Power	100	100

Year wise Tractor Population in Nepal

Fig. 2: Total Number of Tractors Registered in Nepal

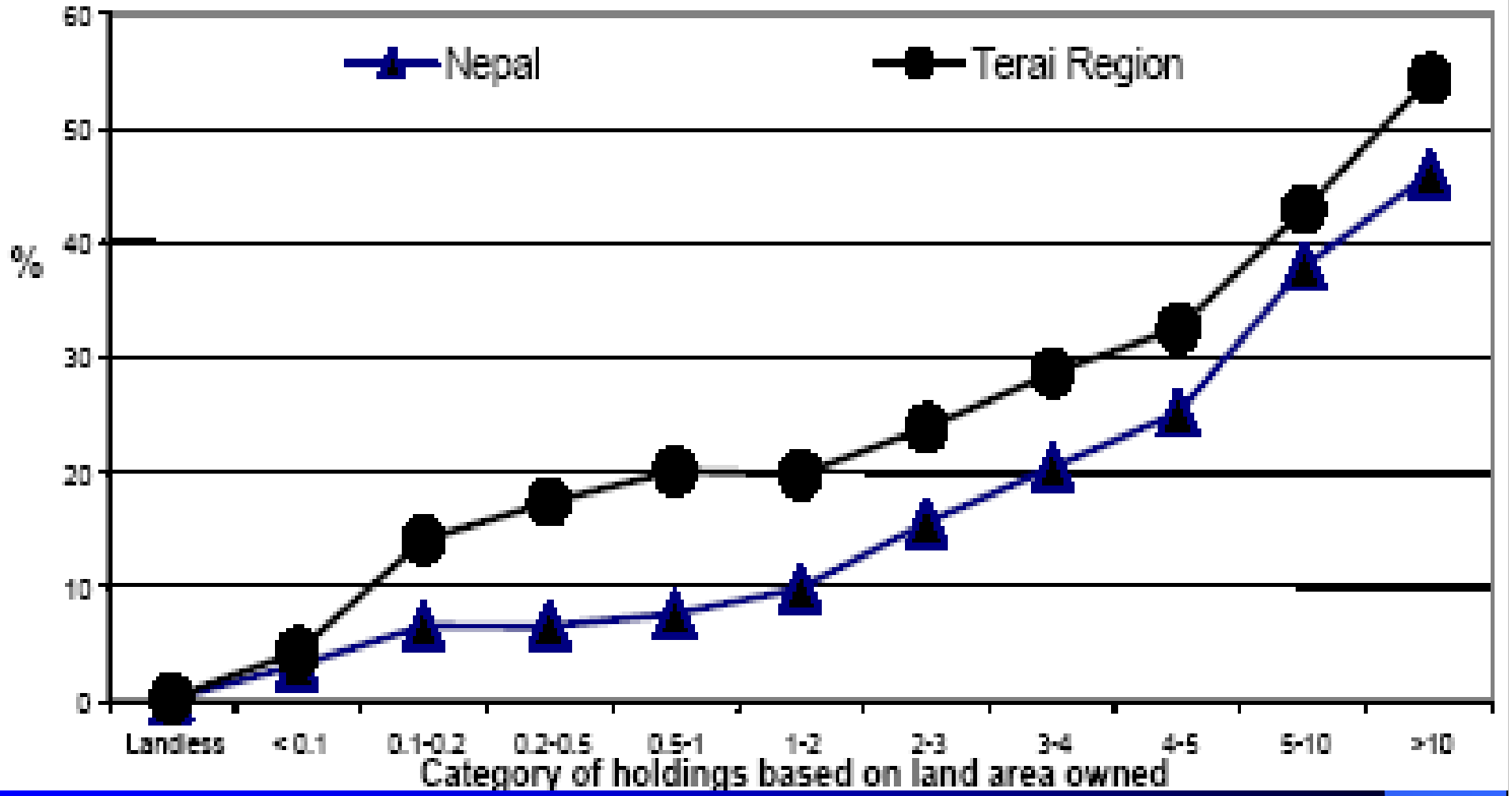


Status of Agricultural Mechanization

Tillage

- Majority of tillage by animal power
- Only 26% 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



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 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

Combine Harvester in Operation

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 is mechanized
- Sheller, Huller, grinding mill, oil expeller, beaten rice mill is common
- Need of appropriate technology in processing of perishables / cash crops

Positive trend in mechanization

- Increased use of tractor for land preparation specially in terai
- Increased use of combine harvestor in Rupandehi, Nawalparashi & Kapilbastu district
- Increased use of Shallow tube well in terai
- Demand of wheat and rice thresher
- Milling operation mechanized in hills and terai
- Farmer's interest in zero till drill and reaper.
- Drip irrigation adoption for small scale vegetable cultivation

Major Agencies Related To Agricultural Mechanization in Nepal

	Institutions	Type	Major Contributions
1	AED & AIRC	Research	Iron Plough, paddy thresher, zero till & minimum till technologies, grain and seed dryers, cardamom dryer, plastic house for vegetable cultivation, solar dryers, small scale processing tech. (corn Sheller, improved quern, millet pearler), coffee pulper
2	RECAST	Research	Improved cook stove, solar dryer
3	Agri. Engg. Directorate	Dissemination	Recently established

Contributions Made by……. Contd.

	Institution	Type	Major Contributions
4	AEPC	Coordinating institution for Renewable energy technologies	• Improved cook stove • Biogas • Micro hydro • Solar technologies (Solar PV, dryers etc.)
5	ADBN	Credit	Major institution involved in financing for tractors, pump sets, agro processing mills etc.
6	NGOS/ Projects		
A	IDE	NGO	Promotion of Micro irrigation & treadle pump
B	REDP	Project	Promotion of Micro Hydro & RET
C	BSP	Project	Promotion of Biogas
D	SIMI	Project	Promotion of Micro Irrigation & Marketing for small holders
E	CRT	NGO	Promotion of ICS & Water mill

SOME SUCCESS STORIES IN AGRICULTURAL MACHINERY/TECHNOLOGY APPLICATION

Combine Harvester

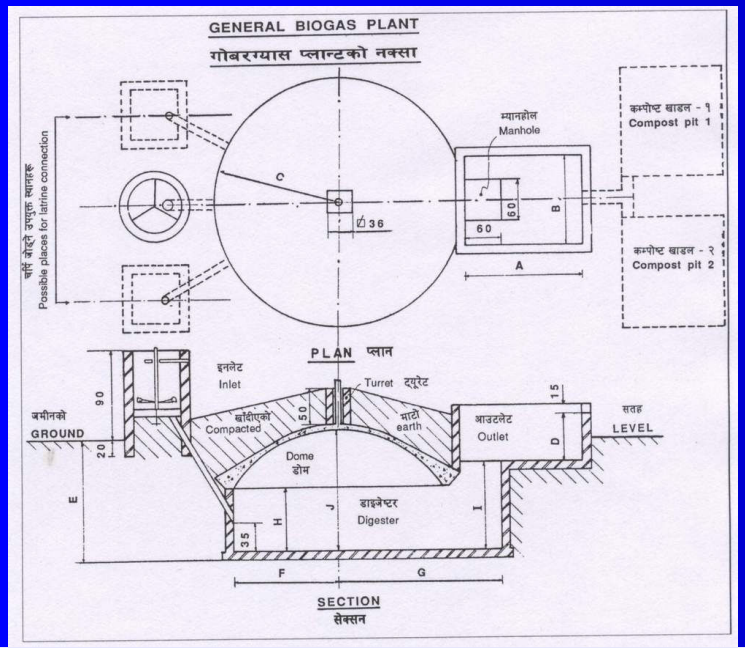
- Timeliness in harvesting
- Reduce the harvesting cost by 50 %
- Adopted without Govt. Support 9 in operation in central and western terai

Minimum and Zero tillage technology

- Reduce cost of cultivation more than 50 %
- Increase the residual soil moisture and increase production 10-20%
- Adopted in central and western terai

SUCCESS STORIES CONTD…

- Biogas
- Treadle Pump
- Simple Low cost drip irrigation system



SOME SUCCESS STORIES IN AGRICULTURAL MACHINERY/TECHNOLOGY APPLICATION

- Improved Water mill
- Gravity Rope way

SOME SUCCESS STORIES ……..

- Pedal Operated millet thresher cum pearler
- Coffee pulper
- Manual Corn Sheller
- Low cost Solar Dryer




ISSUES & CONSTRAINTS OF AGRICULTURAL MECHANIZATION

Socioeconomic Issues:

- Lack of Alternative Employment Opportunities
- Small and fragmented land holding
- Declining Sharing of family labour
- Poor Conditions of Blacksmiths
- Gender Concerns
- Capital Constraints

ISSUES & CONSTRAINTS OF AGRICULTURAL MECHANIZATION

Technological Issues & Constraints

- Need of agricultural mechanization for small-holders:
- Availability of spare parts
- Poor condition of local agricultural machinery fabricators:
- Lack of technical and safety standards

Policy Issues & Constraints

- Lack of agricultural mechanization policy
- Lack of policy support for farmers, fabricators on agril mechanization
- Lack of Recognition of Farm Machinery Custom Hiring Enterprise

ISSUES & CONSTRAINTS OF AGRICULTURAL MECHANIZATION..

Institutional Constraints

- Poor Ag. Machinery Extension System
- Poor Ag. Machinery Research System
- Lack of Awareness of Improved Ag. Machinery
- Lack of Institution for testing and quality control of Ag. Machinery

PRIORITY AREA FOR TECHNICAL CO-OPERATION

Strengthening National Institute of APCAEM

Support from APCAEM is expected in following areas

- Technology transfer
- Exchange of commercially available equipment.
- Study visits for planners/scientists/technical officers in regional countries
- Exchange of information and publications
- Establishment of Farm machinery testing center at AED/NARC
- Skill development training for existing man power

PRIORITY AREA FOR TECHNICAL CO-OPERATION..

Joint Action Research Project Development

- Programs to mitigate climate change effect
- Conservation tillage
- Rainwater harvesting
- Water saving technologies
- Mechanization of hill agriculture
- Value addition of fruits and vegetable products
- Cottage scale processing of herbs and medicines
- Development of safety standard for agricultural machinery
- Documentation of indigenous technologies and successful story/cases related to agricultural engineering and technology

RECOMMENDATIONS FOR ESTABLISHING AN EFFECTIVE MECHANISM TO PROMOTE AGRICULTURAL TECHNOLOGY TRANSFER

- Strengthening R & D Institutes
- Establishment of Standardization and Certification Institute
- Supporting for Local Fabricators of Agricultural Machinery
- Establishment of Network of institutions including private sector involved with agricultural machinery
- Collaboration with national and international institutions for technology transfer

Recommendations……..

Institutional Setup

- Activation of Agricultural Mechanization Committee (AMC) already formed in the Ministry of Agriculture and Cooperatives.
- Establishment of National Agricultural Mechanization Research and Extension Center (NAMREC) to strengthen National Mechanization Program.
- Establishment of Mechanization Promotion Cell (MPC) headed by Agricultural/Mechanization Engineers in the potential District Agriculture Development Offices.

Recommendations….

Policy Support for promotion of agricultural Mechanization

- Co-operative farming and land consolidation for agricultural activity
- Contract hiring of agricultural machinery
- Support for agricultural machinery manufacturers
- Standardization and safety of agricultural machinery
- Promotion for energy efficient machinery
- Promotion for conservation farming related machinery and green technologies
- Promotion for value addition and employment generation related small and medium scale agro industries

Thank you